



St. Xavier's College (Autonomous), Kolkata



POSTGRADUATE AND RESEARCH DEPARTMENT OF ECONOMICS

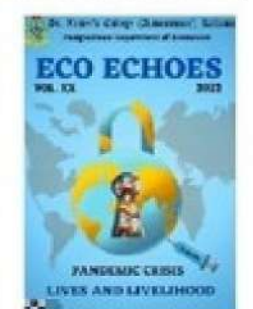
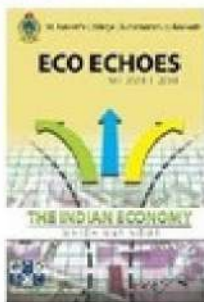
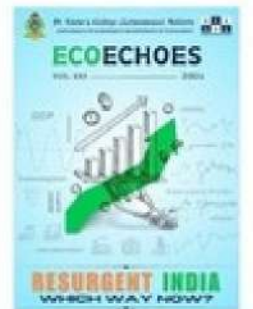
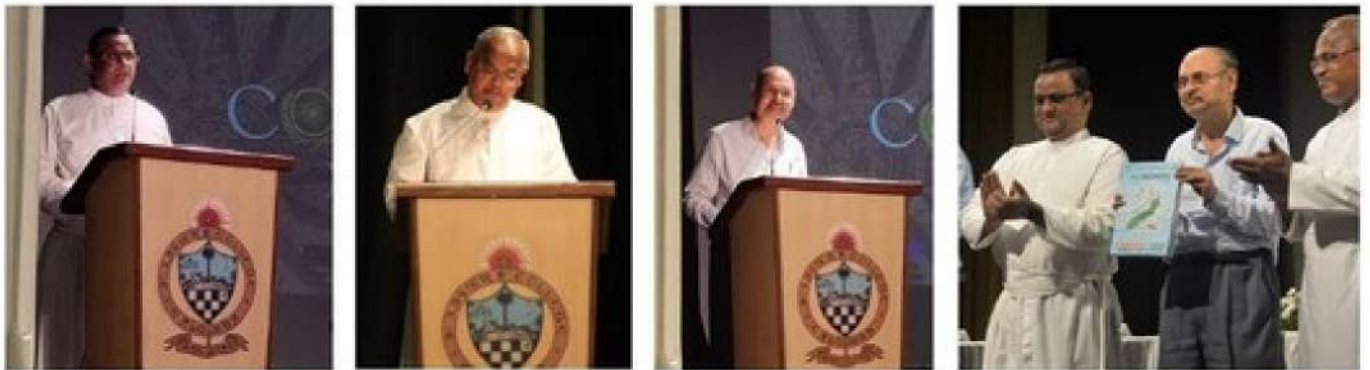
ECOECHOES

VOL: XXII _____ 2025

RETHINKING ECONOMIC GROWTH IN A
GLOBALIZED WORLD:
FOR AN EQUITABLE AND SUSTAINABLE FUTURE



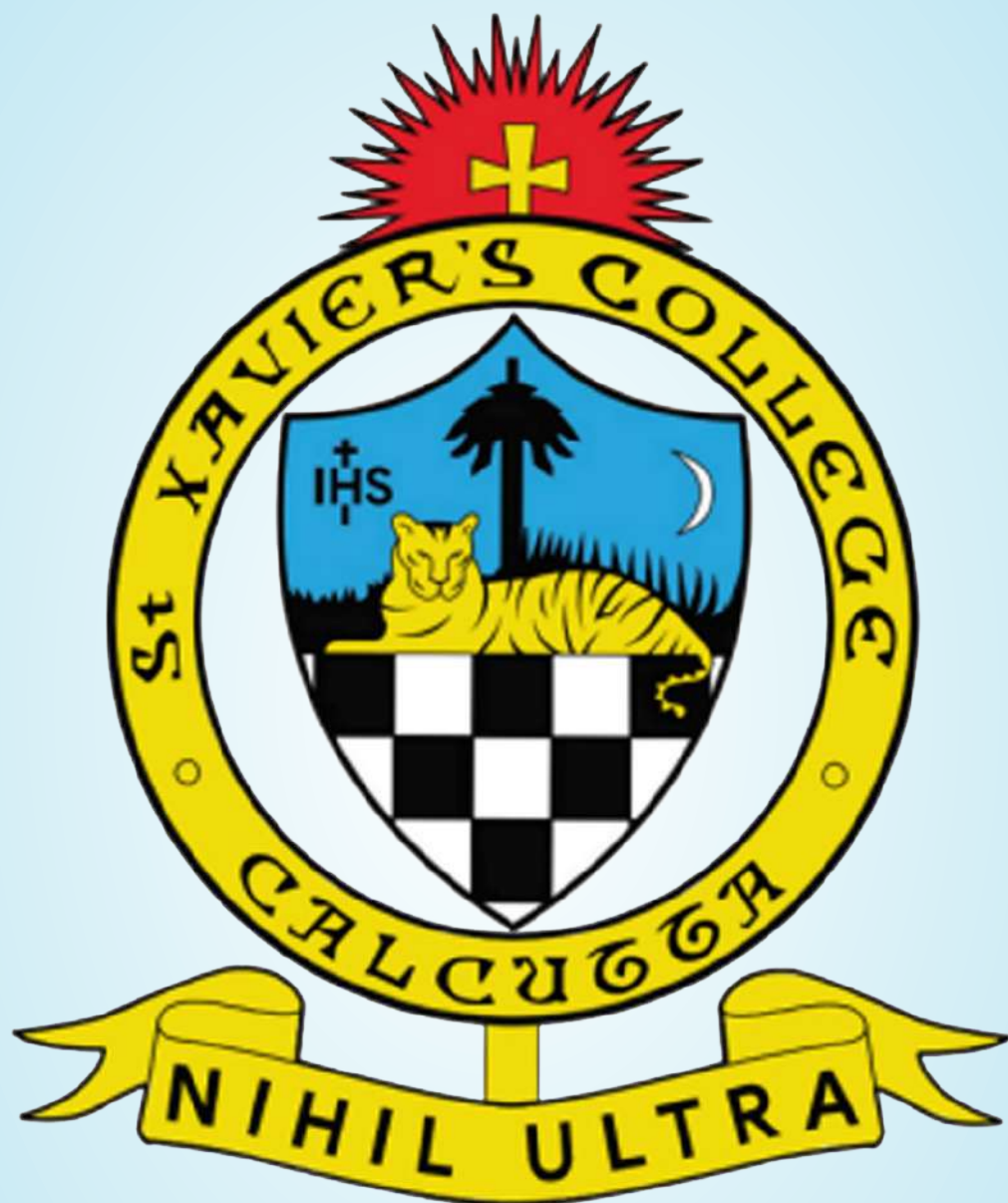
Some Glimpses of our Departmental Activities



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Xavier's Economics Society

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MESSAGE FROM THE RECTOR



“

IT IS A MATTER OF GREAT PLEASURE TO PEN A MESSAGE FOR THIS EDITION OF ECO ECHOES, THE ANNUAL DEPARTMENTAL MAGAZINE OF THE POSTGRADUATE AND RESEARCH DEPARTMENT OF ECONOMICS. THROUGHOUT ITS JOURNEY FOR THE PAST TWO DECADES, IT IS AN INSIGHTFUL INITIATIVE THAT REFLECTS THE ACADEMIC VIGOUR AND INTELLECTUAL ENGAGEMENT OF OUR STUDENTS AND RESEARCH SCHOLARS IN THE FIELD OF ECONOMICS.

THIS YEAR'S THEME "RETHINKING ECONOMIC GROWTH IN A GLOBALIZED WORLD: FOR AN EQUITABLE AND SUSTAINABLE FUTURE" IS EXTREMELY RELEVANT FOR THE CURRENT TIMES WHERE GROWTH HAS TO BE MATCHED WITH ENVIRONMENTAL SUSTAINABILITY AND EQUITABLE DISTRIBUTION OF RESOURCES OF THE WORLD.

THIS MAGAZINE PROVIDES AN ACADEMIC PLATFORM FOR STUDENTS AND RESEARCH SCHOLARS TO EXPRESS THEIR THOUGHTS AND CRITICAL ANALYTICAL SKILLS ON CONTEMPORARY ECONOMIC ISSUES. THIS ENDEAVOUR HELPS THE YOUNG MINDS TO EXPLORE, WITH CONFIDENCE, THE PRACTICAL APPLICATION OF ECONOMICS THROUGH THE LENS OF THEORETICAL PERSPECTIVES. THIS EDITION STANDS AS A TESTAMENT TO THE DIVERSE ABILITIES AND ENTHUSIASM OF OUR STUDENTS AND STAFF ALIKE.

I AM EQUALLY DELIGHTED TO NOTE THAT THE MAGAZINE WILL BE LAUNCHED IN CONFLUENCE XVIII, THE ANNUAL SUMMIT OF THE DEPARTMENT OF ECONOMICS WHICH IS AN EMBODIMENT OF COMMITMENT, KNOWLEDGE, VALUES, SKILLS AND RESILIENCE. IT PROVIDES A PLATFORM FOR STUDENTS TO EXPRESS THEIR IDEAS, NURTURE THEIR TALENTS, AND INCULCATE THE MILESTONES OF THEIR ACADEMIC JOURNEY.

I WISH TO CONGRATULATE THE EDITORIAL TEAM, FACULTY ADVISORS AND ALL CONTRIBUTORS WHOSE COMBINED EFFORTS HAVE RESULTED IN THIS YEAR'S PUBLICATION OF ECO ECHOES. WISHING THE MAGAZINE CONTINUED SUCCESS AND HOPING IT SPARKS MEANINGFUL DIALOGUE WITHIN AND BEYOND OUR ACADEMIC COMMUNITY.

NIHIL ULTRA!

A handwritten signature in black ink, reading "Veluswamy Jeyaraj". The signature is fluid and cursive, with the first name "Veluswamy" and the last name "Jeyaraj" clearly distinguishable.

REV. FR. JEYARAJ VELUSWAMY, SJ.
RECTOR, ST. XAVIER'S COLLEGE (AUTONOMOUS), KOLKATA.

”

MESSAGE FROM THE PRINCIPAL



“ —

IT IS A PLEASURE TO CONVEY MY HEARTFELT GREETINGS TO THE POST GRADUATE AND RESEARCH DEPARTMENT OF ECONOMICS ON THE OCCASION OF CONFLUENCE XVIII AND THE RELEASE OF THIS YEAR'S EDITION OF ECO ECHOES. BOTH THE EVENT AND THE MAGAZINE STAND AS TESTIMONY TO THE DEPARTMENT'S UNWAVERING COMMITMENT TO ACADEMIC INQUIRY, CRITICAL THOUGHT, AND MEANINGFUL ENGAGEMENT WITH THE WORLD AROUND US.

THE THEME OF THIS EDITION—"RETHINKING ECONOMIC GROWTH IN A GLOBALIZED WORLD: FOR AN EQUITABLE AND SUSTAINABLE FUTURE"—COULD NOT BE MORE PERTINENT. AS WE GRAPPLE WITH RISING INEQUALITIES, ENVIRONMENTAL DEGRADATION, AND THE COMPLEXITIES OF AN INCREASINGLY INTERCONNECTED GLOBAL ECONOMY, IT BECOMES ESSENTIAL TO REVISIT AND REIMAGINE WHAT GROWTH TRULY MEANS. MOVING BEYOND CONVENTIONAL INDICATORS, WE MUST EMBRACE MODELS OF DEVELOPMENT THAT ARE INCLUSIVE, JUST, AND SUSTAINABLE.

I WOULD LIKE TO SPECIALLY ACKNOWLEDGE THE TREMENDOUS EFFORTS OF THE ECO ECHOES EDITORIAL TEAM AND ALL CONTRIBUTORS. THEIR DEDICATION, INTELLECTUAL RIGOR, AND COLLABORATIVE SPIRIT HAVE RESULTED IN A PUBLICATION THAT NOT ONLY REFLECTS ACADEMIC EXCELLENCE BUT ALSO INVITES THOUGHTFUL DIALOGUE ON ISSUES THAT MATTER. THE MAGAZINE ALSO FEATURES INSIGHTFUL CONTRIBUTIONS FROM DISTINGUISHED ECONOMISTS AND EMINENT SCHOLARS FROM PRESTIGIOUS ACADEMIC INSTITUTIONS, FURTHER ENRICHING ITS CONTENT AND WIDENING ITS PERSPECTIVES.

I AM CONFIDENT THAT THIS EDITION OF ECO ECHOES WILL RESONATE DEEPLY WITHIN OUR ACADEMIC COMMUNITY AND SPARK CONVERSATIONS THAT EXTEND FAR BEYOND THE CLASSROOM. MAY THE MAGAZINE CONTINUE TO GROW AS A PLATFORM FOR CRITICAL THINKING, DIVERSE VOICES, AND IMPACTFUL IDEAS - NURTURING THE CURIOSITY OF BUDDING MINDS AND INSPIRING A NEW GENERATION OF THINKERS AND CHANGEMAKERS.
NIHIL ULTRA!



Rev. Dr. Dominic Savio, SJ
Principal
St. Xavier's College (Autonomous), Kolkata

— ”

MESSAGE FROM THE VICE-PRINCIPAL



“ —

ECO ECHOES, THE ANNUAL MAGAZINE PUBLISHED BY THE POSTGRADUATE AND RESEARCH DEPARTMENT OF ECONOMICS, IS NOW IN ITS TWENTY SECOND YEAR OF PUBLICATION. THE MAGAZINE IS A VIBRANT REFLECTION OF THE INTELLECT AND CRITICAL THINKING OF THE STUDENT COMMUNITY OF THE DEPARTMENT OF ECONOMICS (ARTS & SCIENCE).

ECO ECHOES IS NOT MERELY A COLLECTION OF ARTICLES IT IS A MIRROR THAT SHOWCASES THE ACADEMIC SPIRIT OF THE DEPARTMENT. IT PROVIDES A PLATFORM FOR STUDENTS TO EXPRESS THEIR IDEAS, NURTURE THEIR TALENTS AND PAVES THE PATH TO CONFIDENTLY PROGRESS TO ACHIEVE THE MILESTONES OF THEIR ACADEMIC JOURNEY. THIS EDITION STANDS TESTAMENT TO THE DIVERSE ABILITIES AND ENTHUSIASM OF OUR STUDENTS AND STAFF ALIKE.

ECONOMICS IS NOT JUST A SUBJECT CONFINED TO TEXTBOOKS AND CLASSROOMS, IT IS A DISCIPLINE THAT SHAPES OUR UNDERSTANDING OF THE WORLD AROUND US. FROM POLICY-MAKING AND GLOBAL ECONOMIC RELATIONS TO LOCAL DEVELOPMENT AND ENVIRONMENTAL ISSUES, THE ROLE OF ECONOMICS IN SHAPING SOCIETIES AND NATIONS IS BOTH DYNAMIC AND PROFOUND. IN TODAY'S WORLD OF ACADEMIA-INDUSTRY INTERFACE AND TECHNOLOGICAL ADVANCEMENTS, DEVELOPING A CRITICAL UNDERSTANDING OF ECONOMIC PRINCIPLES IS MORE IMPORTANT THAN EVER.

THIS MAGAZINE SERVES AS A VIBRANT PLATFORM FOR STUDENTS TO EXPRESS THEIR THOUGHTS, ANALYSES, AND RESEARCH ON CONTEMPORARY ECONOMIC ISSUES. IT IS HEARTENING TO SEE YOUNG MINDS EXPLORING REAL-WORLD PROBLEMS WITH DEPTH AND ORIGINALITY, AND ATTEMPTING TO OFFER INFORMED PERSPECTIVES AND SOLUTIONS.

I EXTEND MY HEARTFELT CONGRATULATIONS TO THE EDITORIAL TEAM, FACULTY ADVISORS, AND ALL CONTRIBUTORS WHOSE EFFORTS HAVE CULMINATED IN THIS IMPRESSIVE PUBLICATION. MAY THIS MAGAZINE CONTINUE TO INSPIRE CURIOSITY, CREATIVITY, AND COLLABORATION IN THE YEARS TO COME.

I WISH THE DEPARTMENT EVERY SUCCESS IN ITS ENDEAVOUR IN LAUNCHING THE MAGAZINE,

PROF. BERTRAM DA'SILVA
VICE-PRINCIPAL (ARTS AND SCIENCE)
ST. XAVIER'S COLLEGE (AUTONOMOUS), KOLKATA

MESSAGE FROM THE
**HEAD OF THE
DEPARTMENT**



“ —
|

ON BEHALF OF THE POSTGRADUATE AND RESEARCH DEPARTMENT OF ECONOMICS, I EXPRESS MY SINCERE GRATITUDE TO FATHER PRINCIPAL AND VICE PRINCIPAL SIR FOR THEIR CONSTANT ENCOURAGEMENT AND CONTINUOUS SUPPORT TO FACILITATE STUDENTS' RESEARCH AND PUBLISH THE SAME IN THIS YEAR'S EDITION OF ECHO ECHOES.

SINCERE THANKS TO PROF. PIA GHOSHAL AND PROF. SASWATI CHAUDHURI FOR THEIR INITIATIVE AND GUIDANCE IN THIS REGARD.

CONGRATULATIONS TO OUR STUDENTS FOR THEIR DEEP INVOLVEMENT AND HARD WORK WHICH HAS CULMINATED IN THE FORM OF THIS YEAR'S EDITION OF ECHO ECHOES.

A handwritten signature in blue ink that reads "Partha Pratim Ghosh".

DR. PARTHA PRATIM GHOSH
HEAD OF THE DEPARTMENT
POSTGRADUATE AND RESEARCH
DEPARTMENT OF ECONOMICS
ST. XAVIER'S COLLEGE (AUTONOMOUS),
KOLKATA

|
— ”

MESSAGE FROM THE EDITORS-IN-CHIEF



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WITHIN THE MULTITUDE OF OPPORTUNITIES PROVIDED BY THE POST GRADUATE AND RESEARCH DEPARTMENT OF ECONOMICS, ST XAVIER'S COLLEGE (AUTONOMOUS), KOLKATA, TO FLOURISH THE CAPABILITIES OF ITS STUDENTS, A MOMENTOUS ONE IS OUR DEPARTMENTAL MAGAZINE 'ECO ECHOES'. IT IS WITH ENORMOUS ENTHUSIASM AND PLEASURE THAT WE PRESENT TO YOU THE 22ND EDITION OF ECO ECHOES WITH THE THEME "RETHINKING ECONOMIC GROWTH IN A GLOBALISED WORLD: FOR AN EQUITABLE AND SUSTAINABLE FUTURE".

THE THEME "RETHINKING ECONOMIC GROWTH IN A GLOBALISED WORLD: FOR AN EQUITABLE AND SUSTAINABLE FUTURE", REFLECTS THE PRESSING NEED TO REVISIT TRADITIONAL GROWTH PARADIGMS THAT HAVE LONG EQUATED PROSPERITY WITH RISING GDP. WHILE ECONOMIC EXPANSION HAS BROUGHT PROGRESS, IT HAS ALSO EXACERBATED INEQUALITY, INTENSIFIED ENVIRONMENTAL DEGRADATION, AND REVEALED DEEP VULNERABILITIES ACROSS COUNTRIES. IN TODAY'S WORLD, CLIMATE CHANGE, MACROECONOMIC REPERCUSSIONS, AND UNEVEN DEVELOPMENT CONTINUE TO CHALLENGE THE GAINS OF GLOBALISATION. THE CHALLENGE, THEREFORE, IS NOT ONLY TO ACHIEVE GROWTH BUT ALSO TO ENSURE THAT THIS GROWTH IS JUSTLY DISTRIBUTED, ENVIRONMENTALLY SUSTAINABLE AND RESILIENT IN A RAPIDLY CHANGING WORLD ORDER. THIS THEME URGES US TO CONSIDER ALTERNATIVE MODELS OF DEVELOPMENT THAT PRIORITISE SOCIAL JUSTICE, ECOLOGICAL BALANCE, AND HUMAN WELL-BEING, RECOGNISING THAT SUSTAINABLE PROGRESS IN A GLOBALISED ERA DEPENDS NOT MERELY ON HOW MUCH ECONOMIES GROW, BUT ON HOW EQUITABLY AND RESPONSIBLY THAT GROWTH IS SHARED.

ON BEHALF OF THE ENTIRE ECO ECHOES TEAM, WE WOULD LIKE TO EXTEND OUR HEARTFELT GRATITUDE TO OUR RECTOR, REV. FR. JEYARAJ VELUSWAMY, SJ, OUR PRINCIPAL, REV. FR. DR. DOMINIC SAVIO SJ, OUR VICE PRINCIPAL, PROFESSOR BERTRAM DA SILVA, THE DEAN OF SCIENCE, DR. INDRANATH CHAUDHURI AND THE DEAN OF ARTS, DR. FARHAT BANO FOR THEIR CONSTANT SUPPORT. WE WOULD ALSO LIKE TO THANK OUR HEAD OF THE DEPARTMENT, DR. PARTHA PRATIM GHOSH, OUR PROFESSORS-IN-CHARGE OF THE MAGAZINE, DR. PIA GHOSHAL AND DR. SASWATI CHAUDHURI AS WELL AS THE ENTIRE FACULTY, STUDENTS AND RESEARCH SCHOLARS OF THE POSTGRADUATE AND RESEARCH DEPARTMENT OF ECONOMICS FOR THEIR UNWAVERING SUPPORT AND GUIDANCE. WE WISH TO EXTEND OUR HEARTFELT GRATITUDE TO OUR RESPECTED CONTRIBUTORS FOR THEIR GUEST ARTICLES WHO HAVE SHARED THEIR VALUABLE THOUGHTS WITH RESPECT TO THE TOPICS OF DISCUSSIONS. WE STRONGLY APPRECIATE AND ACKNOWLEDGE THE DILIGENT AND COMMITTED EFFORTS OF THE MEMBERS OF THE EDITORIAL BOARD AND THE DESIGN BOARD FOR MAKING THIS MAGAZINE COME TO LIFE WITH THEIR UNPARALLELED FOCUS, GRIT, EDITING SKILLS AND DETERMINATION. WE ALSO WISH TO EXTEND OUR HEARTFELT GRATITUDE TO THE SPONSORS FOR THEIR UNWAVERING SUPPORT. WE ALSO WISH TO THANK OUR FAMILY, FRIENDS, BENEFACTORS AND WELL-WISHERS FOR THEIR SUPPORT AND ENCOURAGEMENT.

WE HOPE THAT THE LEGACY OF ECO ECHOES CONTINUES FOR YEARS TO COME. NIHIL ULTRA!

MD. FARHAN ASLAM

OISHEE ROY

”

OUR FACULTY



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GUEST ARTICLES

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RETHINKING ECONOMIC GROWTH IN A
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SCOPE AND FUTURE OF RESEARCH RELATED TO STUDIES ON MIGRATION FROM THE PERSPECTIVE OF CLIMATE CHANGE AND SDG SYNERGIES

*Prof (Dr). Indrila Guha
Principal and HoD, Department of Economics,
Basanti Devi College, Kolkata, India*

*Dr. Atrayee Banerjee
Faculty, Department of Human Rights,
Basanti Devi College, Kolkata, India*

Migration studies have evolved into a critical interdisciplinary field, encompassing sociology, geography, political science, environmental studies, and international law. In the context of accelerating climate change, environmental degradation, and global inequality, migration is no longer solely driven by economic or political factors. Environmental stressors—such as droughts, floods, and sea-level rise—are increasingly compelling people to relocate, both within their own countries and across national borders. This intersection of climate change and human mobility presents urgent challenges and opportunities for researchers, policymakers, and students alike.

Climate change acts as a significant catalyst for migration, particularly in regions where environmental degradation undermines livelihoods. For instance, in several islands of the Indian Sundarbans, such as Ghoramara, Lohachara, and Sagar Island, rising sea levels, coastal erosion, and increasingly severe cyclones have led to the submersion of large tracts of habitable land. Over the past few decades, Lohachara Island has completely disappeared, and Ghoramara has lost more than half its area. Many of these people identify as climate refugees, since their displacement was directly linked to environmental changes rather than traditional economic migration. Another example (outside India) is the Rift Valley of Kenya, where increased rainfall has caused Lake Baringo to rise by 12 meters, submerging homes and farmland and displacing thousands. This phenomenon exemplifies how environmental changes can force communities to seek refuge in urban areas, often ill-equipped to accommodate sudden population influxes. There are many such instances across the globe; only two such cases are mentioned here.

Keywords: Migration, Sustainable Development Goals (SDGs), climate-refugees, internal and international migration, migration models.

Legal and Conceptual Challenges of Climate-Induced Displacement

One of the most pressing issues in climate-induced migration is the lack of legal recognition and protection for those displaced by environmental factors. The term "climate refugee" lacks formal recognition under international law, leaving affected individuals without the rights and protections afforded to traditional refugees. The UNFCCC and IPCC are policy & negotiation platforms that provide funding mechanisms, risk assessments, and displacement related task forces. Furthermore, the interplay between climate change and other drivers of migration—such as economic hardship, political instability, and social unrest—makes it challenging to attribute displacement to environmental factors alone. *This complexity necessitates the importance of interdisciplinary research in developing effective policy responses.*

Migration and the Sustainable Development Goals (SDGs)

Migration intersects with multiple Sustainable Development Goals (SDGs), highlighting its significance in global development agendas. For example,

- **SDG 1 (No Poverty):** Migration can serve as a pathway out of poverty by providing access to better employment opportunities.
- **SDG 10 (Reduced Inequalities):** Well-managed migration policies can reduce inequalities within and among countries.
- **SDG 13 (Climate Action):** Addressing climate-induced migration is integral to climate adaptation and resilience strategies.

Migration and SDG

Integrating migration considerations into SDG implementation can enhance the effectiveness of development initiatives and ensure that the needs of migrants are adequately addressed. The growing complexity of migration dynamics necessitates a robust academic response. Educational institutions play a pivotal role in equipping students with the knowledge and skills to analyse and address migration-related challenges. Migration studies in India are a growing field, with several universities and institutions offering courses, research opportunities, and initiatives focused on various aspects of migration. These include international migration, internal migration, diaspora studies, and refugee studies. Some institutions offering courses related to migration are Centre for Refugee Studies at Jadavpur University, the Centre for Migration, Mobility & Diaspora Studies (CMMDS) at the Indian Council of World Affairs, Five Year Research Programme at Tata Institute of Social Sciences (TISS), Centre for Migration and Mobility Studies at O.P. Jindal University, and Migration and Diaspora Studies at Indira Gandhi National Open University (IGNOU). Many countries are offering programs on migration studies, and one such instance is the Centre for Advanced Migration Studies at the University of Copenhagen, which offers interdisciplinary curricula that encompass social policy, integration, diversity management, and border studies. By examining case studies, conducting fieldwork, and participating in policy analysis, students can contribute to evidence-based solutions that address the root causes and consequences of migration.

Prospects for Migration-Related Research

The field of migration studies offers numerous avenues for future research, particularly in the context of climate change. Key areas of focus include:

- **Policy Development:** Analysing the effectiveness of existing migration policies and proposing reforms to accommodate climate-induced displacement.
- **Legal Frameworks:** Exploring the potential for expanding international legal protections to include climate migrants.
- **Urban Planning:** Investigating how cities can adapt infrastructure and services to support incoming migrant populations.
- **Health and Well-being:** Assessing the physical and mental health impacts of displacement on migrants.

Migration models

1. Push–Pull Model (Everett Lee, 1966; adapted for climate)

- **Core Idea:** Migration decisions result from push factors (negative conditions forcing people to leave) and pull factors (positive conditions attracting people to a destination).

- **In Climate Context:**
 - *Push*: Sea-level rise, crop failure, cyclones.
 - *Pull*: Safer areas with better infrastructure, job opportunities.
- **Use in Research:** Widely applied to explain environmental and climate-induced migration patterns, including in the Sundarbans and Pacific Islands.

2. Climate Change–Migration Nexus Models (IPCC & Groundswell Report, World Bank, 2018)

- **Core Idea:** Combines climate scenarios, demographic projections, and socio-economic pathways to estimate internal climate migration.
- **Example:** Groundswell model predicts up to 216 million internal climate migrants by 2050 under pessimistic scenarios.
- **Use in Research:** Provides quantitative predictions to inform adaptation planning.

Advancements in data collection and analysis, including the use of artificial intelligence and geospatial technologies, can enhance the precision and scope of migration research. Migration studies are at the forefront of addressing some of the most pressing challenges of our time. As climate change continues to reshape human mobility patterns, interdisciplinary research and education become increasingly vital.

Policy implementation

By integrating environmental considerations into migration analysis and policy-making, we can develop comprehensive strategies that promote resilience, equity, and sustainable development. Empowering students to engage in migration research not only enriches academic discourse but also cultivates the next generation of leaders equipped to navigate the complexities of a rapidly changing world.

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TIME ZONE DIFFERENCE AND VIRTUAL TRADE: SOME INTUITIONS AND FACTS

*Prof. Biswajit Mandal
Centre for Studies in Social Sciences Calcutta
Kolkata, India*

International trade, both theory and policy, has been going through enormous changes in the last couple of years since the worldwide outbreak of covid-19 in 2019. However, trade in its primitive form had started long ago. In the early 19th century transaction of goods among producers and consumers had been initiated by the decline in transportation cost. That was the first phase of disaggregation between production and consumption, and we slowly shifted to the era of barter economy. Evolution of trade moved on very fast, since then. Though mercantilist trade triangle primarily covers production and transfer of goods and humans in the European countries, Africa and Americas, the world has also witnessed a spotless domination of Asian and Middle East countries in international trade. Then on changes in the nature and pattern of trade have been captured by different forms of ‘unbundling’ as mentioned in Baldwin (2016). All such unbundlings are the reflections of evolution in the history of progress in transportation technology. With such progress we also moved from trade in final goods to trade in intermediate inputs to trade in services to trade in ideas. Trade in services and in ideas are not very surprising due to maximum decline in transportation cost associated with these two concepts because of information communication technology revolution. In addition to this, such a decline in the cost of internet has paved the way for another interesting dimension to the basic arguments defining the pattern of trade. This pattern is conventionally explained by the popular gravity equation which most importantly elucidates how distance between trading countries influence pattern and the volume of trade. If the physical distance is more between countries, countries become reluctant to be engaged in trade because such distance must be travelled by the goods or the owners of the goods to reach the consumers. And this act requires huge transportation cost which we know as trade cost. However, the issue takes an interesting turn when you move from goods trade to service trade. Transaction of services, be it final or intermediate, does not need physical shipment and it also does not require much time. Therefore, implication of distance for service trade is not identical with its effect on goods trade.

Distance, time zones and the future

Distance has something to do with the geographical location of trading countries and hence it is often proxied by the difference in time zones. If the distance is maximum, countries are located in completely non overlapping time zones. Readers may check Mandal (2015), Mandal and Das (2025), Marjit, Mandal and Nakanishi (2020) etc for further details on such interconnectedness.

This locational segregation helps producers to take advantage of cheaper input costs in some other countries situated in a non-overlapping time zone. On the other hand, time zones (TZ) also define and divide the world to dictate who is going to work and who is going to sleep because day-night schedule has some association with people’s biological clock. People usually work during the day and take rest at night. Producers may combine this day-night mismatch with the notion of outsourcing in intermediate service. This also helps them supplying the final product quickly and that too at a low cost (Marjit, 2007). Producers can sometime procure inputs at a lower cost as well. This essentially boils down to ‘exchange’ of services through ICT and TZ difference – Virtual Trade in services. Some relevant references are Anderson (2014), Dettmer (2013), Head et al. (2009), Fink, Mattoo and Neagu (2005), Matsuoka and Fukushima (2010), and Mandal, Marjit and Nakanishi (2020), Nakanishi and Long (2015) etc.

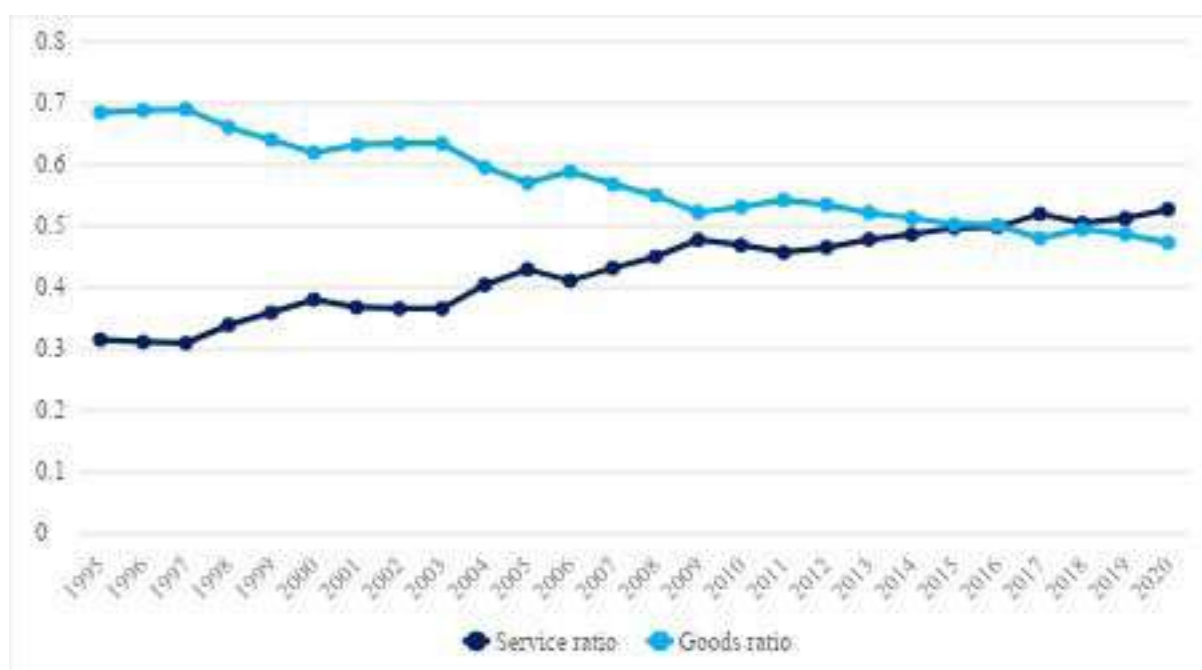
If we move beyond the gravity equation where distance reduces commodity trade, we figure out some interesting implications. In the extant literature, however, we come across that distance may not affect trade negatively.

This is known as ‘distance puzzle’ which started with Cairncross' famous work (1997) ‘The Death of Distance: How the communication revolution will change our lives’. The idea was based on this observation that the information can now be transmitted across the globe free of cost and therefore the world is going to see a sea change in international trade. Hence, the world will really turn out to be ‘flat’. Despite this, the work in this domain is somewhat indefinite with some showing the conventional negative effect and some others showing positive effect. If we connect this debate with the distance puzzle, especially for digital trade, the impact of distance on trade turns out to be smaller. This is principally because technological progress has reduced the cost of sending information from one country to another. Therefore, it is expected that the traditional barriers as denoted by physical distance would have a reduced effect on trade in ICT services. This aligns with the idea that distance should play a less important role in international trade in the context of ICT services.

Interestingly some also argue that the gravity model predicts service trade better than manufacturing trade and geographical distance is more important for services trade than for goods trade. An interesting work in this regard is Kimura and Lee (2006). On the opposite side of the discourse, the distance effect on services trade has been found as more negligible than on goods. A very recent study finds that distance negatively impacts trade in several service categories too. This is consistent with traditional gravity model predictions (Majune et al., 2023). Therefore, it is apparent that some services might be less sensitive to distance due to the digital nature of their delivery, and hence the results are not very conclusive.

Let us now very quickly glance through the trends of India's trade with distant and closer countries. The trade dynamics of India with countries located in non-overlapping time zones, specifically with the USA and Canada, are shown below (see Figure – 1). Notice that the geographical distance between India and these trading countries are maximum. India's goods trade ratio was high in the 1990s, but it has steadily declined, whereas, the service trade ratio has shown an upward trend during the same period. This indicates that India has greater trade opportunities in service trade with distant countries. On the other hand, when we check the same trends for India with countries located almost in the same time zones indicating low geographical distance between India and these countries we observe that both the goods trade and services trade ratios with respect to total trade have shown relatively little change over time (see Figure-2).

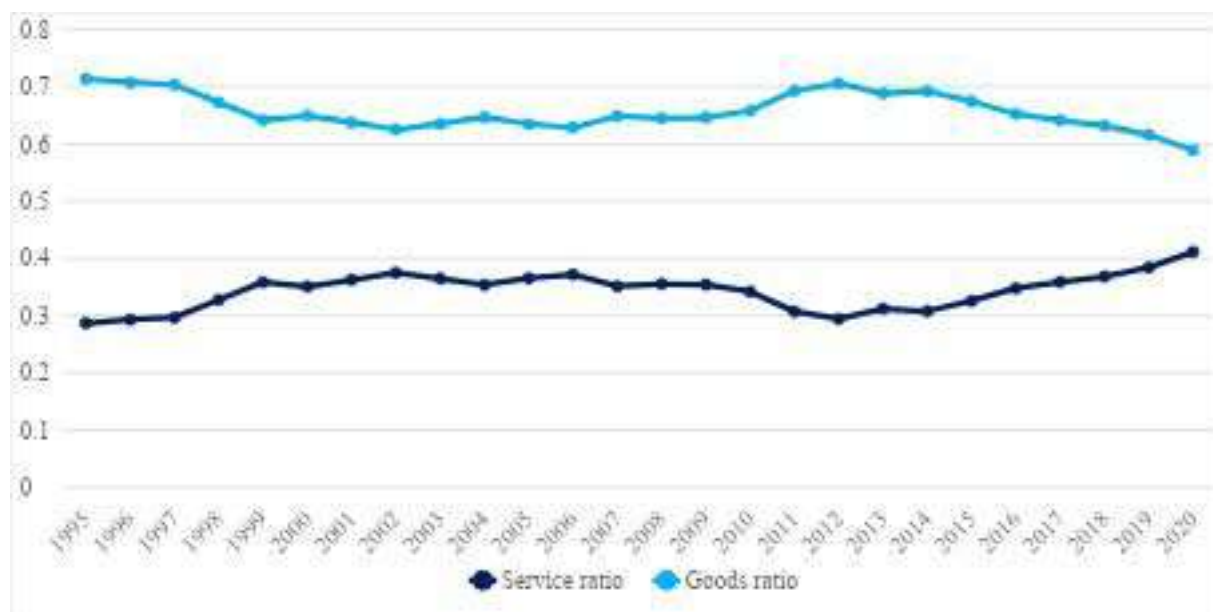
Figure 1: India's trade with USA and Canada



Data Source: <https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm#access>.

The vertical axis represents the (Trade in goods / Total trade) and (Trade in services / Total trade). All the data are calculated for India over the time period 1995 to 2020.

Figure 2: Trade for India with Asian countries



Data Source: <https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm#access>.

The vertical axis represents the (Trade in goods / Total trade) and (Trade in services / Total trade). All the data are calculated for India over the time period 1995 to 2020.

Therefore, it is perceptible that distance has a significant connotation for trade in general. This line of argument is well discussed in conventional gravity equation. But the implications are non-uniform as far as goods trade and services trade are concerned. Goods trade suffers a setback due to physical distance between trading partners while services trade gets a boost owing to the same reason. Digital mode of transaction and consumers' eagerness to get the product quickly delivered have made the whole story unconventional, and hence interesting to be investigated. Such an asymmetry in the causal effect of distance on trade, in turn, points to the possibility of different kinds of trade agreement among countries. Trade agreements, hence, would no longer be uniform. There is no reason to believe why two distant countries would mutually agree to pay huge transportation costs for goods trade. They could neither save trading cost nor time. Savings on both these aspects, however, could be appropriated if goods trade takes place among neighbouring countries. Whereas, the implications are just opposite for services trade. Hence, in the end, countries may find it prudent to be engaged in free trade agreements with distant countries only for services trade, and the same with proximate countries in case of goods trade.

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SUSTAINABLE DEVELOPMENT GOALS ON CHILD HEALTH IN INDIA: EXPLORING SPATIAL INFLUENCE AT THE SUB-NATIONAL LEVEL

*Dr. Sulekha Hembram,
Assistant Professor, Department of Economics
Rabindra Bharati University, Kolkata*

*Prof. Sushil Kr. Halder,
Professor, Department of Economics
Jadavpur University, Kolkata*

Abstract

The paper aims to highlight the progress of the Sustainable Development Goals (SDG) in respect of child health viz. neo-natal mortality rate (NNMR) and under-five mortality rate (U5MR) at the sub-national level in India using NFHS-4(2015-16) and NFHS-5(2019-21) data. The spatial impact of NNMR and U5MR is examined using Global and Local Moran's Index. Results suggest that the bigger states are lagging behind in achieving the SDG targets of NNMR and U5MR compared to the smaller states. It is observed that the inequality of NNMR and U5MR has increased from NFHS-4 to NFHS-5, this is a major concern which ignites the convergence hypotheses in respect of health outcomes. The paper does not aim to determine the factors responsible for spatial variations of NNMR and U5MR, however, simple rank correlation confirms that states spending more on public health sector, gain more reduction of NNMR and U5MR. Spatial clustering of states clearly indicates the presence of neighbouring effect of health outcome. This proves that child mortality is not space neutral.

Keywords

Child health, Sustainable Development, Neonatal Mortality, Inequality, Neighbouring Effects

JEL Classification: I14, I18

Introduction

The United Nation Development Programme (UNDP) sets targets for different socio-economic indicators for its member countries with a view to achieve global inclusive development since the 1990s. The Millennium Development Goals (MDG) ended in 2015; there were eight targets and each and every country should have to achieve the target by the year 2015. The performance of India in achieving the MDG targets was not satisfactory at the disaggregate level (viz. sub-national) though at the national level, it was not so disappointing (Chatterjee et al 2016; Ramachandran 2016; Hembram et al 2020). The UNDP has adopted Sustainable Development Goals (SDG) which comprises 17 goals and every member country should have to achieve the targets by the year 2030. Some studies have tried to predict the possibility of achieving the targets of SDGs based on the current trend of socio-economic conditions of the economies (Anderson et. al. 2017; Cuaresma et al. 2018; Shumilo et al 2018; Alharbi 2021; Chopra et al. 2022). In this study, we have objectively considered SDG Target-3.2 which talks about new born and child mortality (under age 5). The SDG Target 3.2 has stressed that all countries should aim to reduce neonatal mortality (NNMR) to at least as low as 12 per 1,000 live births and under-5 mortality (U5MR) to at least as low as 25 per 1,000 live births by the year 2030. The motivation of choosing these two health parameters of SDG is associated with the realization of the benefits of demographic dividend; India at the aggregate level has started enjoying the benefits of demographic gift and it will continue next two and half decades but the benefits is not automatic; the pre-requisite of enjoying the benefits is the skilled and healthy workforce (Bloom 2011; Bhattacharya et al 2015). Unhealthy and malnourished children create obstacles to accumulate human capital, which in turn will jeopardize our economic returns from demographic dividend. This is why we have considered SDG 3.2 to understand the current positions of the states in India. How are the health parameters dispersed among the states? What is the role of space towards formation of spatial clustering based on NNMR and U5MR? Are the states converging in respect of the said two health parameters? How is the public spending on the health sector related to the reduction of NNMR and U5MR? Earlier studies have explored the determinants of health, therefore, we are not considering the factors responsible towards variations of health outcomes in India; however, we just try to understand how the per capita public expenditure on health is associated with the health outcomes in India at the sub-national level.

Data and Methods

The data on NNMR and U5MR of 31 states (including UT) of India are drawn from National Family Health Survey (NFHS)-4 (2015-16) and NFHS-5 (2019-21). The data on per capita health expenditure has been drawn from National Health Systems Resource Centre, Govt. of India. In order to visualize the dispersion of states around the national average value of the NNMR and U5MR, we have used a Radar diagram. The inequality of NNMR and U5MR are estimated using Coefficient of Variation (CV) and Gini Index. We have used Moran's Index to capture spatial autocorrelation. Following Anselin (1988, 1995), we define Global Moran's Index (MI) as:

$$MI = \frac{N}{W} \cdot \frac{\sum_{i,j} w_{ij} (X_i - \bar{X})(X_j - \bar{X})}{\sum_i (X_i - \bar{X})^2} \dots \dots \dots (1) \text{ where, } N = \text{number of spatial units indexed by } i \text{ and } j$$

(states), $W = \sum_{i,j} w_{ij}$ = sum of spatial weights, w_{ij} is a matrix of spatial weights with zeros on the diagonal ($w_{ii} = w_{jj} = 0$), X be the variable of interest, $\bar{X}$ = mean of the variable. The spatial weight matrix can be defined in many ways but the Rook's contiguity matrix is assumed to be simple and we use it in our analysis. Equation (1) is meant for the Global Moran's Index (GMI), however, a local Moran Index (LMI) is suggested that captures the extent to which points that are "close" to a given point have similar values. Analysis of LMI is very similar to that of GMI as mentioned in the following equation

$$MI_i^L = \frac{X_i - \bar{X}}{S_i^2} \sum_{j=1, j \neq i}^N w_{ij} (X_j - \bar{X}) \dots \dots (2), \text{ the notations bear the usual meaning as mentioned in}$$

(1).

$$S_i^2 = \frac{\sum_{j=1, j \neq i}^N w_{ij}}{N-1} - \bar{X}^2$$

Analysis of the Results

Before going to explain the performance and progress of the states in respect of NNMR and U5MR, we have examined the descriptive statistics of the observed variables over time.

Table 1: Descriptive statistics of NNMR and U5MR across states over time

	Mean	SD	CV	GINI
NNMR_4	22.32	9.90	0.443	0.253
NNMR_5	18.63	9.13	0.490	0.283
U5MR_4	39.7	15.33	0.386	0.216
U5MR_6	32.30	13.91	0.431	0.247

Source: Authors' estimation from Table (2).

The above table shows that both the mean and SD of NNMR and U5MR are decreasing over time across 31 states in India. This implies states are improving and approaching the target levels. However, the inequality or the coefficient of variations is found increasing. Therefore, the states are not performing equally in reducing the mortality of children. Some states may achieve the target on time (viz. by 2030) whereas, few states may not achieve the target by the year 2030. The performance or the progress is observed in respect of NNMR and U5MR as shown in Table-2. According to the SDG-3.2, the target for NNMR is assigned at 12 per 1000 and the target for U5MR is 25 per 1000. The variables are negative in nature, therefore, each state should try to reduce the value as much as possible. It is found that, in 24 states, the NNMR has decreased over time, but in 7 states, the value has increased. Now, decrease in NNMR does not imply the achievement of the target. Similarly, increase in the value does not imply the deviation from the target; for example, Mizoram, the state has already achieved the target before 2030! We have explored the states who have achieved the target and who could not. It is found that 8 states have already achieved the target level before the target year, 2030 assigned by SDG-3.2; rest of the 23 states have not yet achieved the target level.

Table 2: Progress and performance of states towards SDG3.2

States	NNMR				Deviations		Per Capita Public Expdt. On Health(2021)
	2016		U5MR		from	the	
	2021	2016	2021	2016	Target: NNMR	Target:U5 MR	
Andh. Pr.	23.6	19.9	40.8	35.2	7.9	10.2	3,129
Arun. Pra.	11.8	7.7	32.9	18.8	Achieved	Achieved	7,825
Assam	32.8	22.5	56.5	39.1	10.5	14.1	2,753
Bihar	36.7	34.5	58.1	56.4	22.5	31.4	1,320
Chhattisgarh	42.1	32.4	64.3	50.4	20.4	25.4	2,940
Goa	12.9	5.6	12.9	10.6	Achieved	Achieved	8,295
Gujarat	24.9	21.8	43.5	37.6	9.8	12.6	2,769
Haryana	22.1	21.6	41.1	38.7	9.6	13.7	3,237

Hima. Pr.	25.5	20.5	37.6	28.9	8.5	3.9	5,581
J&K	23.1	9.8	37.6	18.5	Achieved	Achieved	4,336
Jharkhand	33	28.2	54.3	45.4	16.2	20.4	2,322
Karnataka	18.5	15.8	31.5	29.5	3.8	4.5	3,259
Kerala	4.4	3.4	7.1	5.2	Achieved	Achieved	4,338
MP	36.9	29	64.6	49.2	17	24.2	2,083
Maharashtra	16.2	16.5	28.7	28	4.5	3	2,872
Manipur	15.6	17.2	25.9	30	5.2	5	5,660
Meghalaya	18.3	19.8	39.6	40	7.8	15	7,690
Mizoram	11.2	11.4	46	24	Achieved	Achieved	9,570
Nagaland	16.5	10.2	37.5	33	Achieved	8	5,490
Delhi	17.8	17.5	42.2	30.6	5.5	5.6	6,941
Odisha	28.2	27	48.1	41.1	15	16.1	3,067
Puducherry	5.8	2.3	16.2	3.9	Achieved	Achieved	8,930
Punjab	21.2	21.8	33.2	32.7	9.8	7.7	2,300
Rajasthan	29.8	20.2	50.7	37.6	8.2	12.6	2,755
Sikkim	20.8	5	32.2	11.2	Achieved	Achieved	7,800
Tamil Nadu	14	12.7	26.8	22.3	0.7	Achieved	3,410
Telangana	20	16.8	31.7	29.4	4.8	4.4	3,007
Tripura	13.2	22.9	32.7	43.3	10.9	18.3	3,473
UP	45.1	35.7	78.1	59.8	23.7	34.8	1,497
Uttarakhand	27.9	32.4	46.5	45.6	20.4	20.6	3,946
West Bengal	22	15.5	31.8	25.4	3.5	0.4	2,454

Note: SDG Targets on NNMR and U5MR are set at 12 and 25 respectively.

It can also be observed that, only in three states, the value of U5MR has increased from NFHS-4 to NFHS-5; rest of the 28 states were able to reduce the value of the U5MR over time. Similar to the NNMR, 8 states have achieved the target level by the year 2021; 23 states are yet to achieve the target level. It is also found that, some states have achieved the target in respect of NNMR and U5MR by 2021; however, some states are yet to achieve the target but few major states like Bihar, Chhattisgarh, MP, UP, Uttarakhand and Orissa have to perform well in achieving the target by the year 2030. The major concern originates from the huge gap (viz. actual-target). Those states should have to take serious and concerted efforts to achieve the target by the year 2030. It is observed that states manifesting higher NNMR also experience higher U5MR as shown in Table-3. The rank correlation between mortality and public spending on healthcare is negative, which means states spending higher public expenditure on health sector, experience lower child mortality and the association is found to be statistically significant as reported in Table-4.

Table 3: Rank correlation coefficient between NNMR and U5MR over time

	U5MR(NFHS_4)	U5MR(NFHS_5)
NNMR(NFHS-4)	0.8297***	
NNMR(NFHS_5)		0.9443***

Source: Authors' Calculation, Note*** significant at 1 percent level

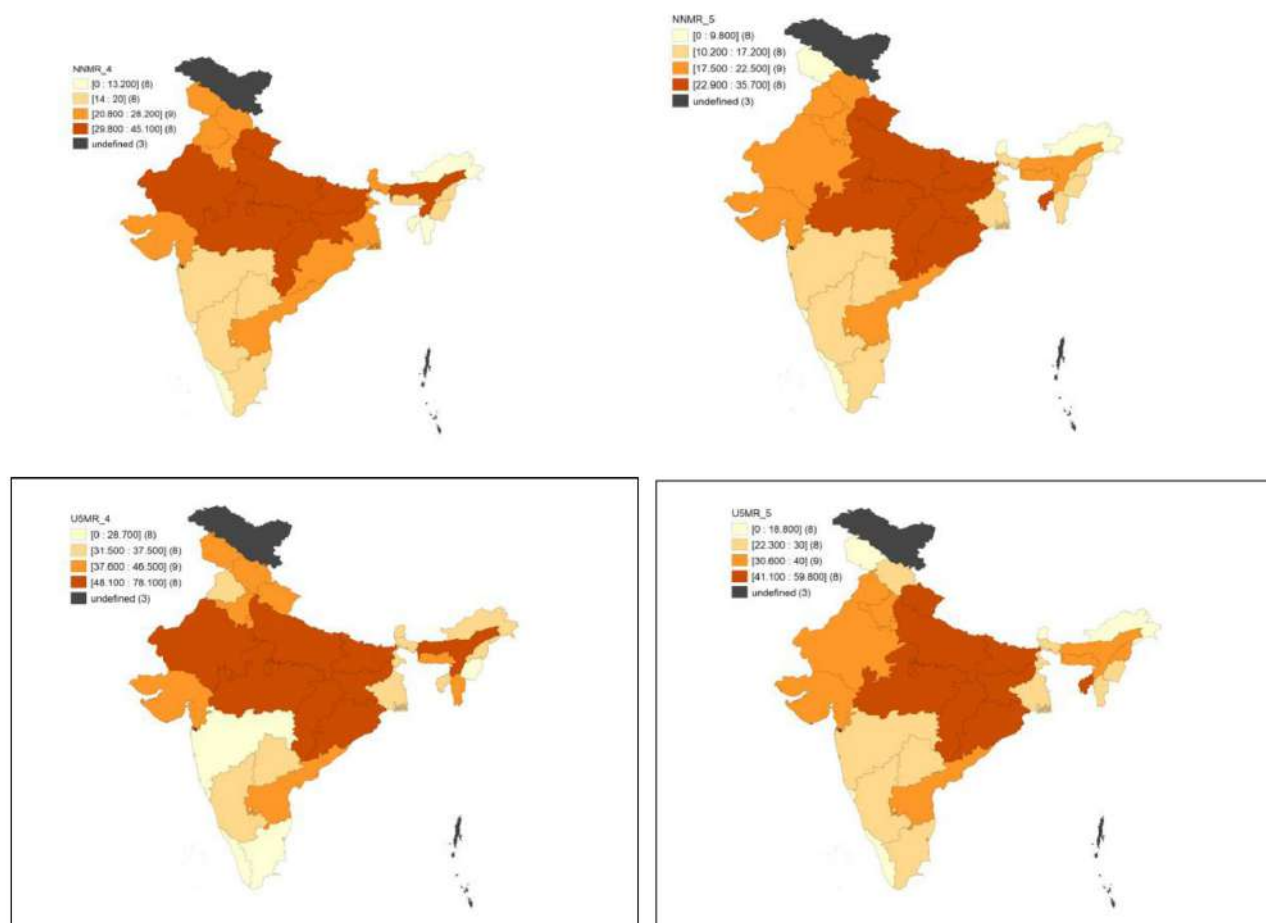
Table 4: Rank correlation coefficient between Mortality and Public Expenditure on Healthcare: 2021

	Per Capita Public Health Expenditure, 2021
NNMR(NFHS_5)	-0.7011***
U5MR(NFHS_5)	-0.6353***

Note*** significant at 1 percent level.

Source: Authors' estimation

The spatial distribution of NNMR and U5MR are shown in Figure-1. We find that spatial clustering in respect of NNMR and U5MR is profound and clear among the 31 states in India.

Figure 1: Geographical Distribution of NNMR and U5MR for NFHS- 4 and 5

The above Maps clearly show the spatial clustering. Good performing and bad performing states are found to be clustered. States belonging to western and central are clustered since they are more or less identical or homogeneous in respect of NNMR and U5MR; whereas the southern states are found to be better in respect of the reduction of NNMR and U5MR. The Global Moran's Index (GMI) which examines the presence of spatial dependency across states is found to be positive and significant for both NNMR and U5MR as shown in Table-5.

Table 5: Result of Global Moran's Index(GMI) for NFHS-4 and NFHS-5

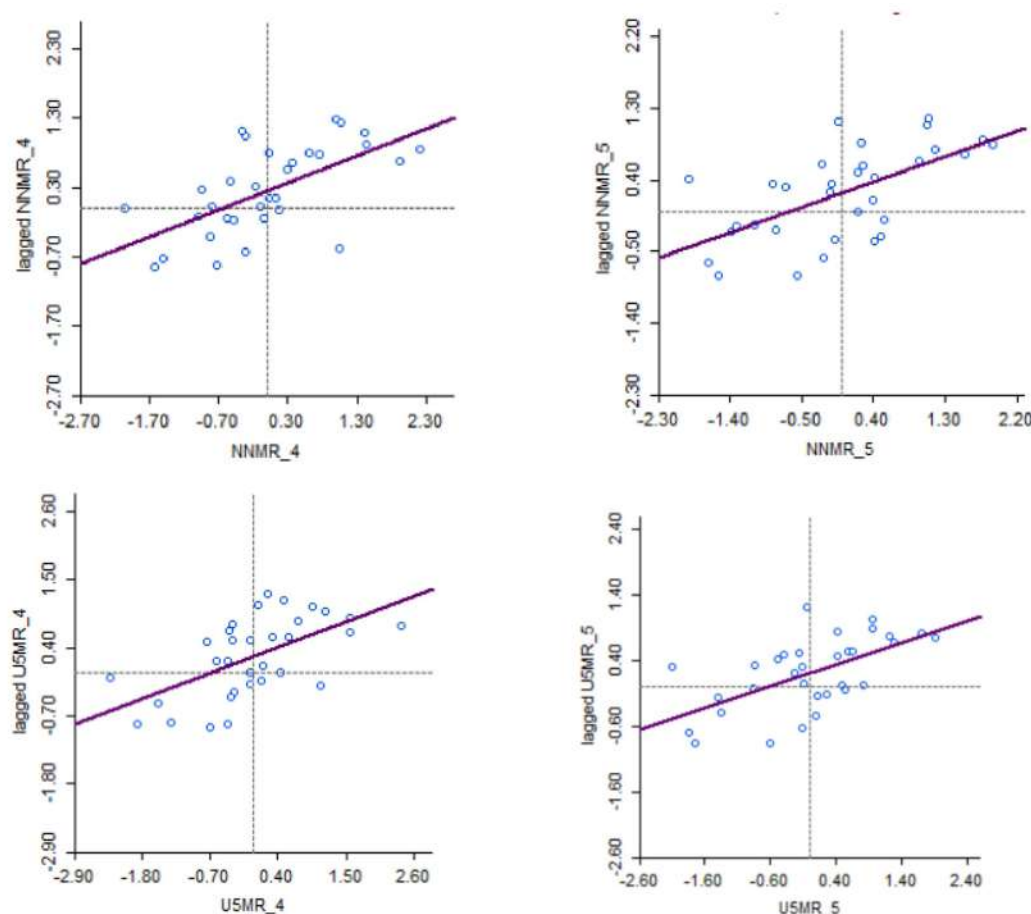
Variables	GMI	Z-value
NNMR_4	0.343***	2.97
NNMR_5	0.378***	2.97
U5MR_4	0.343***	3.16
U5MR_5	0.362***	3.93

Note* significant at 1 percent level**

Source: Authors' Calculation.

The same scenarios are already found in the above four figures. The states with lower NNMR or U5MR are in the same region (southern region) whereas; states with higher NNMR or U5MR are in the same region (western & central region). The same can be observed from the following scatter plots too. On the vertical axis, we have measured the lag of observed variables (average of NNMR or U5MR of neighbors) whereas in the horizontal axis we have measured the observed variables (NNMR or U5MR) of the states. The upward rising fitted line supports the presence of positive spatial dependency across states.

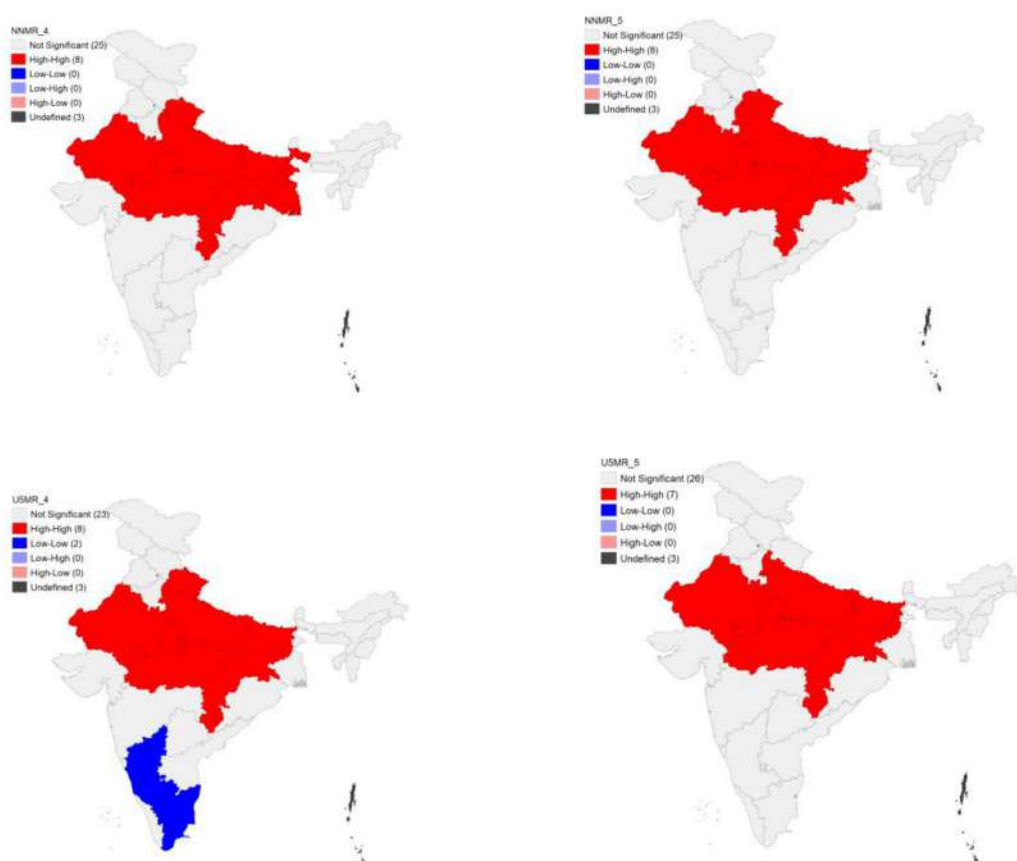
Figure 2: Spatial Scatter Plots of NNMR and U5MR for NFHS 4 and 5.



Each of the points within the plot reflects the association between the observed variable a state and its neighbors. Each scatter plot is divided into four different parts or quadrants. Each of them has the respective definition. Points located at the top right corner quadrant imply that the states having higher NNMR (or U5MR) and it is surrounded by the states with higher NNMR (or U5MR). The left bottom corner quadrant implies the states experiencing lower NNMR (or U5MR) and it is surrounded by the states with lower NNMR (or U5MR). The right down and left top quadrants represent the combinations of states with opposite values of the respective observed variables; they are basically known as the outlier region. From these four scatter plots, one can explore the possible clusters in respect of NNMR or U5MR over time.

The GMI represents the aggregate scenario of spatial dependency, the scatter plots also reflect the number of states falling in the respective clusters, but the above results fail to capture the significant region-specific clusters as well as dependency with the neighbors. The following maps show the significant clusters drawn from Local Moran's Index(LMI) across states in respect of NNMR and U5MR for the time points NFHS-4 and NFHS-5.

Figure 3: Spatial Cluster in respect of NNMR and U5MR for NFHS 4 and 5 using LMI



The following table represents the presence of significant clusters and dependency across states over time. The number within the parenthesis represents the specific clusters. Here, 1 means high-high cluster, 2 implies low-low cluster, 3 implies low-high cluster, 4 means high-low cluster.

As we have considered 31 Indian states in this analysis, therefore, we have obtained 31 values of LMI. The positive value implies the state has spatial dependency with its neighbors (either high-high or low-low); the opposite corresponds to the negative LMI (low-high or high-low cluster). It is found that, in NFHS 4, out of 31 states eight states are forming high-high clusters in respect of NNMR. The number has remained unchanged in NFHS-5. But West Bengal has reduced the NNMR from NFHS-4 to 5 whereas, in Delhi the value of NNMR has increased. Now, the same can be examined for U5MR also. In NFHS-4, eight states are forming a high-high cluster whereas, in NFHS 5, the number has reduced to six.

The states are Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, and Uttar Pradesh are found to be common in high-high trap in respect of NNMR and U5MR. It is also found that they fail to achieve the target level of NNMR assigned for SDGs by 2021 and they have to cover a long distance.

States	NNMR_4	NNMR_5	U5MR_4	U5MR_5
Andhra Pradesh	0.006668	0.012446	-0.00965	-0.01824
Arunachal Pradesh	-0.26676	0.103462	-0.13636	-0.27124
Assam	-0.52848	-0.13021	-0.12859	0.010722
Bihar	1.546313**(1)	1.64138**(1)	1.160137**(1)	1.415064**(1)
Chhattisgarh	1.340464**(1)	1.165122***()	1.051494**(1)	0.892944**(1)
Goa	0.248883	0.150713	0.561095	0.129739
Gujarat	-0.0116	-0.04395	-0.02568	-0.04916
Haryana	0.05462	0.257297	0.134666	0.260614
Himachal Pradesh	0.102383	0.069271	0.002077	-0.01312
J&K	-0.08938	0.260217	-0.0134	0.478666
Jharkhand	1.319267***()	1.32904***()	1.021474***()	1.009007***()
Karnataka	0.124571	0.080541	0.233922**(2)	0.029812
Kerala	1.125667	1.043944	1.202948	1.21977
Madhya Pradesh	1.343082**(1)	0.974046**(1)	1.376481**(1)	0.95776**(1)
Maharashtra	-0.04291	0.000217	0.049293	0.007891
Manipur	0.041657	0.004679	-0.34145	-0.0024
Meghalaya	-0.26506	0.1315	0.141611	0.348083
Mizoram	0.045609	-0.21985	0.029861	-0.18609
Nagaland	0.038565	0.118201	0.000751	-0.01143
Delhi	-0.3337	0.015838**(1)	0.3499**(1)	0.019818
Odisha	0.52049	0.67272	0.362991	0.387742
Puducherry	0.878737	0.851232	0.835901	1.028707

Punjab	0.003153	0.030726	-0.05833	0.00562
		0.256918**(1	0.634642**(1	
Rajasthan	0.628342**(1)	)	)	0.395998**(1)
Sikkim	-0.0022	0.243022	0.08948**(2)	0.389933
Tamil Nadu	0.460989	0.344718	0.449402	0.394139
Telangana	-0.03564	-0.02257	-0.0721	-0.02114
Tripura	-0.05731	-0.02427	-0.20499	0.064263
		1.619093***()	1.794037***()	
Uttar Pradesh	1.861781***(1)	1)	1)	1.478421***(1)
		1.190218**(1	0.605065**(1	
Uttarkhand	1.296569**(1)	)	)	0.879804
West Bengal	0.06669**(1)	-0.11935	-0.22038	-0.16893

Source: Authors' calculation

Conclusions

The rate of reduction of NNMR and U5MR across the states is found to be uneven; the inequality of child mortality (captured by NNMR & U5MR) increases in NFHS-5 compared to NFHS-4. This is indeed a major concern in the context of health convergence. Given the current scenario, the bigger states should have to go a long way to achieve the SDG 3.2 Target. Contrary to this, some smaller states like Kerala, Sikkim, Goa, Arunachal Pradesh, Puduchery, J &K, Mizoram and Nagaland have already achieved the SDG-3.2 Target before the time (viz. 2030). Keeping in mind the results of the spatial analysis of NNMR and U5MR, we suggest a cluster specific health intervention by both central as well as states; more public spending on healthcare (among the major states) is expected to reduce child mortality. Given the current scenario, health convergence (through reduction of child mortality) is difficult to achieve in Indian backdrop at the disaggregate level; this is because the deviations from the target level of SDG 3.2 (in respect of NNMR and U5MR) are found to be higher in bigger states like Uttar Pradesh (UP), Madhya Pradesh (MP), Bihar, Orissa, Jharkhand, Chhattisgarh and Uttarakhand; these seven states roughly constitute 40 percent share of India's population. Therefore, India's success towards achieving SDG 3.2 is heavily dependent on the performance of these states.

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INCREASING RETURNS TO SCALE AND WAY FORWARD TO A SUSTAINABLE FUTURE

*Dr. Bibek Ray Chaudhuri
Professor, Indian Institute of Foreign Trade, Kolkata*

Introduction

Major disparity between countries in terms of per capita GDP level and growth have been well documented. Lucas in his seminal paper opined, once an economist tries to explain this difference it is impossible to think about anything else. Widespread differences between developed and developing countries even after so many years of active policy making both at the national and international level is vexing. Traditional growth models have failed to explain such astounding gaps with no tendency towards convergence. The theory of Convergence relies on diminishing returns whereas evidence suggests increasing returns in particular regions, products and across time. Hence the empirical observation of divergence can hardly be explained by economic theories alone.

Extension of basic Solow model by including human capital to some extent explained the gap between per capita income levels and growth across countries. But it failed to explain the persistence of such huge divergence. Combining economic theory with economic geography literature has the potential to explain the empirical observations. Increasing returns to scale in the modern sector can explain why countries might grow in sequences. Externalities arising from knowledge spillovers can explain gains for firms in advanced sectors. Moreover, such activities may be concentrated in certain regions/clusters. These regions/clusters then have the capability to grow faster than other areas in the same country.

In markets where competition is restricted due to size, large firms gaining internal economies of scale can reduce inefficiencies as market size grows. If firms are heterogeneous in terms of productivity then increase in competition would favour larger firms. Public sector services with high fixed costs are another area where per unit costs fall with scale of operations. The only problem here is the requirement of complementary services for achieving the efficiencies. Further the quality of services also depends on the demand for them. If the business sector is large and sophisticated, they would require high quality services. Political gains from providing such services are then higher and thus efficiencies may increase.

One of the reasons inequalities might persist is the friction related to the overcoming of distance. Distance here is both physical and metaphorical. All barriers to movement of goods, factors, capital, ideas etc. This might be large even between clusters within the same region. Thus, large urban centers have grown around the world as pockets with least distance which leads to productivity gains. City sizes have been found to be directly proportional to productivity.

Fragmentation of the production process is another trend which has allowed countries at the threshold level of development to participate in the economic activities that matter. Gaining advantage in the full value chain of activities would have been difficult for a country lagging behind. Specializing in tasks have given such countries the freedom to concentrate on what they can do best. Hence comparative advantage now is in a limited set of tasks rather than in a commodity. This may lead to learning by doing and increasing returns to scale. Thus, countries are no longer required to specialize in products rather they can concentrate on narrowly defined tasks requiring much less skill-building process.

Growth Implications

Regions where firms can expect higher returns would tend to attract more investments. This would attract more factors to these places, reducing the return of the existing factors. Increasing returns concentrating spatially provides a very different perspective. As productive regions attract more factors and business activities flourish, divergence rises. Within the growing region, diminishing returns might ultimately set in due to congestion and other costs. Increasing returns can explain the divergence in growth pattern across regions. It has been observed that similar regions might diverge due to such dynamics as clusters develop as a result of these forces. Hence factor price differences (immobile factors) and differences in income levels are equilibrium consequences.

Regarding per capita income levels it might be noted that benefits of increasing returns and scale effects resulting from market access depends on trade relations. Own market effects can cause rise in incomes but evidence shows that even after controlling for this and other effects nearness to international markets is a significant determinant of income levels. Cross country differences in per capita income level can thus be attributed to their varying market access.

The growth process has thus become lumpy. Firstly, high income countries with higher wages are also matched with higher productivity and thus firms there might not have any incentive to relocate.

On the other hand, if technological change increases income in the World leading to higher demand for goods and services the high-income country firms will eventually face diminishing returns in their own country and will have incentives to relocate. Now the location they choose would depend on the conditions required for production. Those countries which are at the threshold with the required facilities would win the race. Hence growth under these circumstances would be sequential. Better placed countries would grow first followed by the ones which have achieved the pre-conditions for transition. Secondly, initial differences in the countries might leave some countries behind and it may take several years for them to come out of such backwardness. Thirdly, differences also can be attributed to the kind of products in which the countries specialize. Acquiring skills and developing expertise in a very narrow range of products which exhibit increasing returns can make some countries grow faster than others. For example, countries like Bangladesh and Honduras where such a phenomenon has been observed are specialized in a narrow set of products which are similar yet remain location specific.

Emerging Perns

Combining economic theories and economic geography thus gives us an explanation for enduring differences in per capita income levels across countries. Countries who have gained from this phenomenon are the east Asian countries. They obviously had the pre-conditions to be the preferred location. How did that happen? In the 1930s a very Asian theory of development was proposed by a Japanese economist famously known as Flying Geese Paradigm (FGP). This theory explains how a group of countries at various levels of development can grow faster together than if they had gone solo. The lead goose country (in this case Japan for Asia) leads the group with innovation leading to higher growth. Once the sector reaches its growth limit the location shifts through FDI to a country at the lower level of development which has low-cost labour and resources but lacks technology. The FDI providing country provides a ready market for the products produced in these factories in the FDI recipient country. This can be termed as the case of 'shifting comparative advantage'. The so-called 'East Asian Miracle' of growth with reduced income inequality is a result of this process.

Why were countries in Africa left behind? Mostly natural resource rich, these countries have been historically exploited by the western countries and recently China. FDI targeted towards the extraction of natural resources seldom benefits the host countries. There is no knowledge spillover and hence no increasing returns. Even though some of the countries like Nigeria, Ghana, and some locations in Tanzania are at the threshold, trade policies like 'rules of origin'(ROO) prevent them from specializing in products they can. Minimum value addition requirements are preventing them from specializing in tasks. Dependence on aid is the other problem that many of the African countries face leading to perverse incentives and corruption.

Growth and Sustainability

So far, the points touched upon shows that there is a trade-off between growth and sustainability. In order to grow faster larger urban centers and firms are required. Environmental and sustainability factors limit the growth potential. As we have seen diminishing returns set in when the cities are overcrowded and congestion costs outweigh the productivity gains. The way forward is thus not simple. An optimum size of the growth centers must be determined. Growth to be achieved with sustainability objectives should determine the size of urban centers. Urban areas are overcrowded due to the lack of alternative locations. Identification of such locations and making them attractive for investments is the job of the governments. Once the initial investments make complementary infrastructure available private investors should find future growth possibilities attractive to invest in such locations. Sustainability concerns should be in-built in these policies so that while reaching the optimum size environmental costs don't outweigh the productivity gains.

Policy Implications

At the multilateral level policies should encourage development of growth centers in countries which are near the threshold. Relaxing the value addition requirements so that they can specialize in tasks which may not add substantial value to begin with. Kind of an ‘infant industry protection’. Aid giving agencies should target development of such regions along with backward ones. Education and skill development should be given top priority especially targeted to the sectors and tasks which are going to drive the growth in the future. Sustainability practices should be inbuilt in these policies so that it helps achieve a clean growth. As evidence in Asia shows that culturally close countries can think of coordinated policies to grow faster together. Africa can also think of policies on similar lines with FDI from outside the continent. FDI may concentrate in regions where the growth possibilities are maximum. Countries lagging behind to start with in the meantime can try to reach the threshold level of development through domestic policy and foreign aid. Thus, growth in sequence as discussed earlier can be achieved.

Developed countries should take the lead in cleaner production. They have the cushion of high income which they can use to adopt sustainable practices. Pollution Haven Hypothesis which gives a reason why polluting industries shift from developed to developing countries is an example of lack of long run vision. Developed countries should desist from FDI in polluting industries. It cannot be the case that on the one hand such countries prevent exports from developing countries on environmental grounds and then shift their polluting industries to the same locations. Achieving sustainability requires multi-country collaborations and commitments. There is an inherent non-cooperation in this commitment. The parties which agree to maintain sustainability have the incentive to cheat since that can lead to short term gains. Hence policies should be framed in such a manner that there is no incentive to cheat. Penalties should be imposed for non-compliance and it must be binding on all Agreement signing members.

The future thus belongs to countries with the greatest number of growth centers which exhibit increasing returns to scale. It then depends upon the policymakers how they can prevent diminishing returns from setting in. The advent of Artificial Intelligence and Big Data techniques can help policy makers to make timely decisions. These technologies have made forecasting more accurate giving the decision makers more power to decide on their course of action. A combination of growth enhancing and sustainable policies have to be implemented. This requires tremendous data crunching abilities and use of decision-making models. Machine learning and other associated techniques can help to supplement human abilities to design policies which would help to achieve growth and sustainability goals. Countries thus have to invest in skill formation on these lines to harness the benefits of using such techniques.

Cooperation between developing countries is also required in order to become a cohesive group to negotiate with the developed countries. The group needs to bargain effectively at multilateral forums to get the benefits collectively. Additionally, better-placed developing countries (or emerging markets) can help countries lagging behind with the much-needed capital and skills which help develop growth centers. In this case a similar economic background might help capture the synergies better than a developed-developing country cooperation with a less likelihood of exploitation.

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CAN DIGITAL HEALTH TECHNOLOGY REDUCE INDIA'S HEALTHCARE WOES?

Dr. Souvik Banerjee

Department of Economics, IIT Bombay

India's healthcare system faces enormous challenges. Despite rapid economic growth and technological progress, health indicators in India lag behind many other countries. At the heart of this issue lies a critical gap — India spends only about 3% to 4% of its GDP on healthcare, a fraction of the desirable 8% to 10% needed for a robust system. By no means, higher expenditure on healthcare can ensure better quality of care and more equitable access to care; however, higher investments in healthcare may be of first order importance.

India's health indicators reveal a mixed but worrying picture. As of 2021, around one in three children under five are stunted, while one in five children suffer from wasting. These figures point to deep-rooted issues like poverty, inadequate nutrition, and inadequate healthcare infrastructure.

Meanwhile, among adults, chronic diseases like diabetes and hypertension are rapidly increasing. The dual burden of infectious diseases and lifestyle-related chronic illnesses puts immense pressure on healthcare services. These problems reflect years of underinvestment in health infrastructure and public health initiatives, compounded by socio-economic disparities.

The consequences of poor health are not limited to individuals — they ripple across society, affecting economic growth and social development. Healthy citizens are more productive, innovative, and capable of contributing to the nation's progress. This means improving public health is not only a humanitarian goal but also an economic imperative.

Effective healthcare systems require substantial investments in infrastructure, workforce, and technology. Countries that allocate a higher share of resources to health typically enjoy better health outcomes. For example, well-staffed hospitals, availability of medicines, modern diagnostic equipment, and quality regulatory frameworks ensure that people receive timely and effective treatment.

Unfortunately, India's public healthcare system is chronically underfunded. Government spending on health remains low, forcing a majority of people to rely on private healthcare providers, which often come with high costs and variable quality. Statistics show that nearly 70% of outpatient care and 45% of inpatient hospitalizations are through private providers. This situation disproportionately affects poor, tribal, and marginalized communities who struggle to afford private care.

The solution lies in building a strong and robust public health infrastructure, but also in using technology to bridge existing gaps and improve efficiency. The role of digital health in this regard cannot be undermined.

Digital health technology refers to the use of digital tools — such as telemedicine, electronic medical records (EMRs), mobile health apps, and data analytics — to improve access to care, and enhance healthcare delivery and management.

Over the past few years, India has taken important steps in adopting digital health tools. The launch of the National Digital Health Mission (NDHM) in 2020 aims to create an integrated digital health infrastructure, providing every citizen with a digital health ID, facilitating the use of EMRs, and promoting the interoperability of health data across providers.

Telemedicine

The COVID-19 pandemic accelerated the adoption of telemedicine services in India. With lockdowns and social distancing measures in place, millions of patients turned to virtual consultations. The government-supported eSanjeevani portal alone facilitated over six million consultations by 2021.

Telemedicine helps overcome geographical barriers, especially in remote rural areas where healthcare facilities and specialists are scarce. Patients can consult doctors online, get prescriptions, and receive follow-up care without traveling long distances. This reduces costs, saves time, and improves continuity of care.

However, telemedicine's effectiveness depends on reliable internet access and digital literacy, which are still limited in many parts of rural India. Expanding digital infrastructure remains a priority.

Electronic Medical Records: Digitizing Health Histories

In developed countries, EMRs are widely used to maintain comprehensive digital health records for patients, improving the quality, safety, and efficiency of care. In India, the adoption of EMRs has been slow and uneven.

Since 2013, India's Ministry of Health has prescribed standards for EMRs. The establishment of the National e-Health Authority (NEHA) in 2015 aimed to create a secure, privacy-conscious digital health ecosystem. Additionally, NITI Aayog has proposed frameworks for the National Health Stack, a platform to manage patient data effectively.

Some states, like Assam, have made notable progress by digitally tracking maternal and child health, ensuring immunizations and post-natal care are recorded systematically. Such initiatives hold promise but scaling these systems nationally remains a challenge.

The main hurdles are resource constraints and the need for trained personnel. Many Primary Health Centers (PHCs) still lack basic computer infrastructure — over 30% of PHCs reportedly do not have a single computer on-site. This limits their ability to maintain EMRs and leverage digital tools effectively.

Using Data to Improve Quality of Care

Digital health systems can generate valuable data that help policymakers and healthcare providers understand patterns, measure outcomes, and improve quality of healthcare services. In countries like the USA, programs such as the Value-Based Purchasing Program and Hospital Readmissions Reduction Program link hospital reimbursements to the quality of care delivered.

India is beginning to embrace similar approaches. The National Health Policy 2017 and the NDHM emphasize measuring quality of care and using data-driven insights to improve health services. Defining metrics for quality and ensuring the seamless collection and integration of data from diverse health providers is key to this vision.

By harnessing big data analytics, artificial intelligence, and machine learning, India can identify high-risk populations, optimize resource allocation, and design targeted interventions — all crucial steps toward equitable and efficient healthcare.

Beyond telemedicine and EMRs, other innovative technologies are emerging. For instance, drones have been deployed to deliver essential medicines and vaccines in difficult-to-reach and remote areas. These drone deliveries help overcome logistical challenges posed by difficult terrain and poor transportation infrastructure.

Such technological innovations demonstrate how digital health can address specific problems in India's diverse healthcare landscape. While digital health technologies offer enormous potential, their successful implementation requires bridging infrastructure gaps, training healthcare workers to effectively use digital systems, uploading data, and managing digital patient records, protecting the sanctity of patient information and medical records, and improving access to the internet in remote areas. Addressing these challenges requires coordinated efforts from the government, private sector, and civil society. Investments in digital infrastructure must go hand in hand with capacity building and regulatory frameworks that protect patient rights.

India's healthcare woes are complex and long-standing, rooted in underinvestment, inequality, and infrastructure challenges. But digital health technologies offer a powerful lever to overcome many of these barriers, making healthcare more accessible, affordable, and efficient. The government's initiatives like the National Digital Health Mission and the growing use of telemedicine, EMRs, and innovative delivery mechanisms mark a promising start. With continued investment, policy support, and grassroots engagement, digital health can transform India's healthcare system — improving access to quality healthcare services and health outcomes.



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BEYOND GDP: REDEFINING ECONOMIC GROWTH FOR BOTH PEOPLE AND PLANET

Shreya Agarwal
2nd Year, UG

Abstract

In the face of escalating global climatic challenges, social inequality and widening wealth gap, the traditional model of economic growth – which is rooted in the pursuit of GDP maximisation – has revealed its limitations in fostering equitable and sustainable growth. GDP, though a useful macroeconomic indicator, has numerous shortcomings and fails to capture the multidimensional nature of human progress and environmental sustainability. A fundamental shift from growth, for growth's sake, is now imperative to a more holistic paradigm which prioritises equity, environmental integrity and long-term resilience. Emerging frameworks such as the Wellbeing Economy, Doughnut Economics, and the Human Development Index offer alternatives to GDP-centric models. Bhutan's Gross National Happiness index, New Zealand's Wellbeing Budget and the European Union's Green Deal exemplify how governments can institutionalise inclusive growth metrics. International co-operation is crucial to ensure that globalised economic structures support – not undermine these efforts. Ultimately, a paradigm shift in both economic thought and policy, which acknowledges the limits of planetary resources and redefines prosperity in terms of shared, sustainable human flourishing.

JEL Classification

O10, Q01, I31, F63

Introduction

The 21st century presents an economic absurdity: while global GDP has surpassed unprecedented levels, so does inequality, ecological degradation and social discontent. GDP has long served as the cornerstone metric of national progress, shaping policy decisions and global rankings. Nevertheless, when a nation faces existential threats from climate degradation and social fragmentation, a critical question arises: Is GDP growth actually synonymous with actual development? The COVID-19 pandemic and the accelerating climate crisis have exposed the fragility of global systems and their dependence on economic expansion. While GDP superficially captures market activity, it fails to account for crucial dimensions of human well-being - such as environmental sustainability, social cohesion, mental health, and income equity. Moreover, the GDP-centric model often incentivises resource depletion and wealth concentration, perpetuating a growth paradigm that disproportionately benefits a few while burdening many.

The Problem with GDP

Simon Kuznets introduced the concept of GDP in the 1930s, but he never intended it to be a measure of social welfare. While effective in gauging economic activity, GDP fails to distinguish between productive and destructive growth. For instance, environmental disasters, increased healthcare costs due to pollution, and overconsumption all register as economic gains.

GDP does not give importance to crucial dimensions such as the distribution of income, labour of unpaid workers, such as homemakers, and ecological deterioration caused while maximising GDP. In the case of India, macroeconomic growth often masks deep-rooted challenges in education, health, and equitable employment—factors that GDP does not capture. Moreover, an overreliance on GDP reinforces short-termism, steering public policy toward immediate output gains at the expense of long-term resilience and sustainability.

In today's globalised world, where economies are intricately linked and crises are transnational, such a narrow metric is no longer tenable. A recalibration is needed at the moment—one that not only values quantity but also the quality of growth, inclusivity and sustainability.

Globalization and its Dual Impact

Globalisation has, without a doubt, increased trade, technology transfer, and capital flows. It has helped countless people move above the poverty line and also helped economies connect in unimaginable ways. As every coin has two sides, this is no exception; globalisation led to inequality, wealth gap, labour exploitation, as well as environmental destruction, especially in the global South. Popular policies often clash with “expert” economic advice, especially when the measure of growth fails to resonate with lived human experiences. Global supply chains optimise for profit, not for welfare. GDP-centred policies tend to favour export-led growth over domestic equity or ecological sustainability. This duality demands that globalisation be restructured. Economic integration must be at par with ecological limits and social justice. Growth must not come at the expense of human dignity or planetary resources and health.

Alternative Frameworks: Rethinking Growth

To overcome from limitations of GDP, several innovative models have emerged that offer more holistic and multidimensional measures of prosperity:

1. Doughnut Economics (Kate Raworth)

The economist Kate Raworth combined the social foundation no one should fall below for the sake of humanity and also the ecological ceiling, providing boundaries one must not cross, envisioning a safe, equal and secure space for humanity. Amsterdam has implemented “doughnut” strategies to equalise inclusive development with the constraints of the environment.

2. Wellbeing Economy (New Zealand Model)

New Zealand pioneered its resource budget based on indices like mental health, child poverty, as well as domestic violence – moving ahead and shifting focus from output to outcomes.

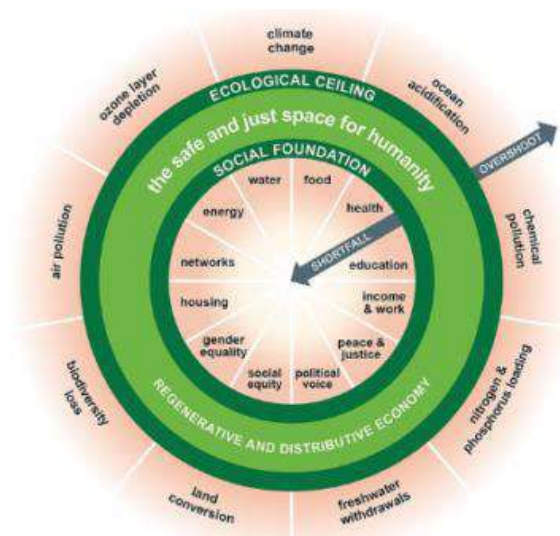


Fig 1: Doughnut economy

Source: *The Sustainable Community*, 2024

3. Human Development Index (HDI)

UNDP already uses this technique for development measures. HDI takes into account life expectancy, education and per capita income. While this too has its fair share of limitations, it better captures the multidimensional development that currently used GDP alone, thus giving a nuanced alternative to GDP.

4. Gross National Happiness (Bhutan)

Bhutan's GNH consists of nine domains, like psychological well-being, diversity in culture and ecological resilience. Though it is small, it provides a more compelling case for happiness prioritisation over the obsession on output.

Policy Recommendations for a Post-GDP Economy

Adopt Composite Indices: National dashboards incorporate the Human Development Index, ecological footprint, and well-being, which is of a subjective nature.

Green Accounting: It integrates the costs of the environment into the accounts of the concerned nation.

Public Investment in Social Infrastructure: India needs stronger investment in health and education to realise its demographic dividend and use it to its advantage.

Global Economic Reforms: Global financial institutions are democratised, and the WTO is aligned, with policies by the IMF with SDG goals.

Empower Local Economies: Community-led development and decentralisation strengthen resilience and reduce the intensity of carbon emissions

Conclusion

Redefining economic growth is not just a theoretical exercise – it is moral and imperative to ecology. As the world is confronting overlapping crises, the shortcomings of GDP are no longer tolerable. The future lies in redefining prosperity to include equal, sustainable and human well-being.

A nation that is truly developed should not be defined by one that has the highest output, but one where people live a life that is dignified and meaningful, and also live in harmony with the planet. It's time to stop asking the question, "How fast is our economy growing?" and start asking what really matters, "For whom is it growing, and what cost is it increasing?"

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POST COVID IMPACT OF HIGH SKILLED INDIAN EMIGRATION TO THE UNITED STATES

*Kenn John Mathew
2nd Year, UG*

Abstract

Given the growing desire among Indians to move abroad, it seemed necessary to quantify the consequences to the Indian economy as a result of the fulfillment of this desire. This article makes an attempt at estimating the fiscal impact of Indian emigration to the United States on the Indian economy. The method used is to first estimate the earnings of the Indian diaspora in the US (for the year 2023) and then taking purchasing power parity into account, materialise a figure for the alternative potential earnings of the group if they had remained in India. After which the revenue the government would have earned as a result of this increase in income (via income tax) is ascertained. The estimate at the end of this process has come out to be 0.54% of Indian GDP (2023). To quantify this amount and realise its significance, I have then imagined its various uses to the Indian economy.

JEL Classification

F220

Introduction

It comes as a surprise to no one that Indian emigration is an aspect that has been poignantly influenced by globalization. The Indian diaspora is as diverse as the country itself, consisting of various levels of dexterity and residing across even more countries. One of these countries happens to be the United States and the nature of your typical Indian emigrant to the US tends to be more skilled than other destination countries^[2]. This article attempts to set an upper bound to the fiscal loss incurred by India due to the emigration of skilled labour to the United States post covid (ie 2022-23) as well as shed light on less obvious losses potentially engendered by this situation.

Literature Review

For an epistemic understanding of this topic, the following materials have been consulted. All do not directly relate to my topic, but undoubtedly help in the understanding of it. (Mihir Desai, Devesh Kapur, John McHale, 2001) Fiscal Impact of Brain drain: Indian emigration to the US^[2]:

The paper points out the disposition of the Indian diaspora in the US to be more educated. They found that 38% of the working age Indian diaspora had a qualification higher than a bachelor's degree, while for the US population (natively born) it only hovered at 9%. They document more information on the diaspora as well. To estimate the fiscal loss they use two methods. The first is where (taking purchasing power parity) into consideration, they estimate the Tax revenue the Indian government would have gained if the diaspora resided in India and earned the same as they did in the US. The second method involves a model based around a mincer equation and trained on the Indian Labour market. The characteristics of the Indian diaspora are then given for it to make predictions. The paper estimates a fiscal loss of 0.24% to 0.57% of Indian GDP in 2001 as a result of emigration to the US. (Devesh Kapur, 2010) Diaspora, Development and Democracy, Chapter 3^[1]:

The skill level of Indian emigrants to the US, transitioned from being relatively low skill to high skill towards the late twentieth century. The nascent Indian diaspora brought into play societal influences that were self rewarding, such as chain migration (i.e. hiring from the same ethnicity due to perceived advantages). It also resulted in certain phenomena like 9% of all startups in silicon valley between 1995-1998 being run by an Indian. This further enabled the maturing of financial relationships between silicon valley and Indian business. Even then, emigration deprived India of necessary skilled labour in sectors like health. A massive portion

of remittances received from emigrants was used for household consumption and not for broad investment into the economy (like Kerala). Also the loss in innovation can be made blatantly apparent in that when normalized for population the ratio of patents filed by Indians in America to Indians in India is 28,000 : 1

(Chinmay Tumbe 2011). Remittances in India: Facts and Issues ^[3]:

In 2010 India was the largest recipient of remittances, however there are consequences for such dependence. Remittances tend to fuel wealth inequality as it is only those Indians from privileged backgrounds that manage to emigrate. Remittance distribution is not evenly spread, it is especially high in states such as Kerala (35.5% of NDP) and Goa (21.6% of NDP). It assumed that 60% of remittances were used for domestic investment as the deposits were kept in NRE accounts (Non residential External) and can only be withdrawn by an NRI. Data recorded from the world bank suggested that 50% of remittances were classified as family maintenance. The paper also talks about the difficulties of estimating remittances in detail.

Methodology and Results

This method of estimating fiscal loss has been imitated from the work of Mihir A Desai, Devesh Kapur and John McHale in their paper- Fiscal Impact of Brain drain: Indian emigration to the US. Using secondary data from Pew Research ^[4], This article has found an estimate for the number of working emigrants in the US (working emigrants here being full time year round workers, above the age of 16 with positive earnings). Then it has taken a middle value for each income bracket and multiplied it by the number of emigrants that fall into them, subsequently giving it a rough approximation of the earnings of the Indian diaspora in the US. After which it has then applied the Purchasing power rate (PPP) ^[5] to estimate the value of that income they would have earned in India. Then based on the 2023 tax system ^[6] and a rudimentary application of it, this article has found the potential revenue the government of India would have received if these emigrants stayed in India. Then using the annual average market exchange rate in the year 2023, it has converted it back to USD. The reason for initially using PPP and then market exchange rate ^[7], is that the first time it does the conversion it is trying to account for the purchases the emigrant would have made (ie the contribution to the economy) while in the second case GDP is a flow and it is trying to ascertain the numerical value and not the value it can purchase. The world bank uses market exchange rates in its estimation of GDP (while the IMF only uses it in some instances and PPP in others)^[8]

Calculation for the above process is shown below:

Table 1:

INCOME BRACKETS	INCOME BRACKET MIDDLE (USD)	INCOME BRACKET MIDDLE TO INR (PPP)	NUMBER OF PEOPLE THAT EARN THE AMOUNT	TOTAL INCOME PER BRACKET MIDDLE (TAKING AVERAGE) (USD)
Less than \$25,000	25,000	507,250	131,220	3,280,500,000
\$25,000 to \$49,999	37,500	760,875	314,928	11,809,800,000
\$50,000 to \$74,999	62,500	1,268,125	341,172	21,323,250,000
\$75,000 to \$99,999	87,500	1,775,375	341,172	29,852,550,000
\$100,000 to \$149,999	125,000	2,536,250	656,100	82,012,500,000
\$150,000 or more	150,000	3,043,500	813,564	122,034,600,000
	TOTAL			270,313,200,000

Source-Based on author's own calculation

Table 2:

INCOME IN INR AFTER PPP (PPP RATE IS 20.29)	TAX RATES PER INCOME BRACKET	GOVERNMENT REVENUE THROUGH TAX (INR)	GOVERNMENT REVENUE CONVERTED BACK TO USD (MARKET EXC RATES AND NOT PPP) (1USD = 82.58 INR)	GOVERNMENT REVENUE CONVERTED BACK TO USD (PPP RATE IS 20.29)
66,561,345,000	0.10	6656134500	80,602,258	328,050,000
239,620,842,000	0.15	35943126300	435,252,195	1,771,470,000
432,648,742,500	0.20	86529748500	1,047,829,359	4,264,650,000
605,708,239,500	0.30	1.81712E+11	2,200,441,654	8,955,765,000
1,664,033,625,000	0.30	4.9921E+11	6,045,169,381	24,603,750,000
2,476,082,034,000	0.30	7.42825E+11	8,995,212,039	36,610,380,000
5,484,654,828,000		1.58882E+12	19,239,759,083	78,305,535,000

Source-Based on author's own calculation

The article concedes that there are numerous flaws with this approach. Even though we have taken PPP into account, it is not a completely accurate representation of the potential earnings these emigrants would have earned if they decided not to emigrate due to a variety of reasons such as jobs in India pay significantly less than their equivalents abroad, no guarantee that the Indian job market would have provided the same number and type of jobs etc. However, it is robust enough of an approach to provide a useful estimate.

Regarding the veracity of the data published by Pew Research, the primary source is the 2023 American Community Survey conducted by the US census Bureau of the US department of Commerce.

If we were to use market exchange rates in the second conversion, we get the estimated fiscal loss to be 0.54% (around 19 billion USD) of India's GDP in 2023, however if we were to use PPP we get an estimate of 2.19% (around 78 billion USD). However, as mentioned earlier, I will be sticking to the first case where market exchange rates are used.

Conclusion

To define how salient 19 billion USD is for the Indian government, it dwarfs the amount allocated for higher education in India ^[10] and it is roughly 1/4th of India's defence budget in 2023 ^[9]. To be clear, it is not the case that the Indian economy has been completely deprived of 19 billion USD, it of course receives some of it through the households that receive remittances, non-residential Indian investments and taxes on international transactions. Still the majority of this money is utilised in America. Even whenever some amount trickles back down it is not used in an ideal way to spur economic growth as it tends to make the economy remittance dependent like Chinmay Tumbe observed in his paper.

Emigration does not only embody a fiscal loss, but also that of skill and innovation. It would be in the economical interest of any government to ensure that the potential is fulfilled.

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WIRED FOR INCLUSION: INDIA'S DIGITAL BACKBONE FOR EQUITABLE GROWTH

Tanisha Osta
2nd Year, UG

Abstract

India's ambitious push towards digital transformation has redefined the contours of inclusion and governance in a country of 1.4 billion. Through the development of Digital Public Infrastructure (DPI), a framework of interoperable, secure, and accessible systems, the government has enabled access to financial services, identity, and welfare benefits at unprecedented scale. Core initiatives like Aadhaar, Unified Payments Interface (UPI), DigiLocker, and the JAM Trinity have collectively enhanced efficiency, reduced leakages, and brought underserved populations into the formal economy. By aligning technological innovation with equity-oriented objectives, India's DPI model presents a distinctive development pathway, especially relevant for the Global South. However, despite its successes, this model also raises critical concerns. Structural gaps in digital access, gender disparities, and regional divides continue to hamper universal inclusion. Moreover, issues related to privacy, data security, and exclusion errors expose the ethical tensions in deploying large-scale digital governance tools. This paper evaluates the impact of India's digital backbone in promoting inclusion, while also interrogating the socio-technical challenges that must be addressed to ensure a more equitable digital future.

JEL Classification

O33, I38, O15

Introduction

"In a country with 1.4 billion people, a fingerprint can now unlock a bank account." In the world's largest democracy, inclusion has been a policy priority, yet achieving it at scale has remained a challenge.

In recent years India has made many efforts to digitally transform its economy and governance systems. The Digital India Mission envisions a future built on digital trust, accessibility, and secure infrastructure for all citizens. Tools such as Aadhar, UPI, Digilocker and Jan Dhan-Aadhar-Mobile (JAM) trinity have not only transformed the delivery of services but also expanded access to finance, welfare schemes and identity in ways previously unimaginable. Technology is no longer confined to convenience, it is now a key instrument for empowering the underserved and bridging long-standing gaps on access and opportunity. This transformation has touched all segments of society involving public and private institutions, rich and poor. With over a billion people now digitally connected, India offers a unique model for how technology can serve inclusion, not just efficiency or profit. This article explores how India's digital backbone is reimagining inclusion, the structural challenges that persist and what lessons it holds for other developing economies.

Building the Digital Backbone

Digital Public Infrastructure (DPI) refers to a set of shared digital systems which are secure and interoperable, built on open standards and specifications to deliver and provide equitable access to public and private services at societal scale, and are governed by enabling rules to drive development, inclusion, innovation, trust and competition and to respect human rights and fundamental freedoms.

Introduced in 2009, Aadhar is the world's largest biometric identification system, assigning a unique 12-digit identity number to Indian residents based on their biometric and demographic data. It includes fingerprints and iris scans, and has enrolled over 1.3 billion individuals as of 2023 (UIDAI, 2023). Aadhar has become a critical enabler of financial inclusion, digital identity, and targeted service delivery. It forms the foundation of the government's Direct Benefit Transfer (DBT) framework, which aims to reduce leakages, eliminate ghost beneficiaries, and ensure that welfare benefits reach the intended recipients directly. By enabling real-time identity authentication, Aadhaar facilitates access to banking, mobile connectivity, healthcare, and other essential services, especially for the underserved and undocumented populations (World Bank, 2018).

Launched in 2016 by the National Payments Corporation of India (NPCI), the Unified Payments Interface (UPI) has emerged as one of the most transformative innovations in India's financial landscape. UPI allows users to transfer funds instantly across bank accounts via mobile devices, using simple identifiers like phone numbers or Virtual Payment Addresses (VPAs), eliminating the need for traditional banking details. Designed as an open and interoperable system, UPI democratized access to digital payments, especially for small merchants, gig workers, and individuals in rural and semi-urban areas. In contrast to private digital wallets, UPI is built on an open infrastructure, allowing integration across platforms and financial institutions (RBI, 2022). The ease of use, zero-cost transactions, and 24/7 availability have fueled its exponential adoption, with over 11 billion transactions per month recorded by mid-2023 (NPCI, 2023). Moreover, UPI's success is attracting global interest, with several countries exploring similar systems for inclusive and efficient digital payments (IMF, 2023).

As part of India's expanding digital ecosystem, DigiLocker was launched in 2015 to provide citizens with a secure, cloud-based platform for storing and accessing official documents such as Aadhaar, driving licenses, educational certificates, and PAN cards. By enabling paperless verification and reducing dependency on physical documents, DigiLocker has simplified access to government services, especially in remote regions. The JAM Trinity, an integration of Jan Dhan Yojana (bank accounts), Aadhaar (identity), and Mobile connectivity has been a cornerstone of India's Direct Benefit Transfer (DBT) reforms. It ensures targeted delivery of subsidies and welfare payments directly into beneficiaries' bank accounts, significantly reducing leakages, middlemen, and delays (MeitY, 2022). Together, DigiLocker and JAM have improved service access, empowered rural populations, and brought millions into the formal financial system.

Inclusion Through Infrastructure: A New Development Model

India's approach to digital transformation is distinct in that it positions Digital Public Infrastructure (DPI) not merely as a tool for technological advancement, but as a foundation for inclusion and equity. By embedding principles of openness, interoperability, and affordability, platforms like Aadhaar, UPI, DigiLocker, and the JAM Trinity have redefined how citizens interact with the state and markets. This infrastructure-centric model has lowered access barriers for marginalized communities, especially women, daily wage workers, and rural populations, who often lacked formal identification, bank accounts, or reliable service delivery mechanisms (World Bank, 2018). For example, Aadhaar-linked bank accounts now enable direct benefit transfers even in remote areas, while UPI empowers small vendors and gig workers to participate in the digital economy without credit histories or physical banking infrastructure (CSEP, 2022; NPCI, 2023). This alignment of technology with inclusive governance challenges the conventional "growth first, inclusion later" paradigm, offering a template for developmental democracies in the Global South (Basu & Ghosh, 2023; NITI Aayog, 2021).

Structural Gaps and Ethical Concerns in India's Digital Push

While India's digital transformation has significantly enhanced service delivery and inclusion, several structural and ethical concerns remain. A key challenge is the digital divide that is access to digital services is still uneven across geography, gender, income, and education. As per the National Family Health Survey (NFHS-5, 2021), only 42% of women in rural India have ever used the internet, compared to 73% of men in urban areas, pointing to a gendered access gap. Additionally, digital illiteracy continues to limit meaningful participation, especially among the elderly, tribal populations, and people with disabilities.

Concerns around privacy, surveillance, and data security have also gained attention. The absence of a robust data protection law for years raised questions about how biometric and financial data collected through Aadhaar, UPI, and DigiLocker are used, stored, or shared (Internet Freedom Foundation, 2022). While the Digital Personal Data Protection Act, 2023 attempts to address some of these concerns, civil liberties advocates argue that it gives excessive power to the state and limits user consent.

Moreover, exclusion errors in welfare delivery such as Aadhaar authentication failures have led to denied benefits for vulnerable citizens. These issues raise questions about techno-solutionism and the risk of replacing one form of exclusion with another, if proper safeguards are not ensured.

Conclusion

India's Digital Public Infrastructure represents a paradigm shift in how governance, technology, and inclusion can intersect at scale. The success of platforms like Aadhaar, UPI, DigiLocker, and the JAM Trinity illustrates how state-backed digital systems can expand access to public services, financial tools, and welfare delivery at an unprecedented scale. These innovations have not only improved efficiency but also empowered previously excluded groups-rural populations, informal workers, and women by reducing traditional barriers to participation. These platforms have enabled millions to participate in the formal economy and have streamlined welfare delivery, particularly during crises like the COVID-19 pandemic.

Yet, the promise of DPI must be tempered with attention to its limitations. Gaps in digital access, literacy, and infrastructure persist, disproportionately affecting the most vulnerable. Issues related to privacy, data security, and exclusionary errors highlight the urgency for policy safeguards that protect rights while promoting innovation. The enactment of the Digital Personal Data Protection Act, 2023 is a step forward, but its effective implementation and oversight will be critical in maintaining public trust.

For DPI to serve as a sustainable and exportable model, future policies must prioritize digital inclusion as a core design principle not an afterthought. This includes investing in digital literacy, strengthening grievance redressal mechanisms, and ensuring that emerging technologies operate within transparent and accountable frameworks. India's digital journey, if made more equitable, offers a compelling template for other developing democracies seeking inclusive digital transformation.

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DE-DOLLARISATION : A POSSIBLE SHIFT IN THE GLOBAL CURRENCY MAP

Chirag Doshi, Tanish Bohra and Yash Sarawagi
2nd Year, UG

Abstract

This paper examines the possibility of de-dollarisation, exploring its drivers and potential limitations within the evolving global monetary order. The U.S. dollar, long established as the dominant reserve currency since the Bretton Woods era, faces increasing scrutiny due to its strategic “weaponisation,” persistent U.S. trade and fiscal deficits, and geopolitical realignments. We analyse the role of key actors—particularly BRICS+ nations—in diversifying reserves through alternative currencies, regional payment systems, and gold accumulation. The discussion highlights gold’s enduring appeal as a safe-haven asset and its function in hedging against currency volatility and sanctions risk. Furthermore, the study considers the Chinese yuan’s incremental internationalisation and the prospects of a BRICS reserve currency, alongside the constraints posed by capital controls, limited convertibility, and investor confidence. Despite these challenges to dollar primacy, our findings indicate that no competing currency currently matches the scale, liquidity, and trust embedded in U.S. financial markets—a condition reinforced by the Triffin dilemma. While de-dollarisation trends are likely to persist, they will unfold gradually, shaping a more multipolar yet dollar-anchored monetary system in the foreseeable future.

JEL Classification

F02, F31, F33, E42

Introduction

For decades, the U.S. dollar reigned supreme as the world’s reserve currency — but shifting geopolitics and economic realignments are beginning to chip away at its dominance. The US dollar has now become a risky and unreliable tool for international financial transactions. The dominance of the US dollar was institutionalised through the Bretton Woods Agreement at the end of World War II. This agreement aimed at establishing a stable economic system to promote international monetary cooperation, and prevent competitive devaluations and trade barriers that plagued the global economy during the interwar period (Hetzel 2013). The system was modelled after the gold standard and also led to the establishment of the IMF and the World Bank. The Bretton Woods agreement solidified the dollar as the world’s global reserve currency in the international monetary system and established hegemony in the global trade sphere.

However, the Federal Reserve continued to print dollars to fund various wars. As a result, there were four times more dollars in circulation than gold in reserves. In order to avoid bankruptcy, the Bretton Woods Agreement was suspended and on 15th August, 1971, US dollar became a fiat currency, backed only by people's faith in the government.

This reserve currency status allows the US to use dollar as a tool for international diplomacy or many might say, to showcase its "international dominance". It started in 1979 from freezing exchange reserves of Iran, then such actions were taken against North Korea (2005), Libya (2011), Syria (2012), Venezuela (2019) and Afghanistan (2021). Recently, Russia's exchange reserves were also frozen and Russia was banned from SWIFT, the worldwide interbank financial communication system.

This is where we introduce De-dollarisation, a term recently surfaced in public discussion. Further in this article, we will look at why and how de-dollarisation is a possibility, what are the alternatives to dollar as a reserve currency and we will also analyse why de-dollarisation is not possible in the near future.

Current State of De-dollarisation Process

De-dollarisation can be understood as the result of a process of dethronement of the US currency from its dominant role as reserve currency and means of international payment, the keystone that preserved and strengthened US's global hegemony in the backdrop of globalisation. The dominance of the dollar gave the US the power and ability to spend more than it actually earns. The external debt of the US is steadily growing (Gluschenko, 2024). In 2024, the current account deficit of the US was \$1133.6 billion, almost 20 times greater than that of Brazil, next on the list (IMF, 2025a). The deficit of the international investment position of the US reached \$26232.1 billion in 2024, about 35 times greater than the next in list, Brazil and Spain (IMF, 2025b). It is impossible to pay off this debt as all US reserve assets at the end of 2024, including gold reserves, amounted to \$909.9 billion (BEA, 2025). The recent "Liberation Day" tariffs are considered to be an attempt to solve this problem. However, this goal is unlikely to be achieved due to the opposition from US trading partners.

Currently, Russia is the most active player in the process of de-dollarisation who has been launching a full-fledged de-dollarisation strategy since 2014, making it official in 2018 as a response to Western sanctions. Next in line, in terms of the severity of the sanctions is Iran who has been forced to give up dollars for its international transactions. We can draw up a similarity here. The Russian central bank owns a quarter of the yuan held by foreign central banks, and yuan is also the main reserve currency of the Iranian central bank, due to a shift in the payment of Iranian oil in Chinese currency. Moreover, Iran already trades in its own currency with Lebanon, Syria and Iraq, exports oil and gas to India in exchange for rupees (November 2018 agreement) and is seeking a similar path with Ankara. Saudi Arabia has also considered the option of selling oil to China in exchange of yuan, which would deal a serious blow to the "petrodollar". Oil has been the main line of defence of the international status of the US dollar, after the US-Saudi agreement (1970). Since then, oil and almost all other commodities are denominated in dollars in most transactions. Should the "petrodollar" fall, the damage to the US hegemony would be considerable. This has a direct relation to the current punitive tariffs imposed by the US on India for its oil deals with Russia in their local currency. This "weaponisation" of the global reserve currency by the West has caused Russia and other developing countries to have a sense of distrust with the current international financial system.

It is interesting to note that Russia, China, India, Iran, Saudi Arabia, and the UAE are all official members of the BRICS+ bloc. Along with the rest of the BRICS+ nations, they have increasingly begun to question the reliance on dollar-denominated assets and the geopolitical risks these pose. Conveniently, many of these same countries have also emerged as some of the largest purchasers of gold in recent years. Gold now represents a crucial terrain for the prospects of further de-dollarisation.

The Safe Haven Status of Gold

According to Baur and Lucey (2010), safe haven assets are defined by their zero or negative correlation with other asset classes under crisis conditions. Such assets play a critical role in risk management strategies, offering protection against losses in more volatile investments during market downturns.

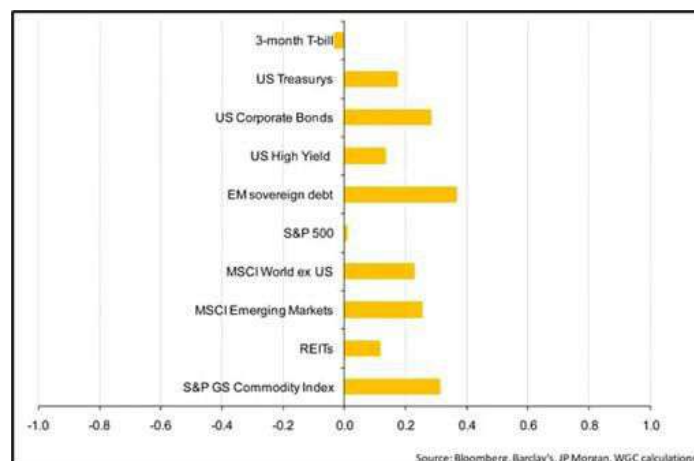
Over the past two decades, intensifying geopolitical tensions and sustained monetary uncertainty have heightened the demand for robust hedging instruments. Gold has long been regarded as a paradigmatic safe haven asset, owing to its intrinsic ability to preserve real value amidst economic dislocation. Its tangible nature, absence of default risk, and independence from corporate policies or central bank decisions differentiate it from conventional financial assets. Additionally, gold's universal recognition across cultures and its limited natural supply—coupled with high extraction costs—enhance its status as a rare and valuable store of wealth.

The ongoing trend of de-dollarization—where global economies reduce reliance on the U.S. dollar—has further reinforced gold's appeal. A decline in the dollar's dominance may prompt greater investment in gold. In recent years, central banks in countries like China, Russia, India, and several Middle Eastern and Southeast Asian nations have significantly increased their gold reserves. Beyond risk diversification, this accumulation reflects a broader objective: hedging against currency volatility and reducing reliance on dominant reserve currencies, notably the U.S. dollar. Gold thereby functions as both a financial hedge and a tool of macroeconomic stabilization and monetary sovereignty.

A. Gold Prices in the Wake of Geopolitical Uncertainty

Geopolitical uncertainty is a significant driver of gold demand. Empirical evidence from geopolitical events—such as the 2008 global financial crisis, Russia-Ukraine conflict, South China Sea tensions, instability in the Middle East, COVID-19 pandemic and the recent Liberation Day Tariffs conflict—demonstrates that spikes in the Geopolitical Risk Index (GPR) have a statistically significant positive impact on gold prices.

Fig 1: Correlation of Various Asset Classes with Gold prices



Source: Bloomberg

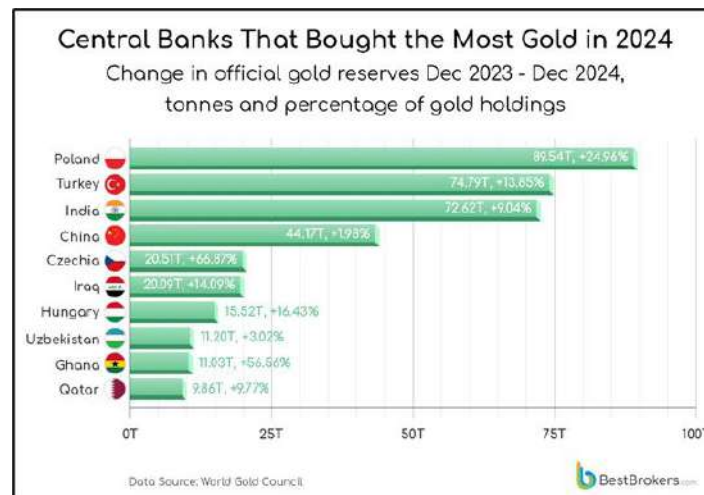
B. U.S. Dollar VS Gold Prices

The relationship between the U.S. Dollar Index (DXY) and gold prices is widely acknowledged to be inversely correlated. Dollar depreciation erodes returns for foreign holders of US debt, undermining confidence in the US Treasury and economy, which further boosts demand for gold as a safe-haven asset. Empirical studies consistently report a negative correlation between DXY and gold prices in the range of -0.4 to -0.6. However, Granger causality tests suggest that monetary factors such as DXY and interest rates, while impactful, are not the primary causal drivers of gold prices. Instead, geopolitical tensions and

financial market volatility exert a stronger influence. For example, during Q1 of 2022, amid the Russia–Ukraine conflict, gold prices surged by over 15%, even as the U.S. Federal Reserve began raising interest rates.

The trend of de-dollarisation has further increased central bank gold demand, particularly in emerging markets. As of 2024, gold comprises approximately 9% of EM FX reserves, up from 4% in 2014, while developed economies hold around 20%. Countries such as China and Russia have led this accumulation. Gold enables countries to diversify reserves away from the U.S. dollar, mitigating exposure to U.S. sanctions, and exchange rate volatility. Its dual role as a medium for settlement and a long-term store of value strengthens nations' ability to conduct trade and manage reserves independently, advancing the process of de-dollarisation.

Fig 2: Change in Official Gold Reserves



Source: World Gold Council

Alternatives of U.S. Dollar

The direction of the gradual process of de-dollarisation that began about a decade and a half ago is the entry of the Chinese currency – renminbi, also known as yuan – on the world stage. The objective needs of China's capitalist development have begun to push for a path of automatization from excessive dependence on American finance. China has a long-term plan for the internationalization of renminbi, turning it into a freely convertible currency (Nabar & Tovar, 2017; Lim, 2023). More recently, the deterioration of relations with Washington, due to trade wars, as well as the weaponization of the currency in the Ukrainian conflict have convinced the Chinese leadership that exposure to the dollar system now represents a risk that is less counterbalanced by the advantage of access to western export markets.

Beijing has taken significant steps in the past decade for a more decisive internationalisation of its currency. Increasing participation in international trade and investments in the BRI (Belt and Road Initiative) have given way to a whole series of trade and banking transactions abroad in yuan, at the same time as since 2015 Beijing has been setting up its own international inter-bank payments system (CIPS: Cross-Border Inter-Bank Payments System), in particular for oil trade, completely separate from SWIFT, which is de facto controlled - as most recently seen in the Ukrainian crisis - by the US government. In the meantime, Beijing has launched its digital currency (digital yuan) in 2022, controlled by the Central Bank, which should further facilitate the yuan's international diffusion, particularly within the BRI and in the East Asian region. We have seen the ongoing shift to payment in Chinese currency for Iranian oil and that yuan is already the main reserve currency of the Iranian central bank. While as early as 2020, only 20% of Russian exports to China were denominated in dollars, today Chinese purchases are almost exclusively in yuan.

Fig 3: Global Usage of Yuan



Source: Bloomberg

Another way of transforming the international monetary structure, is the complete breakup of the single currency system. This means that all countries will trade in national currencies, maintaining paired export-import balances. This is already happening in part, as exemplified by trade between Russia and India. However, it is unlikely that the international currency system will completely disintegrate. Most probably, we should expect its fragmentation into currency zones like the dollar zone, euro zone, yuan zone, rouble zone etc.

It was recently supposed that the last two zones could be replaced by the BRICS currency zone. The creation of international reserve currency based on a basket of BRICS currencies was being worked out at the official level. According to some researchers, this currency could significantly displace the dollar. For instance, model estimates (Coquidé et al., 2023) show that about 58% of countries would prefer to trade with the BRICS currency, 23% with the euro and 19% with the US dollar. Still, the idea of the BRICS currency seems to have encountered serious problems which we discuss in the next section.

Challenges to De-dollarisation

As shown in the figure below, the US dollar comprised 58% of disclosed global official foreign reserves in 2024 and far surpassed all other currencies including the euro (20%), Japanese yen (6%), British pound (5%), and the Chinese renminbi (2%). Notably, it is basically unchanged since 2022, suggesting that U.S. sanctions on Russia following the invasion of Ukraine have not led to fears of dollar "weaponization" causing a notable reallocation of reserves out of dollars.

Fig 4: US Dollar Share of Global Reserve Currencies



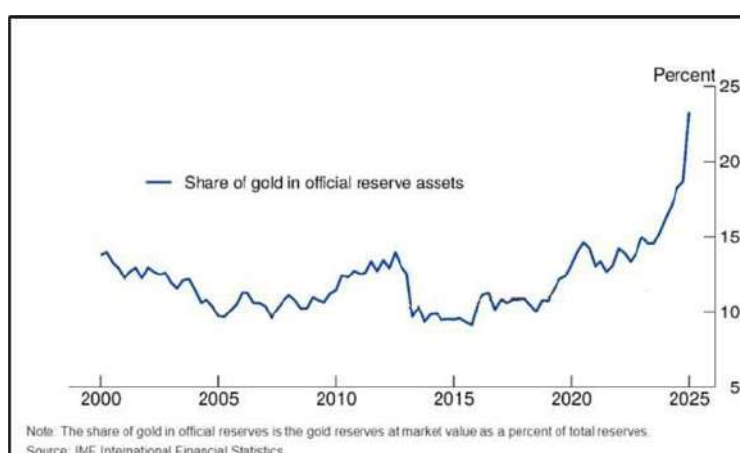
Source: IMF

What needs to be focused on is then the link between the strategy of cautious and regulated internationalisation of yuan and the issue of de-dollarisation in its various aspects. It is true that Beijing has passed legislation to counter the US sanctions regime, but Chinese companies are forced to be extremely cautious with respect to the threat of being placed on the Washington Department of Commerce's Entity List on the basis of so-called secondary sanctions. Importantly, the renminbi is not freely exchangeable, the Chinese capital account is not open, and investor confidence in Chinese institutions is relatively low (Wincuin, 2019). So, the Chinese government, with a lucid evaluation of the balance of power, is not aiming at this stage at a symmetrical response to the United States, but at obtaining greater margins of action on all levels. For these reasons, the internationalisation of the Chinese currency does not actually go beyond encouraging its international use without full convertibility at present. It is therefore not yet sufficient for the yuan to acquire a strong international position among reserve currencies, while its role as a means of payment is growing thanks also to the digital yuan, but in an area hitherto limited to bilateral trade relations mainly with developing countries. It remains to be seen how far yuan trading will succeed in imposing itself outside the Chinese market, particularly in East Asia and the Middle East, where for now the petrodollar is still dominant.

Moreover, a shifting payments landscape could also result in an enhancement to the U.S. dollar's dominance. For example, the rapid growth of digital currencies, like Tether, USD Coin, Pax Dollar, may solidify the dominant role of the dollar. About 99% of stable coin market capitalization is linked to the dollar, implying that crypto assets are de facto traded in dollars. Indeed, increased stablecoin usage may cause more emerging market economies to become effectively dollarized (Cowen, 2025).

The other crucial aspect of de-dollarisation, Gold, is being hoarded in large quantities by BRICS+ nations lately. Even on this front, however, it is more plausible that this is a defensive measure for the gold purchasers, in the short to medium term, to further diversify against the risks of an inflated dollar that would empty its currency reserves, rather than an actual de-dollarisation strategy. The share of gold in official reserve assets has more than doubled from below 10 percent in 2015 to over 23 percent now (figure below). However, this increase mostly reflects the over 200% increase in the gold price over that period. In contrast, the physical quantity of gold holdings has only increased by less than 10% over this period. Furthermore, Weiss (2025) shows that increases in gold holdings are generally not associated with a decline in U.S. dollar reserves except for China, Russia, and Turkey. So, even though gold has become more popular as a reserve asset, the increase in gold holdings is not necessarily linked to the decline in dollar holdings, at least till now.

Fig 5: Share of gold in official reserve assets



Source: IMF

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GLOBALIZATION, DIETARY SHIFTS AND SUSTAINABILITY: A COMPARATIVE ANALYSIS

Jaanya Agarwal
2nd Year, UG

Abstract

This article examines how the food consumption patterns of rural consumers have changed before and after the implementation of liberalization reforms. Data from the National Sample Survey Organization (NSSO) for the years 1988-89 and 2004-05 have been used to compare the absolute expenditure and the percentage share of major food groups in the Monthly Per Capita Expenditure (MPCE). It was observed that there has been a noticeable shift away from the staple cereals and pulses towards more diverse and packaged food items. While this diversification suggests increased incomes and better supply chains in rural areas, the sustainability of these changes is a matter of concern. Globalisation has had a twofold impact – it broadened consumer choices, leading to alterations in their diets, but also created susceptibilities in the long run.

JEL Classification

D12,F62

Introduction

India is one of the world's largest economies, with a population of 1.4 billion. After its independence, however, the economy was in ruins due to the 200 years of British rule. In an attempt to restore the economy's vitality, the government decided to increase trade barriers, effectively closing the economy. The country operated independently for 45 years with minimal international contact. In 1991, the economy was opened up because of a foreign exchange crisis. This became a crucial point for the Indian economy. The LPG policy (Liberalization, Privatisation, Globalisation) was implemented, which changed the course of the economy forever.

Consumption expenditure on food items before and after these reforms has changed drastically because of the international influence on the economy. This article aims to comparatively analyse these changes in the rural part of India, using the data provided by NSSO surveys, and also examine the sustainability of the observed changes.

Comparative Analysis

The secondary data provided in NSSO surveys of the years 1988-89 and 2004-05 has been compared on the following two bases:

1) Monthly Per Capita Expenditure (MPCE) and percentage change in expenditure

MPCE is the average expenditure an individual in a household incurs on consumption in a month. It is a key indicator of individual and household well-being.

Table 1: Break-up of MPCE by food group in rural India (1988-89 and 2004-05)

ITEM GROUP	MPCE (Rs.) in 1988-89	MPCE (Rs.) in 2004-05	Percentage Change
Cereals and cereal substitutes	45.77	101.04	120.75
Pulses and their products	7.57	17.91	136.59
Milk and its products	15.65	47.31	202.30
Fruits	2.83	10.42	268.19
Vegetables	9.32	34.07	265.55
Meat, egg, and fish	6.12	18.6	203.92
Edible oil	7.59	25.72	238.86
Sugar and salt	5.49	14.37	161.74
Spices	4.97	12.78	157.14
Beverages and refreshments	6.49	25.37	290.90
TOTAL	111.8	307.59	

Source: NSSO SURVEYS 1988-89 AND 2004-05, MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION, GOI

Table 1 shows the Monthly Per Capita Expenditure (MPCE) on food items in the years 1988-89 and 2004-05. As expected, there is a significant increase in the MPCE of all food groups due to the general price increase. 1. The total rural MPCE on food and non-food items in 1988-89 was Rs. 175.10, of which Rs. 111.80 was that on food items only. This implies that 63.8% of expenditure was on food items before the globalization era. 2. In 2004-05, the total rural MPCE was Rs. 559, with Rs. 307.59 being the expenditure on food,

implying that 55% of the spending was on food items. The expenditure on food items has decreased after the introduction of reforms, as consumer preferences have shifted towards more non-food, imported products due to globalization.

2) Share of each food group in total food MPCE

Table 2: % share of food groups in the MPCE (1988-89 and 2004-05)

ITEM GROUP	% share in 1988-89	% share in 2004-05
Cereals and cereal substitutes	40.94	32.85
Pulses and their products	6.77	5.83
Milk and its products	14	15.38
Fruits	2.53	3.38
Vegetables	8.34	11.08
Meat, egg, and fish	5.47	6.05
Edible oil	6.79	8.36
Sugar and salt	4.91	4.67
Spices	4.44	4.15
Beverages and refreshments	5.81	8.25

Source: NSSO SURVEYS 1988-89 AND 2004-05, MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION, GOI

Table 2, representing the share of each food group of the total MPCE, is also indicative of the change in dietary habits of consumers influenced by globalization. It is a relative indicator. Even if the absolute expenditure on a food group increases, the share in the MPCE can specify the dietary changes.

The consumption of cereals and pulses has reduced substantially. Consumption of fruits, vegetables, and beverages records a significant increase, while that of milk, meat, and eggs shows only a marginal increase. Consumption of sugar, salt, and spices has remained largely unchanged. Thus, it can be derived that consumers' diets have shifted to higher-value and processed food items away from simple cereals and pulses. The rural population is also allocating more income to fruits and vegetables, possibly due to increased health awareness and better supply chains. Therefore, globalization-led market integration has diversified the diets of the rural consumers.

What caused these changes?

The maximum change in spending has been on beverages, followed by that on fruits and vegetables. Some reasons behind this major change are as follows:

- Before 1991, beverage options for the rural population were largely limited to traditional drinks such as tea, buttermilk, and sugarcane juice, which were often prepared at home. However, after 1991, there was a surge of beverage choices in the market, with multinational brands expanding distribution in rural areas.
- Multinational FMCG brands like Pepsi and Coca-Cola adjusted their marketing strategies to appeal to the rural population. Increased advertising through television and cinema made their products available to the rural public.
- Increased agricultural prices led to a rise in rural income. Beverages, therefore, became a lifestyle product, especially for the youth.
- The availability of fruits and vegetables increased as cold storage facilities enabled the sale of seasonal products year-round.
- Given the high income elasticity of fruits, increased income led to an increased expenditure on fruit consumption.

Essential food items such as cereals, spices, and pulses have had the least change in expenditure. This is because of their low income elasticity. The amount of cereals and pulses a household can consume is largely fixed and does not change much despite an increase in the household's income or greater availability of the goods due to imports. Some households may have shifted to consuming a better quality of these goods, enabled by their surplus income and availability of imported goods.

Are the changes sustainable?

Globalisation has certainly brought about several changes in consumer behaviour and spending habits. How future-proof the changes are depends on the nature of the change.

Diversification of dietary habits indicates income growth and international integration of markets, with rural households benefitting from the wider product availability. However, beverages and processed foods have higher per-unit costs than traditional cereals and pulses. Sustaining this shift can become a load on the household income if it does not keep pace with the rising prices. Additionally, perishable goods like milk and fresh fruits are susceptible to seasonal non-supply, leading to a sudden increase in prices. Domestic farmers become vulnerable to international price shocks and input costs, especially in a globalized economy, where domestic demand is also determined by global factors. Without certain policy interventions, the observed dietary shifts may not be economically sustainable.

From an environmental perspective, packaged food and beverages produce more plastic waste and have a higher carbon footprint. The year-round availability of fruits and vegetables depends on cold storage facilities and long-distance transport, both of which contribute extensively to greenhouse gas emissions. On the other hand, diversification of crops could support greater agricultural biodiversity. The changes will only be environmentally sustainable if they are based on locally sourced produce and reduced dependence on packaged food products.

Conclusion

The comparative analysis clearly shows that globalization reforms have substantially altered the consumption patterns of rural consumers. Rising incomes and increased exposure to the international market have led to a decline in spending on cereals and pulses, shifting the preferences towards beverages, milk products, food and vegetables. These changes are indicative of better supply and distribution systems in rural India in the era

following globalization. However, the transition is not without challenges. Higher value packaged goods can become an economic burden to the rural incomes during inflationary periods. The increased carbon footprint and pollution due to the production and transport of these goods will also be a burden to the environment. Targeted policy measures need to be implemented to sustain these changes. These could include promoting locally sourced food products and a movement towards biodegradable packaging.

Thus, post-1991, even though consumer choices have expanded due to the integration with global markets and consumer preferences have changed, appropriate measures need to be taken to make sure these changes are future-proof and align with the sustainability goals of the country.

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DIGITAL HEALTH: A CATALYST FOR EQUITABLE GROWTH IN INDIA

Essence Delilah Flynn
2nd Year, UG

Abstract

According to NDTV(2022) India has a doctor-to-patient ratio of 1:1854 which is well below the ideal benchmark 1:1000 as set by WHO. Traditional healthcare models are not always accessible to everybody in the country. This is where digital health comes in. Digital healthcare platforms are designed to transcend geographical limitations and facilitate remote consultations between healthcare providers and patients. In a globalised world, growth is not only measured by numerical figures but also by overall development and equitability.

In the last five years, India has been on a significant journey of embracing digital health for facilitating both equitability and economic growth. The Ayushman Bharat Digital Mission (ABDM) offers services like issue of health IDs, creation of registries for doctors and health facilities and creation of personal health records. Telemedicine platforms like e-Sanjeevani offer a case study on how technology enabled public services create both economic and social value. Not only government run platforms but also privately owned platforms offer a plethora of services to people starting from wearables that detect a person's step count and heartbeat to delivery of medicines and even doctor-to-patient consultations.

JEL Classification

I15, I18, O33

Introduction

India's healthcare landscape is going through a digital transformation, run by government initiatives, policy reforms, and technological advancements. The Indian population is growing quickly and as a result there is a high demand for quality healthcare services that are accessible, affordable and effective. The new age healthcare infrastructure in India is gradually being digitised thereby, bridging the gap between urban and rural healthcare services, by adopting telemedicine, electronic health records (EHRs), and diagnostics driven by Artificial Intelligence (AI). During the COVID-19 pandemic digital health facilitated an effortless delivery of health services from doctors to patients. Digital health has been expanding since then.

Reasons for a rise in popularity of Digital Health in India.

- **COVID-19:** The lock down that was caused by the pandemic is a huge driving factor that resulted in the surge of virtual healthcare services in India. When everyone was restricted to the boundaries of their homes, telemedicine served as a useful tool to help patients communicate with healthcare professionals via a digital platform.
- **Digitalisation:** One of the most important factors that drive this successful rise in popularity of digital health is digitalisation itself. This has been facilitated by a rapid increase in the use of mobile phones and other electronic devices like laptops and computers, etc. India now has around 1.15 billion mobile connections. Internet coverage and data supply continue to improve as time passes.
- **Supportive Government Policies:** The Indian government recognised the potential of digital health and has taken measures to implement and integrate technology into the healthcare system, this includes initiatives to promote the adoption of modern technology in both public and private healthcare sectors.
- **Growing demand for healthcare services:** With a rapidly growing population, the need for healthcare is also on the rise. It is necessary to make healthcare accessible and affordable for all including rural as well as urban areas.

Ayushman Bharat Digital Mission

The implementation of Ayushman Bharat Digital Mission (ABDM) was done with a vision of creating a national digital health ecosystem. Some core components of ABDM are ABHA (Ayushman Bharat Health Account) which enables users to generate a 14 digit number i.e. the ABHA ID, a universal health ID which links a person's health records, prescriptions and other data under one secure platform. Next we have the Healthcare Professional Registry (HPR) which provides a verified database of healthcare professionals in India such as doctors, nurses, pharmacists etc. It aims at maintaining transparency and trust among patients and healthcare providers. Health Facility Registry or HFR is also under ABDM, it is a national registry of public and private healthcare institutions ranging from hospitals to clinics and diagnostic labs. It allows patients to compare health services all over the country. Lastly we have UHI or Unified Health Interface which enables interactions between healthcare providers and users through UHI-enabled platforms, facilitating interoperability.

As of 06.02.25, more than 73.98 Crore ABHA accounts have been created, over 49.06 Crore health records have been linked with ABHA. Over 3.63 lakh health facilities on HFR and more than 5.64 lakh healthcare professionals on HPR have been registered. Over 1.59 lakh health facilities use ABDM enabled softwares.

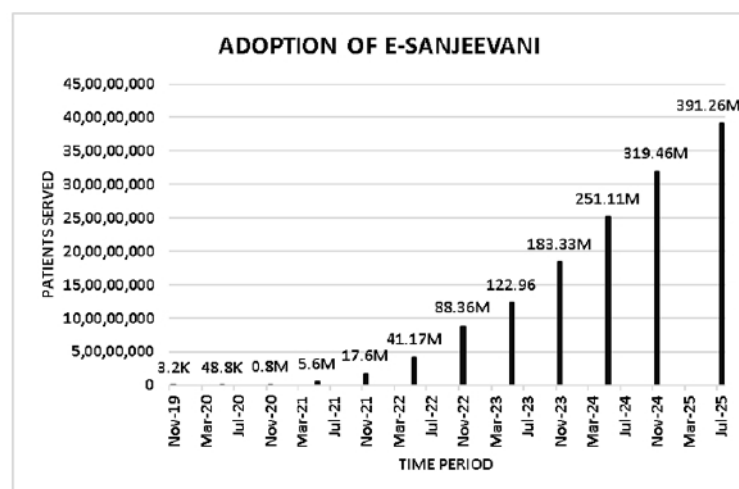
Telemedicine in India: Bridging the Healthcare Divide

Telemedicine helps to address the imbalance of distribution of healthcare between rural and urban areas. e-Sanjeevani has been implemented nationally by the Ministry of Health and Family Welfare (MoHFW). It has been integrated with Ayushman Bharat Digital Mission. This allows existing users of e-Sanjeevani to easily create Ayushman Bharat Health Account (ABHA), which they can use to link and manage their existing health records with doctors facilitating better clinical decision making. The national telemedicine service, e-Sanjeevani, has served close to 400 million patients (as of July 2025).

Any beneficiary visiting an Ayushman Bharat-Health and Wellness Centre (AB-HWC) can virtually connect to doctors and specialists through the telemedicine service. e-Sanjeevani OPD serves patients across the country connecting them to doctors from the comforts of their homes.

The graph below represents how many patients have been provided with quality healthcare through e-Sanjeevani, the time period being November 2019 to July 2025 (08.07.25).

Fig 1: Patients provided with quality healthcare through e-Sanjeevani



Source: www.mohfw.gov.in

The Private Sector and Health & Fitness Apps

Private Companies are making efforts complementary to public sector healthcare initiatives. They are shaping general consumer behaviour and creating health-tech models that are beneficial for the economy.

- **Telemedicine Platforms:** These platforms offer video consultations with doctors, online prescriptions, homecare services, diagnostics and others. Some examples may include Practo and Apollo 24/7.
- **E-Pharmacy & Online Medicine Delivery:** Tata 1mg, PharmEasy and NetMeds provide doorstep delivery of prescription medicines. They often offer discounted rates as opposed to traditional pharmacies making it affordable.
- **Fitness & Preventive Health Apps:** Cult.fit(then Cure.fit) offers workout programs, mental wellness programs, diet plans and more via its app. HealthifyMe is India's leading AI-powered nutrition and fitness app which uses an AI coach to create personalised workout plans.

How is Digital Health beneficial for the economy?

In a globalised world, economic strength is tied to the health of a nation's population. The traditional GDP-growth model often overlooks health equity but the recent digital health revolution makes us rethink the scenario.

- **Human Capital as a Core Driver:** It is important to know that workforce productivity is of utmost importance to a nation and its growth. Digital healthcare is accessible to everyone and it reduces illness-related productivity losses.
- **Creates a growing Health-Tech Industry:** Revenue in the Digital Health Market is projected to reach US \$6.33 billion in 2025 and it is expected to grow at an annual rate of 11.82% (CAGR 2025-2029) resulting in a projected value of US\$9.90 billion in 2029 (Statista). It helps to create employment in fields of software development, customer service, logistics, etc
- **Sustainability and Equitability:** A healthcare system focusing on prevention of diseases, enabled by data from health records, can substantially reduce pressures on the environment and the economy. For instance, fewer hospital visits can reduce resource usage and lower carbon emissions that are made from travel. In terms of equitability, digital health reaches rural pockets of the country providing quality healthcare to all.

Challenges in India's Digital Health Journey

While India's digital healthcare journey has been remarkable there are still challenges that need to be tackled.

- **Internet Connectivity:** There are still large pockets of India that lack proper access to the internet making digital care out of reach. Internet connectivity still has room for improvement.
- **Digital Literacy:** There is also a problem of low digital literacy, many first time users struggle to navigate health platforms especially if the apps are English-heavy, it might alienate non-urban populations.
- **Privacy & Security:** Health data is extremely sensitive and there has been an increase in cyberattacks recently. It is necessary to protect a user's privacy and establish clear consent norms.
- **Integration Issues:** Many healthcare institutions like hospitals and clinics are still not integrated with ABDM which can lead to disjointed health records and it makes continuity of care difficult.
- **Affordability:** While digital health is supposed to be more affordable than traditional healthcare in cities, some services like diagnostics and premium app subscriptions remain out of reach for low-income groups.

Possible Reforms and Solutions

- **Infrastructure Investment:** Expanding broadband connections to those areas that lack proper internet connections, affordable internet connections and offering subsidised smartphones or shared community devices in rural health centres may solve many issues.
- **Digital Health Literacy Programs:** Arranging awareness programs to reach out to the public and spread the word about the effectiveness of digital healthcare can be helpful.
- **Data Protection:** Ensuring a person's privacy and keeping their health data secure is much needed for digital health platforms to grow.
- **Integration with ABDM:** Incentivising private platforms and institutions to integrate with ABDM to ensure a standard delivery of healthcare. Offering subsidies/tax breaks may motivate new entrepreneurs to make rural-friendly health tech.

Conclusion

Digital Health in India is not just a technological upgrade, it is an economic strategy. By improving health services and outcomes, reducing costs and financial burdens and expanding accessibility of quality healthcare to everyone, India is laying the foundation of equitable and sustainable growth in a globalised set up. Digital Health can transform the entire healthcare landscape in India. It invites several opportunities of employment, job creation, work efficiency and most importantly technological development. Creating a thriving health-tech industry is necessary because it has the potential to lift millions into more productive and secure livelihoods.

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THE ENERGY EQUATION: OIL, GAS AND GLOBAL TENSIONS

Vidhi Agarwal, Tanisha Jain and Disha Khajanchi
2nd Year, UG

Abstract

This study investigates the crude oil market's reaction to the combined shocks of COVID-19 and unprecedented price collapses, along with later geopolitical disruptions such as the Russia–Ukraine war and Middle East conflicts. It explores the dynamics of price volatility, supply–demand imbalances, monetary policy responses, OPEC+ strategies, and shifts in global trade flows. It also explores how natural gas markets in North America, Europe, and Asia became more connected from 2011 to 2024, and the risks that come with this. It also addresses the challenges posed by the “resource curse,” environmental sustainability concerns, and the influence of climate policies on the global energy transition. The objective is to assess the economic and geopolitical factors shaping oil and gas markets, evaluate integration patterns, and identify policy approaches that enhance energy security and support a sustainable transition.

JEL Classification

Q35, Q43, F51

Introduction

Oil and natural gas have shaped the modern world in ways few other resources have. They have fueled cities, facilitated trade across countries, and impacted the growth and decline of economies. They are strategic levers of power that influence national security choices and create global alliances, making them more than merely fuels. Nearly 50% of the world's energy demands were satisfied by oil in the early 1970s; even with new energy sources, it continues to lead the way today. Once restricted by geography, natural gas today travels across seas as LNG, which connects far-flung markets. The economic power of these fuels makes them very sensitive to crises, whether caused by pandemics, wars, or policy changes. In today's unstable geopolitical landscape, which includes the Russia-Ukraine war, tensions in the Middle East, and changing alliances, understanding their market behavior is essential. This knowledge helps economies respond to volatility while striving for long-term sustainability.

Dynamics of Global Crude Oil Markets

We aim to study the responses of the crude oil markets to the double blow of COVID-19 and the historic oil price shock over the past 10 years. Given the massive global use of this commodity, it is obvious that any price shock and ensuing volatility would inevitably have detrimental effects on the expansion of the world economy.

By January 2015, oil prices had fallen to less than half of what they were in July 2014, when they averaged over \$100 per barrel. In June 2015, prices briefly rebounded to around US\$60, but by February 2016, they had fallen by half again to slightly over \$30.

The crude price exceeded the USD 70 a barrel mark in 2018, triggered by the U.S. sanctions imposed on large oil producers such as Iran and Venezuela. Geopolitical shocks, including the attack on the Saudi facilities caused sharp but brief price increases. Despite these factors, overall volatility remained low, and prices gradually rose toward the end of the year.

The unprecedented fall in prices that ensued in March 2020, triggered by a lethal double bout of COVID-19 pandemic and a protracted battle between Saudi Arabia and Russia for oil market share.

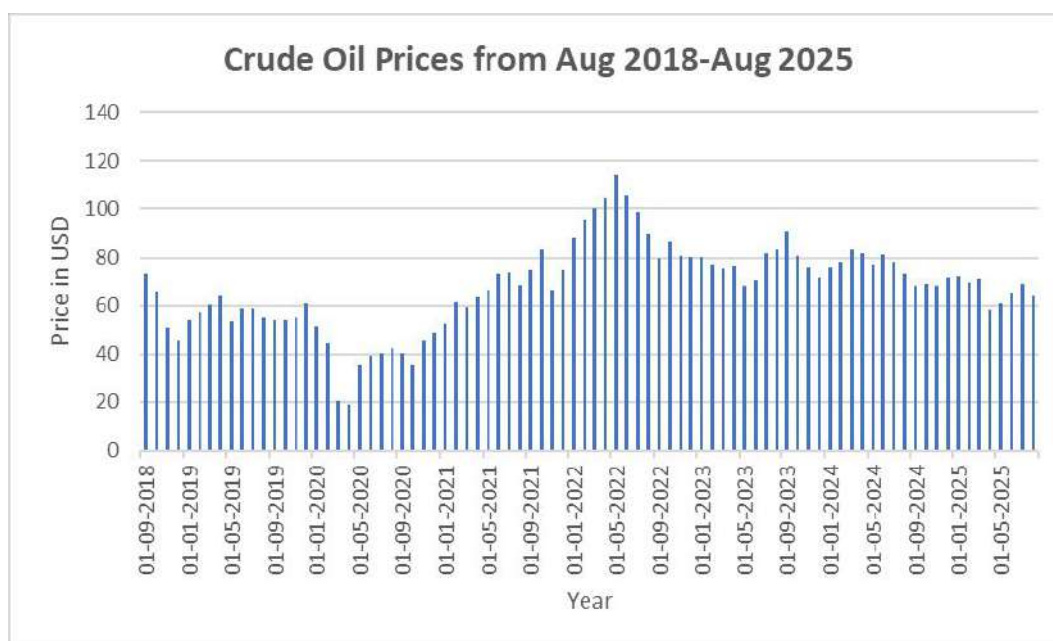
The oversupply in the crude oil market and a steep 30% decline in worldwide fuel consumption brought on by protracted lockdowns, regular travel restrictions, little to no vehicle use, and a decline in economic activity were the main causes of this. On April 20, the price of WTI crude oil futures finally fell into the negative zone. Furthermore, the unprecedented bundling of the demand and supply shocks not only roiled the oil market, but the storage capacity of surplus crude oil became completely exhausted. Saudi Arabia decided to reduce production (upto 30%) but Russia, the biggest non-OPEC producer, deserted because it was afraid of losing its own market share. This ultimately led to major instability of the oil market. By the summer of 2020, oil prices began to rebound as nations emerged from lockdowns temporarily and the OPEC agreed to major cuts in crude oil production by 9.7 million barrels per day for an initial period of two months but prices did not launch a meaningful recovery until the second half of the year.

The pandemic caused a significant decline in the price of energy commodities, which was followed by a period of recovery and a subsequent spike, especially in gas prices. Due to a combination of supply and demand issues, gas prices have increased especially sharply since the summer of 2021. Oil prices rose 46% in the second half of the year.

After the pandemic recovery in 2022–2023 increased demand, growth slowed as teleworking decreased commuting, electric vehicle adoption increased, and nations like Saudi Arabia replaced oil in power generation with gas and renewables, temporarily pushing prices to two-year lows before they recovered amid the Middle East conflict. In 2024, Brent crude averaged \$81 per barrel, close to the predicted \$82 per barrel from January 2024. Early in 2024, geopolitical threats and OPEC+ production cuts drove prices upward, with the spot price reaching a high of \$93/b on April 12.

Currently, with oil prices at about \$63 per quintal, the global oil markets have faced a volatile 2025 up to now. The global economy and, consequently, the rise in oil demand have been impacted by increased trade tensions and uncertainties. In April and early May of 2025, global oil prices hit a four-year low.

Fig 1: Crude Oil Prices from Aug 2018-Aug 2025



Source: in.investing.com

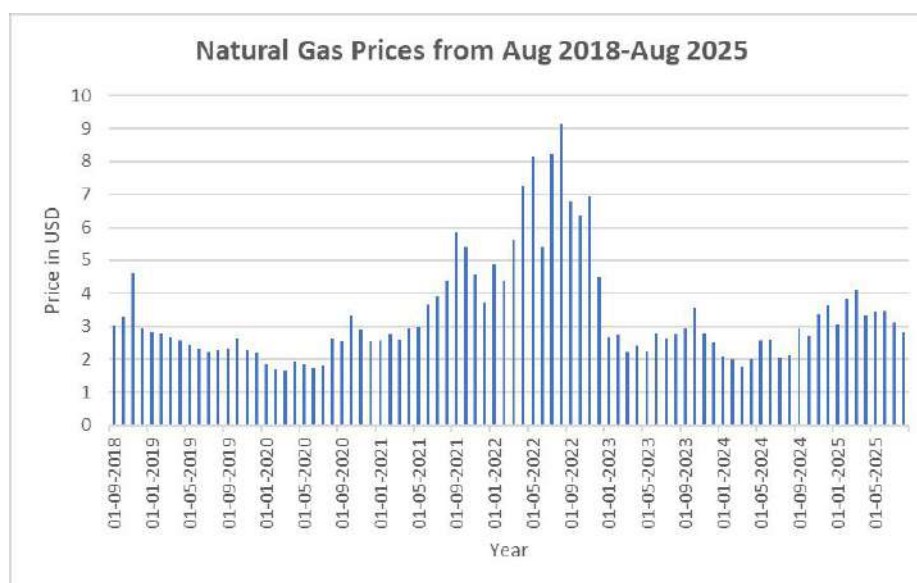
Global Natural Gas Trends and Market Integration

From 2011 to 2024, we will look at the price correlations in North America, Europe, and Asia. The findings demonstrate a high correlation between Europe and Asia, with European price returns reliably forecasting Asian price returns. Only at longer lags does North America have weak correlation with Asia. The fact that North America is still the most insulated confirms its relative immunity to shocks to world prices.

From roughly \$1026 billion in 2023 to \$1,160 billion in 2024, the natural gas industry is expected to reach \$1,550 billion by 2028. Because of infrastructure constraints and transportation costs, regional differences continue to exist. Although this is impacted by outside forces, LNG technology has improved market connectivity between Europe and Asia. Global energy problems and price volatility were brought on by the decline in Russian exports due to the Russia-Ukraine conflict. Previous research frequently looks at stable times, missing lead-lag correlations and non-linear temporal dynamics during moments of severe volatility.

Japan is the main importer of LNG in Asia, and it has typically set its prices using the Japanese Crude Cocktail. Japan has increased flexibility by diversifying its procurement since 2010. Spot prices increased as a result of the Russian invasion of Ukraine, revealing weaknesses. Prior to divergence brought on by geopolitical upheavals, the European market was integrated by pipelines and coordinated hub pricing. Henry Hub is at the center of North America's integration, which has a high level of internal connectivity but little global integration. Due to world events, volatility peaked for everyone between 2019 and 2024. HHB has the lowest average and volatility, NBP the largest range, and JP the highest average price.

Fig 1: Natural Gas Prices from Aug 2018-Aug 2025



Source: [in.investing.com](https://www.investing.com)

Geopolitical Forces Shaping Energy Security

For over a hundred years, oil has been at the heart of global politics, shaping alliances, rivalries, and economic strategies. But its dominance is no longer unquestioned. The growing weight of climate policies and the steady rise of renewable energy are beginning to change the balance. While many climate pledges are still only partly fulfilled, they point toward a slow but steady move away from fossil fuels—though the world is still far from fully meeting the Paris Agreement's targets.

Historically, control over oil supply and demand determined who held the power in global energy politics. Exporting nations could use their resources as leverage over importers, influencing everything from trade to security. Today, that power dynamic is starting to shift. Low-carbon energy is gradually stepping into the spotlight, and the geopolitics of the future may center less on oil wells and more on solar farms, wind turbines, and decarbonization strategies.

A. Russia-Ukraine war impact

The war in Ukraine sent shockwaves through the global energy system, cutting off critical oil and gas flows and exposing just how dependent Europe had become on Russian fuel. Ukraine's battered power grid was partially stabilized by an emergency link to Europe's network, but the disruption was severe. Even before the invasion, the oil market had been bruised by earlier turmoil. In April 2020—under heavy pressure from the US and the G20—Saudi Arabia and Russia struck a deal to limit production. Yet by then, the market had already suffered deep damage, and a quick recovery was out of reach.

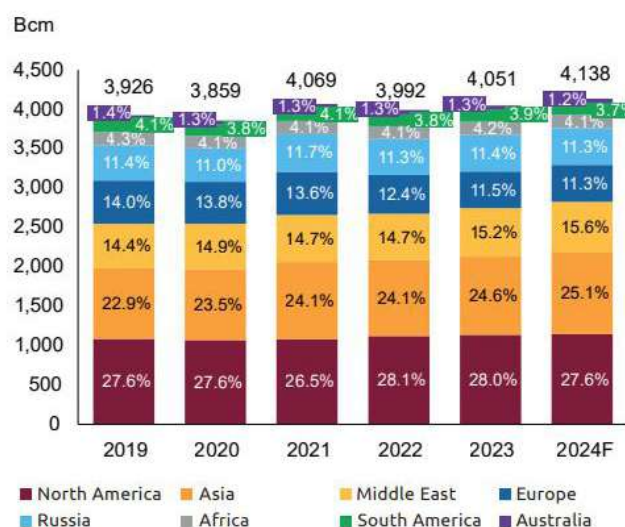
In response to the war, the EU vowed to slash Russian energy imports by two-thirds, pivoting toward US liquefied natural gas (LNG) and other suppliers. The US quickly became Europe's biggest LNG partner, while OPEC+ members only slightly increased production. Iran and Venezuela eyed potential openings if sanctions were eased.

Russia, cut off from much of its European market, began selling more oil to China, India, and other buyers—often at discounted rates. Japan and South Korea scrambled to find new suppliers. Australia experienced a significant increase in LNG and hydrogen export demand. African and Latin American producers experienced mixed fortunes, depending on their stability and infrastructure. The crisis sped up global moves toward diversifying supply, investing in renewable energy, and rethinking what energy security should look like in a more unpredictable world.

B. Israel-Iran war impact

By the end of the Northern Hemisphere's summer, the usual seasonal bump in demand fades. This year, it left behind a surplus—pushing prices downward, a trend experts believe could last through 2026. Political tensions in the Middle East have further slowed global demand growth. Rising production is the key driver. Expanded OPEC+ quotas encouraged Gulf exporters to pump more oil. Iran quietly lifted its output to more than 3.5 million barrels a day—the highest in seven years—despite the regional unrest.

In the US shale sector, production swings closely follow prices: under \$50 a barrel, drilling slows; \$55 keeps operations afloat; \$60 sustains activity; \$65 encourages growth; and \$70 or more sparks rapid expansion. With supply now outpacing demand, many high-cost producers are under pressure.



Source: safety4sea.com

Global gas demand sustained its growth in 2023, increasing 59 Bcm (1.5%) and is expected to continue growing in 2024 with a further ~87 Bcm (2.1%) increase in demand.

C. Effects on Sustainability and Economic Growth

Having abundant oil doesn't always mean widespread prosperity. Economists call this the "resource curse." Of the 34 countries where oil exports make up over 5% of GDP, only nine enjoy political stability. Heavy dependence on oil often prevents economies from diversifying, making them vulnerable to price swings and leading to "Dutch Disease," where a strong currency hurts other industries. Oil wealth can be concentrated in the hands of governments and elites, creating few local jobs and weakening the link between citizens and taxation. This concentration of power often goes hand in hand with corruption and authoritarianism.

Nigeria, Angola, and Equatorial Guinea show how oil riches can coexist with poverty, unemployment, and inequality. Much of the revenue benefits foreign companies or domestic elites, while healthcare, education, and social services remain underfunded. Transparency International regularly lists oil and gas as among the world's most corruption-prone sectors. Botswana stands out for its careful management of resource income, yet even it struggles without stronger economic diversification.

D. Policy Responses and Energy Transition

The global oil and gas industry is now navigating a transformation. Agreements like the Paris Accord and the EU Green Deal are pushing companies to cut emissions, invest in renewables, and tighten environmental standards. Many firms are moving into carbon capture, methane reduction, and clean-energy technologies.

Different regions are taking their own approach—North America, Asia-Pacific, and the Middle East each tailoring strategies to their resources, costs, and political realities. While the road to a low-carbon future has technical and policy challenges, it's also opening space for innovation, partnerships, and early-mover advantages. Those who adapt fastest could hold the strongest positions in the energy market of tomorrow.

Conclusion

The COVID-19 epidemic, geopolitical conflicts, and changing energy transitions have all contributed to the extraordinary volatility of the crude oil market over the last ten years. The sector's vulnerability and pivotal importance in the global economy are highlighted by significant events, such as the price crashes of 2014–2016, the negative pricing in 2020, and supply disruptions brought on by the hostilities between Israel and Iran and Russia and Ukraine. Market fundamentals and geopolitical influence are being redefined by structural changes such as the growth of renewable energy, the expansion of LNG commerce, and decarbonization policies.

This study demonstrates how globalization and the oil and gas trade have a big impact on how natural resources are managed. Global energy links are impacted by political events, which can reroute trade flows and create new alliances. Targeted regulations, strong infrastructure, and a variety of approaches are necessary to manage this changing energy landscape, protect energy security, and lower dependency risks. Building dependable, affordable, and sustainable energy systems will depend on encouraging collaboration, promoting innovation, and maintaining flexibility as the world's shift to cleaner energy quickens.

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GLOBALIZATION AND SUSTAINABLE DEVELOPMENT: A CROSS-REGIONAL REGRESSION ANALYSIS OF BRICS, G7, ASEAN, AND GCC ECONOMIES

Swarnim Chaudhuri, Rupam Debnath, Souhardya Seth and Ayushman Biswas
2nd Year, UG

Abstract

The complex relationship between globalization and sustainable development in the context of the four main economic blocs—BRICS, G7, ASEAN, and GCC—is examined in this article. We use bloc-level weighted aggregation, based on a balanced composite of GDP (PPP) share and population share, and regression analysis to measure the correlation and the marginal impact of globalization on sustainability. We do this by using annual data from the UNDP Sustainable Development Index (SDI) and the KOF Globalization Index from 2000 to 2022. Although the strength, statistical significance, and explanatory power vary significantly, the results show a generally strong and positive relationship across all blocs, with ASEAN exhibiting the best fit and GCC the worst.

The study uses a marginal returns analysis to go beyond linear relationships, and the results show a reverse sickle-shaped curve that illustrates how sustainability gains change as globalization levels rise. This curve displays diminishing returns for highly globalized economies like the G7, strong positive returns for mid-globalization blocs like ASEAN and GCC, and negative marginal returns for low-globalization economies like BRICS. By connecting these patterns to structural traits, integration maturity, and policy environments, the analysis offers economic intuition for these trends.

The study emphasizes that the sustainability impact of globalization is highly context-dependent by fusing statistical data with economic reasoning. To promote balanced and sustainable global growth, the findings provide specific policy recommendations, with a focus on diversification for resource-dependent blocs, qualitative globalization strategies for developed economies, and structural reforms for emerging economies.

JEL Classification

F63, Q01, C33, O57

Introduction

The twin forces of globalization and sustainable development are major concerns for societies, economists, and policymakers alike in an increasingly interconnected world. The world landscape has undergone a significant transformation due to globalization, which is defined by the increasing interdependence of the economies, cultures, and populations of the world. This has been brought about by cross-border trade in goods and services, technology, and flows of people, money, and information. At the same time, sustainable development—which the UN defines as development that satisfies current needs without jeopardizing the capacity of future generations to satisfy their own—has become a crucial framework for tackling urgent global issues like poverty, inequality, and climate change. These two phenomena have a complicated and multidimensional relationship that frequently offers both opportunities for synergy and inherent conflicts.

Numerous aspects of this relationship have been studied in the past; some research indicates that globalization may speed up economic growth, which may then free up funds for social programs and environmental preservation. On the other hand, detractors contend that unbridled globalization can worsen local cultures, increase income inequality, and worsen environmental degradation. Developing successful policies that support long-term sustainability and global integration requires an understanding of how various economic blocs negotiate this complex relationship.

By offering a thorough empirical analysis of the relationship between globalization and sustainable development across four different economic groups—the Association of Southeast Asian Nations (ASEAN), the Gulf Cooperation Council (GCC) states (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates), the BRICS countries (Brazil, Russia, India, China, and South Africa), and the G7 countries (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States)—this article seeks to further this ongoing conversation. These blocs provide a rich comparative context for our study because they reflect a wide range of economic development, geopolitical influence, and governance styles.

The UNDP Sustainable Development Index (SDI) serves as a stand-in for sustainable development in our analysis, while the KOF Globalization Index is used to gauge globalization. We use regression models to measure the magnitude and direction of the relationship between these two variables for each bloc by looking at data from 2000 to 2022. We also examine the underlying mechanisms through which globalization affects sustainability and vice versa, delving into the economic intuition that underlies our findings. The study also offers a marginal analysis to pinpoint the moments when the benefits of greater globalization for sustainability start to wane or quicken, offering important information for optimizing policy.

Methodology

This study takes a quantitative approach, using time-series data for four different economic blocs—BRICS, G7, ASEAN, and GCC—to examine the connection between globalization and sustainable development. The analysis period, which runs from 2000 to 2022, offers a wide temporal scope for identifying patterns and connections. The Sustainable Development Index (SDI) and Globalization Index scores for each nation were aggregated at the bloc level using a weighted average approach. Within each bloc, the weighting system was created to balance population importance and economic size. In particular, the 2022 share of the bloc's total population and its 2022 share of its total GDP (at purchasing power parity) were calculated for each nation. To ensure that neither purely demographic nor purely economic dominance would disproportionately skew the aggregation, each share was given an equal weight of 50%. Each nation's final weight was determined as follows:

$$0.5 \times (\text{Population Share}) + 0.5 \times (\text{GDP (PPP) Share}) = \text{Final Weightage (\%)}$$

This strategy maintained representational fairness while reflecting the economic-demographic balance of the real world by ensuring that both populous nations with lower economic output (like the Philippines in ASEAN) and large economies with comparatively smaller populations (like Saudi Arabia in the GCC) exert proportionate influence in determining bloc-level indices.

Data Sources

Globalization Index: The main indicator of globalization is the KOF Globalization Index. The KOF Swiss Economic Institute created this index, which fully accounts for the political, social, and economic facets of globalization. It is well known for being reliable and having extensive coverage, which makes it appropriate for comparisons between nations and regions.

The dependent variable is the Sustainable Development Index (SDI), which measures the degree of sustainable development in each economic bloc and is calculated using UNDP data. The SDI is a composite index that takes into account the economic, social, and environmental facets of sustainability.

Regression Model

For each economic bloc, a simple linear regression model is employed to assess the relationship between the Sustainable Development Index (SDI) and the Globalization Index. The model is specified as follows:

$$\text{SDI} = \alpha + \beta * \text{Globalization Index} + \epsilon$$

Where: - **SDI** represents the Sustainable Development Index (dependent variable). - **Globalization Index** represents the KOF **Globalization Index** (independent variable). - α is the intercept, representing the expected SDI when the Globalization Index is zero. - β is the regression coefficient, indicating the change in SDI for a one-unit change in the Globalization Index. - ϵ is the error term, accounting for unobserved factors and random variations.

Statistical Analysis

Pearson correlation analysis is used in conjunction with regression analysis to assess the direction and magnitude of the linear relationship between each bloc's Globalization Index and SDI. The explanatory power of the models and the statistical significance of the observed relationships are assessed by computing key statistical metrics, such as R-squared (R^2), beta coefficients (β), p-values, and F-statistics.

Marginal Analysis

A marginal analysis is carried out in order to obtain a better understanding of the disparate effects of globalization on sustainable development at various levels. This entails comparing changes in the Globalization Index to the rate of change in the SDI. We determine points of increasing, decreasing, or negative returns by examining the smoothed 4-point curve of the marginal returns of sustainability to globalization. This gives us a more nuanced understanding of the ideal levels of globalization for sustainable development within each bloc.

Data Processing and Tools

Python is used for all data processing, statistical analysis, and visualization. Statsmodels are used for regression analysis, matplotlib and seaborn are used for data visualization, numpy is used for numerical operations, and pandas is used for data manipulation.

Findings and Discussion

Across the chosen economic blocs, our analysis offers compelling insights into the connection between globalization and sustainable development. Together, the marginal analysis, summary statistics, and regression results provide a comprehensive picture of the interactions between these two crucial forces.

Regression Analysis Results

For each of the four economic blocs, the regression models show a statistically significant and positive correlation between the Globalization Index and the Sustainable Development Index. This suggests that higher levels of sustainable development are typically linked to greater globalization.

Table 1

Group	R ²	Beta	p-value	Correlation	Significance
BRICS	0.6409	0.9178	0.0000	0.8006	***
G7	0.8063	0.7274	0.0000	0.8980	***
ASEAN	0.8693	0.9397	0.0000	0.9324	***
GCC	0.5876	0.4740	0.0000	0.7665	***

BRICS (Brazil, Russia, India, China, South Africa): The BRICS bloc exhibits a strong positive relationship ($R^2 = 0.6409$, Correlation = 0.8006) between globalization and sustainable development. According to the beta coefficient of 0.9178, the SDI for BRICS nations rises by roughly 0.9178 units for every unit increase in the Globalization Index. Globalization has been a significant driver of sustainable development in these emerging economies, as evidenced by the strong correlation that is highly significant ($p < 0.001$). The economic premise here is that BRICS countries gain access to resources, expertise, and best practices required to further their sustainable development agendas as a result of their increased integration into the global economy through trade, investment, and technology transfer. For instance, foreign direct investment (FDI) can bring cleaner technologies and more efficient production methods, while participation in global markets can incentivize adherence to international environmental and social standards.

G7 (Canada, France, Germany, Italy, Japan, United Kingdom, United States): The G7 bloc demonstrates an even stronger positive relationship ($R^2 = 0.8063$, Correlation = 0.8980) between globalization and sustainable development. A strong positive impact is indicated by the beta coefficient of 0.7274. This high R^2 value indicates that a sizable amount of the variation in SDI for G7 countries can be explained by globalization. As highly developed and globalized economies, the G7 nations possess the financial resources, technological prowess, and institutional frameworks necessary to harness globalization for sustainable results. Instead of causing social inequality or environmental degradation, their robust regulatory frameworks and dedication to international agreements probably guarantee that the advantages of globalization are directed toward sustainable practices. According to economic theory, developed economies are better able to withstand and adjust to the demands of globalization, turning them into chances for long-term, sustainable growth through innovation and policy.

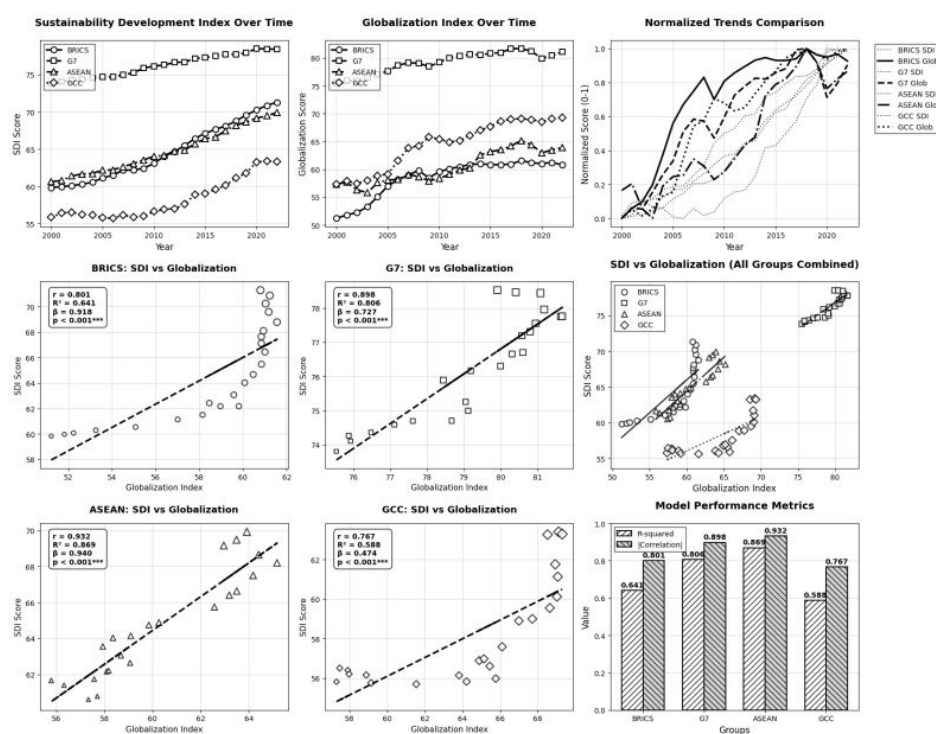
ASEAN (Association of Southeast Asian Nations): ASEAN exhibits the strongest positive relationship among all blocs ($R^2 = 0.8693$, Correlation = 0.9324). With a beta coefficient of 0.9397, SDI is extremely responsive to shifts in globalization. This remarkably strong correlation implies that the ASEAN region has benefited greatly from globalization as a force for sustainable development.

As developing economies, ASEAN nations stand to gain greatly from greater trade, regional integration, and foreign investment, all of which support economic expansion, the fight against poverty, and improved social indicators. Additionally, ASEAN regional cooperation frequently incorporates programs for sustainable resource management and environmental preservation, enhancing the benefits of globalization for sustainability.

GCC (Gulf Cooperation Council): The GCC bloc shows a strong positive relationship ($R^2 = 0.5876$, Correlation = 0.7665), though it is the weakest among the four blocs. In comparison to other groups, the positive but less noticeable impact is indicated by the beta coefficient of 0.4740. This implies that although globalization helps GCC countries achieve sustainable development, other factors may be more important or there may be particular difficulties in converting the advantages of globalization into sustainability gains. The resource-rich character of these economies is the basis for the economic intuition here. The path to sustainable development may be more complicated, requiring diversification away from hydrocarbon dependence and addressing particular environmental challenges related to arid climates and rapid urbanization, even though globalization makes it easier to import goods and services and export their primary resources. The comparatively lower R^2 may indicate that internal economic structures and development priorities have a greater impact on the SDI for the GCC than the current model does.

With time-series trends, regression fits, combined group analysis, and model performance metrics, the figure below provides a thorough visual representation of the connection between globalization and sustainable development across the four economic blocs. It provides the empirical basis for the main conclusions and interpretations of the study.

Graph 1: Globalization–Sustainable Development Relationship: Time-Series Trends, Regression Analysis, and Model Performance Across Economic Blocs



Summary Statistics

Table 2

Group	SDI_Mean	SDI_Std	SDI_Growth	Glob_Mean	Glob_Std	Glob_Growth
BRICS	64.673	3.882	19.171	58.541	3.386	18.704
G7	76.237	1.575	6.273	79.222	1.944	7.334
ASEAN	64.750	2.986	15.361	60.335	2.962	11.475
GCC	58.217	2.692	13.382	64.477	4.353	20.921

Highest SDI Average: Because of their advanced stage of development and demonstrated commitment to sustainability, the G7 bloc continuously maintains the highest average SDI (76.237). This makes economic sense because developed countries typically have the public awareness, policies, and infrastructure needed to achieve greater sustainability results.

Fastest SDI Growth: With the fastest SDI growth (19.171%), the BRICS countries have made notable strides in sustainable development during this time. Their lower starting base and the significant investments in technology, infrastructure, and social programs—often made possible by their growing integration into the global economy—are responsible for this quick growth. According to economic logic, emerging economies can adopt more sustainable practices as they grow and have more room for improvement.

Most Globalized: With an average Globalization Index of 79.222, the G7 is also the most globally integrated bloc, which is consistent with their economic makeup and historical significance in international trade and finance. This supports the notion that greater degrees of globalization are frequently linked to greater degrees of development and, as a result, sustainability.

Highest Globalization Growth: Globalization grew at the fastest rate (20.921%) in the GCC bloc. The GCC countries are becoming more integrated globally, but the conversion of this integration into sustainable development outcomes may be influenced by particular internal factors or development pathways, as indicated by the rapid increase in globalization and the comparatively weaker relationship with SDI when compared to other blocs.

Marginal Findings and Economic Intuition

Beyond straightforward correlation-based interpretations, the marginal returns analysis offers a more complex understanding of the connection between globalization and sustainable development. Using the smoothed 4-point curve of marginal returns ($d(\text{SDI})/d(\text{Globalization})$), we find that the impact of globalization varies significantly based on the structural features and current level of globalization of the economic bloc.

BRICS: The BRICS economies seem to be facing negative marginal returns from further globalization in recent years, as evidenced by their low normalized globalization index of 0.24 and average marginal return of -10.57. Due to structural inefficiencies, unequal benefit distribution, or environmental trade-offs brought on by rapid industrialization, this suggests that additional globalization may not be translating into sustainability gains at the current levels of integration. Economic intuition holds that globalization alone may worsen current inequalities and resource pressures, undermining net sustainability gains, unless accompanied by domestic reforms such as diversification, more robust environmental regulation, and equitable distribution policies.

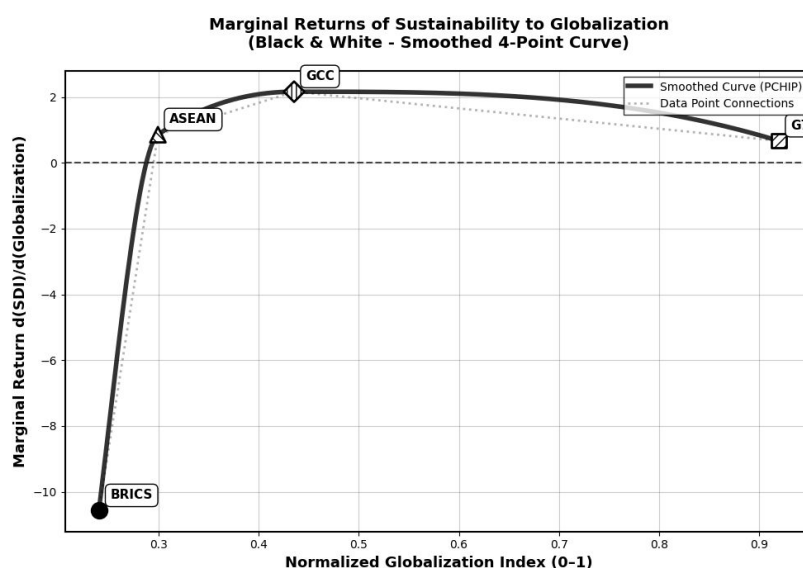
ASEAN: At a normalized globalization index of 0.30, ASEAN exhibits positive marginal returns of 0.85. This suggests that the bloc is still in a phase where sustainability metrics show quantifiable gains as a result of gradual globalization. Along with continued infrastructure development and integration initiatives, the advantages most likely result from increased trade, investment, and technology transfer. These benefits are amplified by ASEAN's active regional cooperation and reasonably balanced economic makeup, which places the bloc in a "sweet spot" where additional globalization keeps improving sustainability results.

GCC: With a moderate globalization index of 0.44, GCC economies report the highest marginal returns, at 2.16. This illustrates how globalization has produced substantial sustainability benefits at their current level of integration, especially in the form of wealth creation from international energy trade. However, if further globalization does not occur at the same time as diversification away from resource dependence, economic intuition indicates that these high returns may peak and then decline. Long-term maintenance of these favorable returns will depend on ongoing investments in human capital, renewable energy, and green technologies.

G7: The G7 has the highest level of globalization (0.92), but its marginal returns are only 0.66. In economies that are already highly integrated, this pattern suggests that the benefits of further globalization are diminishing. Since a large portion of the "low-hanging fruit" of integration has already been realized, the benefits of additional globalization at this point are smaller. The way forward for the G7 is not to increase the quantity of globalization but to improve its quality by utilizing international collaborations to achieve advanced sustainability objectives like inclusive social development, deep decarbonization, and circular economy transitions.

The marginal returns curve generally shows a reverse sickle-shaped pattern, with gains tapering gently at the highest levels of globalization (G7), a sharp upward shift into positive returns at moderate levels (ASEAN and GCC), and steeply negative returns at the lowest levels (BRICS). This figure graphically illustrates the diversity in the dynamics of globalization and sustainability: low-globalization blocs (BRICS) need institutional and structural changes to counteract the current negative marginal effects; highly globalized economies (G7) see diminishing returns where quality improvements are more important than scale; and early-to-mid-stage blocs (ASEAN, GCC) can still benefit greatly from incremental integration. This progression is well represented by the attached curve, which plots the route from negative to peak returns before flattening out like an inverted sickle blade.

**Graph 2: Marginal Returns of Sustainability to Globalization:
Reverse Sickle-Shaped Relationship Across Economic Blocks**



Conclusion

Although the strength and type of this relationship vary, this study looked at the relationship between globalization and sustainable development across the four main economic blocs—BRICS, G7, ASEAN, and GCC—and found a positive and statistically significant link in each case. In a region that is rapidly integrating, ASEAN exhibits the strongest impact, with globalization serving as a potent catalyst for sustainability. The G7, which is already very international, uses integration to achieve complex sustainability goals. While the GCC's outcomes show both the advantages and disadvantages of its resource-dependent economy, BRICS has made strides but still faces institutional and structural obstacles.

A reverse sickle-shaped curve representing the marginal returns analysis shows how sustainability gains vary with the degree of globalization. Since BRICS currently have negative marginal returns at low levels of globalization, further integration may not improve sustainability outcomes in the absence of targeted policies and structural reforms. Although GCC will require economic diversification to maintain them, ASEAN and GCC, which are located in mid-globalization zones, benefit greatly from further integration. Smaller incremental gains are experienced by the G7 at near-saturation levels, where attention must be directed toward qualitative enhancements like deep decarbonization, adoption of the circular economy, and fair international participation.

These results highlight how context greatly influences how globalization affects sustainability. Diversification and the use of renewable energy are priorities for resource-based economies; leadership in sustainability innovation and fair benefit-sharing are priorities for developed countries; and responsible market integration, green investment, and technology transfer are priorities for emerging economies. The reverse sickle curve shows how important timing, quality, and strategic direction are to making sure globalization continues to be a path toward a more just and sustainable future for all.

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PERFORMANCE OF DIFFERENT SECTORS POST-GLOBALIZATION

Souparni Das
2nd Year, UG

Abstract

This article explores the impact of globalization on different sectors and subsectors in India and the global economy. It outlines the history of globalization, and its influence on major sectors. It analyzes shifts in GDP contributions across all sectors. Through various charts, it demonstrates how globalization reframes economies, facilitates interdependence, and challenges traditional growth models.

Additionally, the study underscores the rise of the quaternary and quinary sectors which reflects global shifts toward knowledge-based services. It takes into account the role of technology and trade liberalization in driving sectoral transformation.

JEL Classification

F63,O13,O14,O19

Introduction – What Is Globalization?

In the 21st century, the field of economics is incomplete without the mention of globalization. It is a dominant paradigm which has started ruling the world since the nineties of 20th century.

Globalization can be regarded as a system through which various goods, services, and information are spread across the world. It describes the economies connected through free trade, capital flow, and access to resources of various countries. It has skyrocketed primarily due to the use of new advanced technologies. An American economist, Theodore Levitt has coined the term 'Globalization' (1983) in an article named, "The Globalization of Markets".

History Of Globalization In Global Economy

The first wave of globalization was felt in the 19th century (1840). The Industrial Revolution (1760-1840) was a huge step for global trade. Different trade liberalization process began that ultimately led to development of WTO (1995).

History Of Globalization In India

India has always been playing a vital role in international trade due to its spices, jewellery, textiles. The Gulf War, burden of fiscal deficit on the government were the driving forces behind the liberalization (1991), privatization and globalization of the Indian economy.

The share of India in the global economy was 7.5% in 2023.

Globalization And G20

G20 (1999) is an international forum formed by governments of different countries (19) and the European Union (EU). It discusses various topics like international financial stability. The G20 leaders engage through a summit annually held, to explore global issues.

How Does Globalization Work?

Countries try to specialize in the goods and services in which they have a competitive advantage and thus they can produce at a low cost. Policies like free trade and international cooperation aid in globalization. Technological developments like the Internet , AI , and transportation also accelerate the process. Examples of Globalization include Amazon which has around 10 million sellers all over the world .

Like any concept in the world , globalization too has some pros and cons

Pros:

1. Economic problems solving
2. Free trade promotion
3. Developing economy
4. Helping with trends in human rights and environment

Many see globalization through the critical lens . John Lennon imagined “*no countries... all the people living life in peace*”—a vision that mirrors globalization’s ideal of unity.

Cons:

1. Destabilizing markets
2. Harmful to environment
3. Fall in living standards
4. Global recession

After the Covid-19 pandemic , companies are considering the downsides of globalization too, and henceforth reforming accordingly.

Deglobalization

Globalization has its counterpart -Deglobalization . We have seen deglobalization recently during the Covid -19 pandemic which affected the global supply chains leading to shortage of goods , and worsened economic conditions of a number of countries.

Sectors

A sector is a component of the economy where activities , goods and services are shared by businesses. The types of sectors and examples are tabulated below -

<u>SECTORS</u>	<u>ACTIVITIES</u>	<u>SUBSECTORS</u>
Primary	Producing raw materials , farming	Agriculture , mining , forestry
Secondary	Minerals turning raw materials into manufactured items, construction of buildings	Factory jobs like manufacturing , textiles ,
Tertiary	Providing With services	Healthcare, financial services
Quaternary	Jobs based on knowledge like IT programming, consulting	Data analysis, product developers
Quinary	Top executives offering highest level of services	Research scientists , police , military, nonprofit organizations like NGOs,

TABLE -1

Sectoral Linkages And Globalization

This section explains the relation between globalization and different sectors of the economy.

Globalization and Primary sector

Due to globalization and technological advancement, cost reduction is facilitated which increases rapidly the process of production in agriculture. In low income countries which are not improving their agricultural research capacity, cost reductions are not experienced there. Globalization leads to improved overall infrastructure of the rural regions. Domestic demand for livestock and horticulture is predicted to rise rapidly. It is expected that high income countries will provide financial help for rural programmes while low income countries should spend the public expenditure on agricultural production .

Globalization and Secondary sector

Globalization has leveraged global industries . Foreign countries produce goods at much cheaper rates and thus companies can easily access consumer markets leading to economic growth . Industries can reduce production costs, thereby making their operations more profitable . For example liberalization policies in post -1991 enabled Indian industries to internationalize .Indian companies like Tata Consulting Range of Industries, CIPLA have become MNE (Multinational Enterprises). But it should be kept in mind that adaptability and acceptance are keys to avoid missteps.

Globalization and Tertiary sector

Technological changes ,trade policies foster globalization. The North American Free Trade Agreement (NEFTA) has covered trade and investments in services, along with the efforts of the World Trade Organization under which the countries committed to the GATS (General Agreement On Trade in Services). It is seen that in the case of India , the services sector has emerged significantly during the post – liberalization era. It is suggested to all countries to be self dependent so that recession cannot affect a country .

Globalization and Quaternary sector

The global economy has been drifting towards a knowledge rich economy . Use of AI and automation, upskilling ,and knowledge networks are key features of this sector .The interconnected economies facilitate spread of innovations to stimulate growth . Organizations collaborate to stay in the competition which needs unique skills . Policymakers and economists are expected to recognize its contributions.

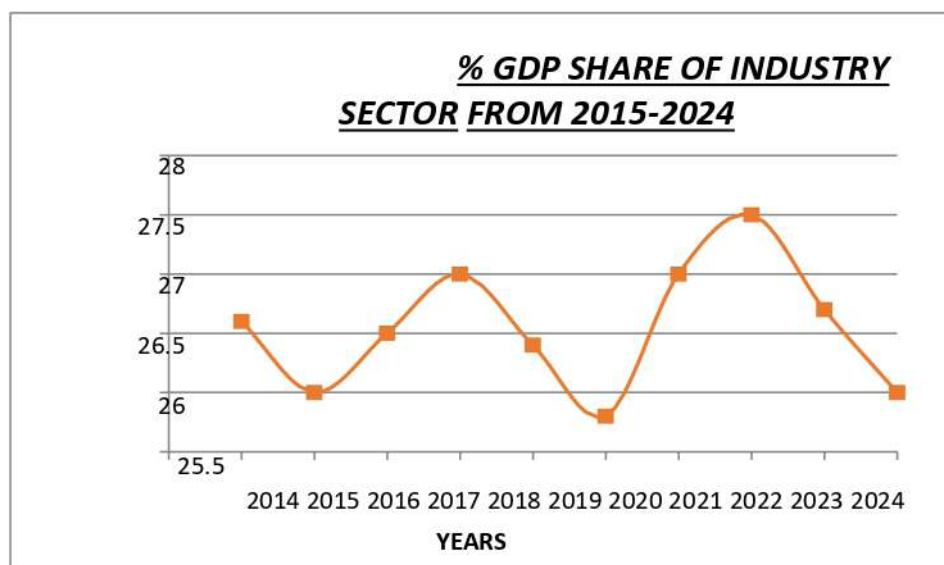
Inter -Sectoral Linkages In The Economy Of India

Demand for one sector is presumed to be a function of outputs that is generated in other sectors . A positive relation exists between manufacturing and service sectors . It is clear from the data provided by the Reserved Bank of India that agriculture’s growth has remained lower while services has been the leading edge of growth.

Sectoral And Subsectoral Contributions To GDP(%)-India & World

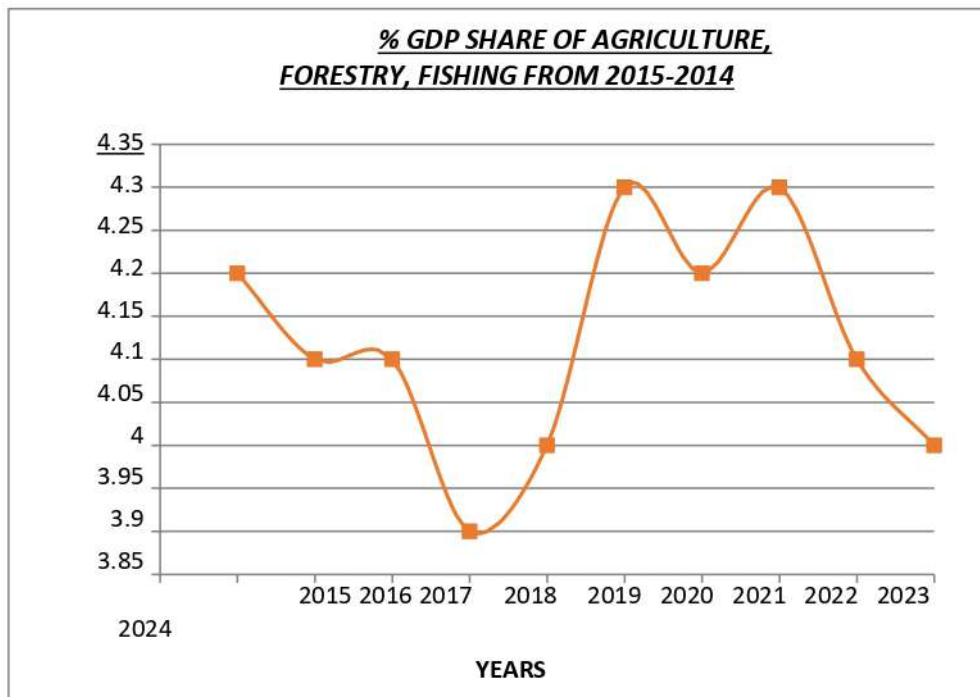
The Figures, based on data collected from WORLD DEVELOPMENT INDICATORS, retrieved from World Bank Open Data, show the shares of GDP (%) of different sectors in the world economy.

Fig 1: Share of Industry Sector in GDP



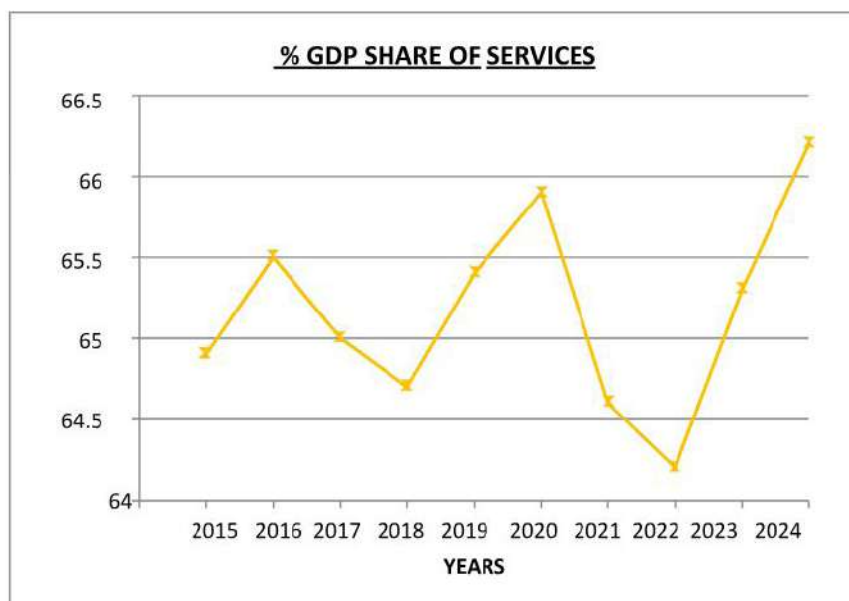
Source: Data from World Development Indicators , World Bank

From Fig 1, it can be concluded that the primary sector has seen a slight decline in 2018, rose sharply in the next few years , then again saw a decline in 2024 .

Fig 2: Share of Agriculture, Forestry, Fishing

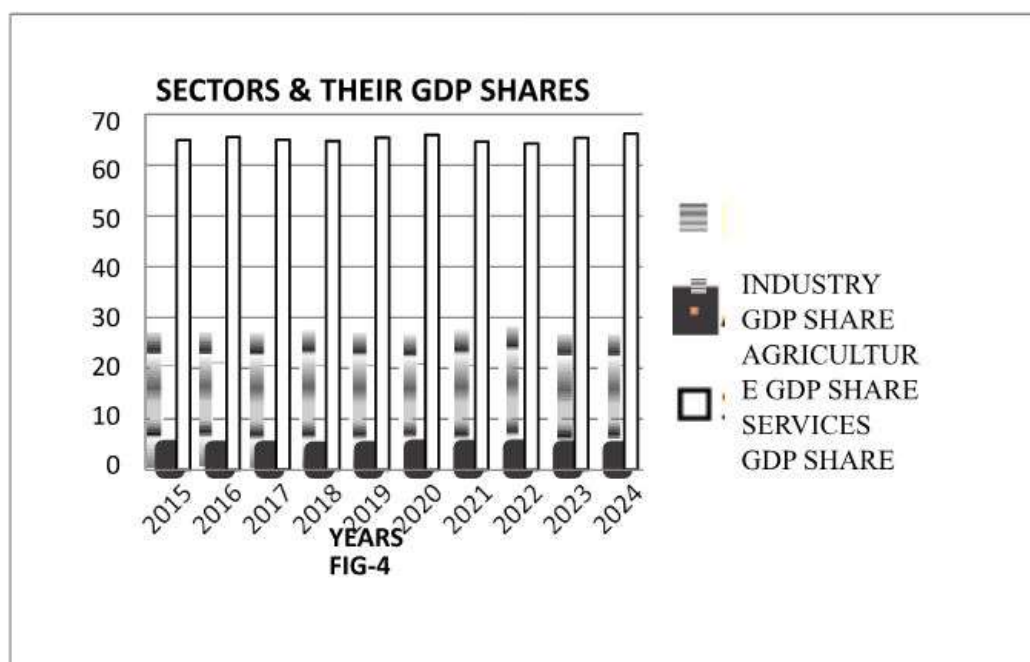
Data Source: World Development Indicators , World Bank

From Fig 2 it is evident that the industry sector has fallen ,rising several times in the past years but lowest point was 2020 and the highest was in 2022.

Fig 3: % GDP Share of Services

Data Source: World Development Indicators , World Bank

From fig- 3 we see 2022 was the lowest point for the services sector

Fig 4: GDP Shares of Sectors

Source: Data from World Development Indicators , World Bank

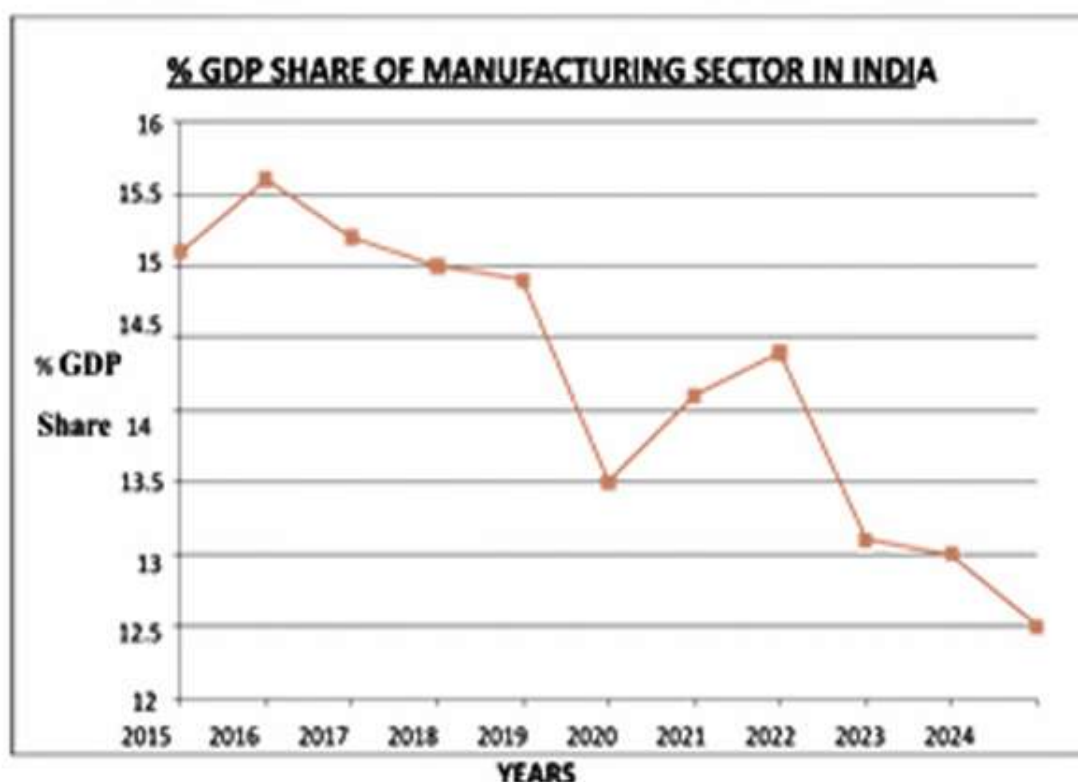
Fig:4 shows the sector – wise GDP share from 2015-2024.It is clear that services has been holding the top position followed by industry and agriculture.

Fig 5: GDP Shares of Sectors

Data Source: World Development Indicators , World Bank

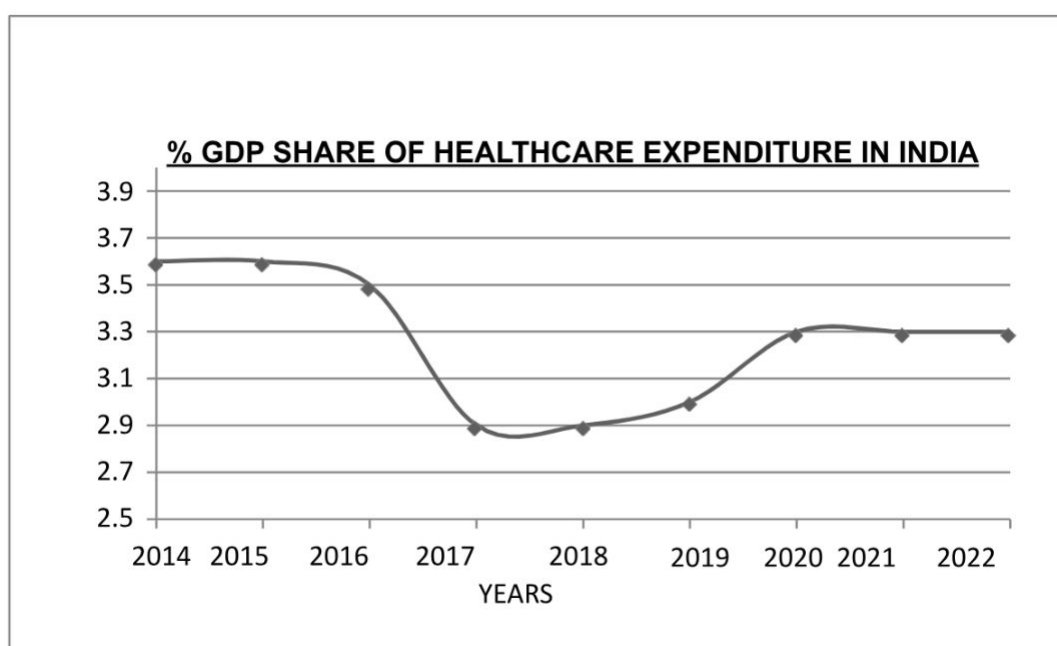
Fig-5 shows the textile industry was at its peak during 2010-15 and over the course of time it has declined significantly.

Fig 6: Constant decline in % GDP share of the sector.



Data Source: World Development Indicators , World Bank

Fig 7: Healthcare Expenditure % share in GDP



Data Source: World Development Indicators , World Bank

Fig-7 shows there is a slight dip during 2017-18 and has again risen from 2019 onwards

Future Of Globalization: Conclusion

Even though technological advances are fueling globalization, protectionism and anti-globalization and factors like climate changes, cyber attacks, reduced demand may slow its pace. Globalization evolves sectoral linkages through intensified structural shifts. Its vast impact prevails across labor adaptability, public planning and policymaking.

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The Digital Rupee and the Future of Inclusive Growth: Can CBDCs Transform Access to Economics in a Globalised India?

*Saman Quasim
2nd Year UG*

Abstract

As the world becomes more digitised and inter-connected, Central Bank Digital Currencies (CBDCs) provide an opportunity for financial transformation. This article proceeds with the explicit aim of determining whether the Digital Rupee (₹) can be an enabler of inclusive growth in India. The research question for this article is whether CBDCs can help reduce financial exclusion, lower transaction costs, and increase the effectiveness of welfare delivery while also reducing the risk posed by cyber fraud and hacking of bank accounts, unequal access to the digital network and banking disintermediation. The paper's argument proceeds with a rationale for CBDCs and explores policy pathways that can ensure that digital money is not only efficient, but also secure and equitable.

JEL Classification

E42 (Monetary Systems), **E58** (Central Banks and Their Policies), **D63** (Equity, Justice, Inequality, and Other Normative Criteria and Measurement), **G28** (Government Policy and Regulation), **O16** (Financial Markets; Financial Institutions; Development), **O33** (Technological Change: Choices and Consequences)

Introduction

In a globalized economy, the rise of digital payments has already occurred. However, access to formal financial systems remains inequitable. The World Bank's Global Findex Database (2022), indicated that there are still 22% of adults that do not have a bank account in India and nearly 30% have never undertaken a digital payment. Traditional banking systems often do not reach their most remote populations while digital banking such as UPI is dependent on the use of a smartphone, bank accounts, and access to stable internet. Central Bank Digital Currencies (CBDCs) - through the Reserve Bank of India's Digital Rupee, afford a timely opportunity for a reconceptualization of economic access.

This article will methodologically evaluate the thesis that India's Digital Rupee can significantly reduce the financial access gap for under banking populations through inclusive implementation. Central banks have historically engaged with their economy at arms length through commercial banks, (Freixas & Rochet, 2008) and CBDCs can create an engagement with the central bank, potentially relishing the transaction friction and potentially expanding access to underbanked communities. This article will evaluate the potential and context of the Digital Rupee in a globalized, sustainable economy using first-hand data, global comparative study, and a policy critique.

Understanding the Overall Unique Nature of CBDCs - Exploring the Digital Rupee

CBDCs (Central Bank Digital Currencies) are an omnichannel public form of national currency deposited at the central bank. The RBI's Digital Rupee is a retail CBDC intended for the public to use through RBI issued digital wallets. CBDCs differ from payment services like UPI (United Payments Interface) and mobile wallet payments, as these methods, while digital, rely on commercial banks or Fintech platforms to facilitate transactions. CBDCs allow for a direct claim against the central bank, which provides more trust and fewer intermediated layers of value transfers. This is an important distinction as we look at the Digital Rupee (RBI, 2023).

India's readiness to embrace digital innovations as consumers is noteworthy. As of FY 2023:

- There are 50 + crore Jan Dhan bank accounts in India (PMJDY Dashboard, 2023)
- UPI enjoyed 9,404 crore transactions amounting to ₹139 lakh crore in FY23 (NPCI, 2023)
- However, there are still over 27 crore people unbanked in India (World Bank, 2022)

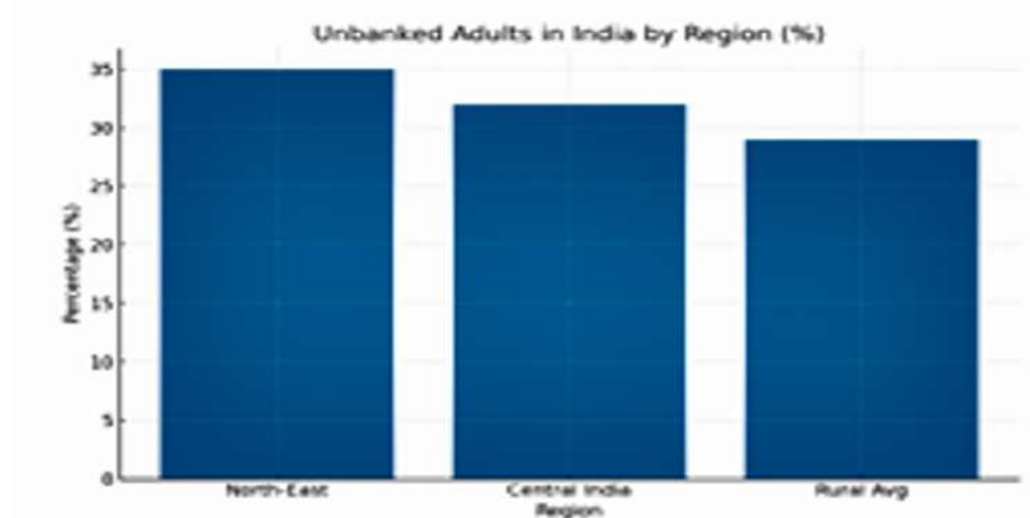
The above data demonstrates two contrary realities - one of the unifying characteristics of the volume of UPI transactions is showing us how the velocity of money has accelerated because of digital payments since money circulates faster and stimulates aggregate demand. However, the existence of millions of unbanked people reveals the gap that CBDCs need to fill. This same rapid digitalisation also poses the danger of hacking, phishing, and bank account hacks which diminish public trust. So CBDCs need to balance the movement of velocity in the digital realm with the need for adequate security, financial literacy, and protections for vulnerable populations. While these features provide a foundation, it is important to test their relevance through quantitative evidence that demonstrates how CBDCs could reshape inclusion and efficiency.

Quantitative Case for Inclusion: Can the Digital Rupee Bridge the Gap?

To assess potential impact, we analyse three key variables:

1.Unbanked Adults' Share by Region in India (%)

Fig 1: Unbanked Adults' Share by Region in India (%)

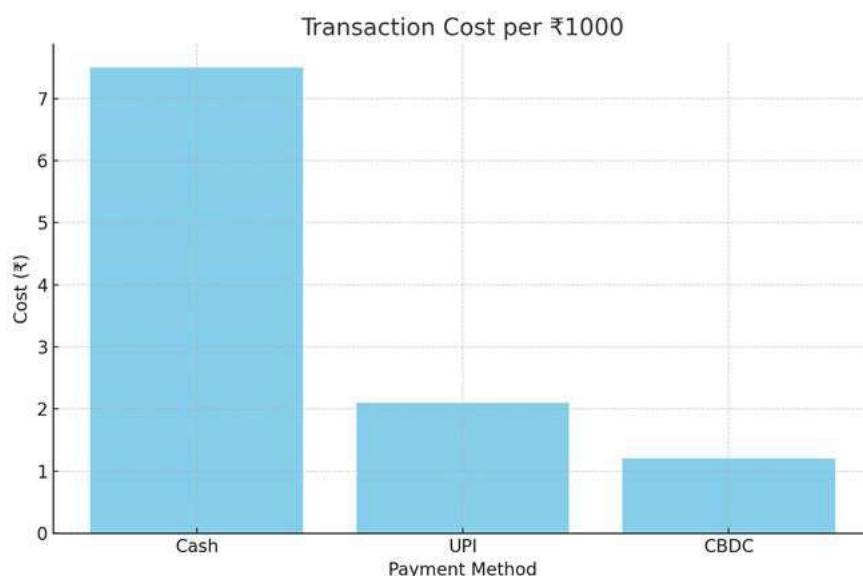


Source: World Bank Global Findex Database (2022)

The image demonstrates the ongoing regional inequalities in financial inclusion. The highest percentage of unbanked adults are found in the North-East (~35%) and Central India (~32%) areas - the average for rural India is also relatively high at just under 29%. This demonstrates that despite the incremental progress made by Jan Dhan, UPI, and Aadhaar access for account holders, large swathes of people continue to remain beyond the ambit of the formal financial system, especially for geographical reasons in more limited access areas. It speaks to the challenge of providing equitable access to digital public infrastructure (DPI) and if it doesn't happen, the progress made on digitizing financial services will be consistently capable of exacerbating inequalities. Building on the challenge of regional inequality, the next graph highlights the issue of transaction costs, another barrier that CBDCs can address.

2.Transaction Cost

Fig 2: Transaction Cost per ₹1000

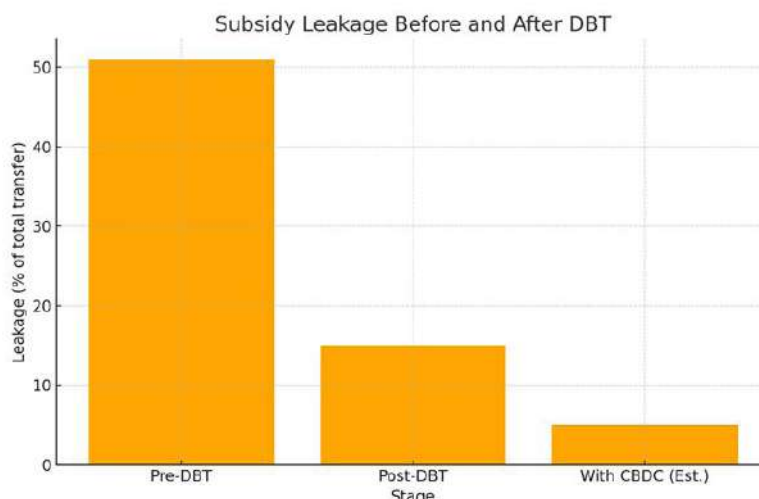


Source: RBI, NPCI, BIS, 2023

Cash involves the highest costs of exchange, almost ₹7 per ₹1000, while UPI lowers this significantly (~₹2). Estimates for the cost of CBDC are even lower (~₹1.2) – which leads to the conclusion that digitisation can decrease transaction frictions considerably. Lower costs associated with digital transactions lead to greater efficiency and scale of financial inclusion, which is relevant especially for low-income households and small businesses where the transaction size is small and transaction frequency is high. As well, it makes subsidy distribution and small-value payments sustainable. Once transaction costs are accounted for, the question of public welfare delivery efficiency comes into focus, which is explored in the next graph.

3.Leakages

Figure 3: Leakages as % of Total Transfers



Source:- Economic Survey (2021): Estimated figures by RBI

Before the introduction of the DBT (Direct Benefit Transfer), leakage was a worrying issue, with reports suggesting over 50% leakage, whereby, in a way, half of the economic benefit never flows to the actual beneficiary. With DBT, however, leakage has been lowered to ~15%, demonstrating the effectiveness of digital authentication to

1. Identify and register targeted beneficiaries, and
2. Effectively transfer resources based on Aadhaar.

With the introduction of CBDC, the RBI believes that transfer leakages would fall to ~5%, providing near 100% targeting accuracy. This connects to the equity argument - efficient transfers mean more resources reach the poor, reducing both inequality and fiscal waste. Leakages in welfare schemes can, thus, be drastically reduced through CBDC-linked direct benefit transfers. But if digital money channels are vulnerable to phishing attacks or system downtime, the benefits may be reversed. Hence, cyber resilience and offline accessibility are as important as efficiency in securing welfare gains.

Thus, the graphs collectively show the transformative potential of CBDCs, but potential does not eliminate risks. The paper therefore turns to the major challenges that must be confronted.

Major Challenges: Identifying Potential Risks

Despite the Digital Rupee's potential, there are still several limitations. For the Digital Rupee to fully realize its potential, India will need to address a number of risks beyond the technology.

Technological Exclusion:

While smartphone penetration is growing there will still be some gaps. 42% of Indian women do not regularly use a smartphone (GSMA, 2022), illustrating how gendered digital divides exacerbate financial exclusion. The exclusion is not just technological but economic and by not having a digital currency and access to it, there continues to be marginalization of vulnerable groups in terms of formal credit and savings opportunities. Without specific targeted digital literacy and inclusion programs, there are no guarantees that the Digital Rupee will not further existing inequities rather than overcoming them.

Limited Awareness of CBDC:

There is a very low level of public awareness of CBDCs. Only 12% of respondents in pilot cities stated they had even heard of the Digital Rupee (Mint, 2023). The low level of awareness indicates that adoption is likely to be predominantly by urban, educated and relatively wealthy individuals and it is likely that rural/semi-urban populations will lag behind. This presents a potential asymmetry of adoption in that while efficiency gains can accrue to the portion of the population that adopts, the ultimate outcomes remain to be seen in terms of potential multiplier effects on financial inclusion.

Privacy Issues:

CBDCs are not anonymous like cash is. This creates the potential for government surveillance of our transactions (IMF, 2022). The main issue economically is that such risks diminish trust and may drive users away from CBDCs for daily usage, thus preventing the positive spillover effects that are especially important for network effects, but also for boosting the overall transaction volume. In addition, the effectiveness of the CBDC as a complete solution lacks offline, leaves CBDC vulnerable in areas with poor infrastructure, and further deepens the urban-rural divide.

Bank Disintermediation:

Along the same line, widespread use of CBDCs would also compete against traditional deposits held at banks. If CBDCs were to become a preferred option, banks would be left with a reduced level of deposits from which they lend based upon, grinding a reserve of funding for lending to a halt with the possibility of the central bank having to adjust the monetary policy tool kit (BIS, 2023). There is a cause-and-effect relationship between increased levels of speedier payment options with reduced ability to provide credit intermediation, the two key functions of banks, which only marginally contributed to the total amount of economic growth. Clearly, if the design of CBDC is not capped or designed to provide benefits in a tiered manner, the risk may undermine total financial stability.

Monetary trade-offs:

CBDCs raise challenges to monetary transmission. Households and businesses move deposits from banks to CBDC wallets, and there is less capacity for banks to create credit which results in less investment and slower growth. Consequently, central banks may have to reconsider the aspects of liquidity management, of interest rate policy and of being a lender of last resort. Thus CBDCs will push policymakers to make hard and unfair decisions and trade-offs between innovation and stability.

Cybersecurity & fraud risk:

Besides introducing structural risks, digital currencies may further provide opportunities for hacking, phishing, identity theft, and significant data breaches. Compared with cash, which only poses a risk of physical theft, CBDCs expose users to systemic risk. In rural areas with weak digital infrastructure, there may be increased levels of vulnerability as people may find themselves excluded in an economy relying increasingly on digital platforms. In terms of the economics of this transition, the poorest are at greater risk of being worse off by having to shoulder a disproportionate burden of the transition costs.

To sum up, the digital rupee is not a benign instrument- its risks are fundamentally economic. There are threats that exclusion, instability, and privacy issues will offset material gains in efficiency. Failing to carefully integrate protections into policy design will result in equitable inclusivity and efficiency for India, resulting in the opposite: a growing inequality and financial instability.

Are CBDCs Overrated?

Given these structural and practical risks, policy responses must be designed with precision. The next section outlines targeted recommendations that directly address the problems raised.

The Next Steps: Policy Recommendations

To manage the risks described and guarantee that the Digital Rupee is a complement, rather than a replica, to the vulnerabilities of online UPI transfers, policymakers must frame their products carefully. Each policy will be designed to improve access, while at the same time, reduce systemic risks:

Tiered access:

Allow low-KYC wallets with limits for marginal users. Use a maximum spending limit to ensure that people without complete documentation (and who are currently excluded from UPI systems) have a way to utilize the utility safely, while doing the same reduces the risk of fraud and money laundering, when the maximums on the value of a transaction are used.

Offline transaction features:

Allow Bluetooth- and SMS-based transfer functionality for areas with minimal connectivity. Unlike UPI services, a digital currency that operates offline will mean that citizens in rural and remote areas could utilize the Digital Rupee. Offline modes helped relieve usage dependency on network connections, making it impossible not to include these citizens by just providing a safety net.

Awareness Campaigns:

Utilize SHGs, ASHA workers, post offices and public information systems to maximise local reach. In addition to local reach, these local institutions would increase financial literacy which involves demonstrating how the Digital Rupee is more safe against fraud risks often seen in UPI transfers that result from phishing or fake apps. So, awareness is not something cosmetic, it is also an important channel for mitigating behavioural risk.

Shift to Privacy-by-Design:

Restrict data surveillance by law or mandate that data surveillance be limited, and to design the CBDC with modes of selective anonymity. This will provide users, with more confidence than they have at present with UPI, where transaction trails are readily used/analysed. A privacy-respecting approach will diminish surveillance-as-a-anxiety and build confidence in being able to use the CBDC in the long term.

User Behaviour and Trust:

It is important to remember that adoption does not solely hinge on access: perceived security, fraud protection, and ease of use will lead to behaviour. For communities unfamiliar with digital money, building trust requires including a grievance redressal mechanism, cyber-safety training, and demonstration of tangible benefits is required to not enable the now-elusive psychological barriers to uptake currently inhibiting uptake of UPI in some user cohorts.

UPI Interoperability:

Development of CBDC wallets should include interoperability with QR codes, Aadhaar-linked payments and current UPI rails. Integration lowers transition frictions and allows users to easily manage movement away from UPI rails to a CBDC. In addition to substantial economic factors like lowered transaction costs or other peculiarities, interoperability promotes efficiency and lessens fragmentation risk, which, in its own right, can hinder uptake.

In summary, these policy interventions foster uptake by going beyond just access. They purposefully address perceived potential risks of fraud, exclusion, and surveillance which undermine trust in UPI whilst providing some technological solution to groups of people who cannot rely on a stable connection. By addressing our systemic risks on the one hand, and behavioral obstacles on the other, we are able to build a stronger and more resilient Digital Rupee that can function meaningfully as part of India's digital payments ecosystem

Learning from abroad, acting local:

The experiences of other countries show a need for industry-designed CBDC to fit local conditions. The **Bahamas** used postal networks and smaller merchants to reach rural populations, motivating widespread local grassroots infrastructure as the foundation of a lot of scale. Whereas **China** embedded e-CNY into the dominant WeChat and Alipay ecosystems, capitalizing on the interoperability of large networks to create widespread adoption. The experimental nature of **Sweden's e-Krona** explored the coexistence of digital money with cash, banks, etc. with anonymity as a tenet for the accountability of cash to preserve a relationship with the public.

For **India's** example, the experiences of these nations suggest that the implementation does not need to be a one-size-fits-all model. The unique digital infrastructure in India (Jan Dhan accounts, Aadhaar Authentication, India Stack, and extensive India Post network) would provide a proper framework for scale with equity. By embedding a CBDC into these trusted and available channels, India can simultaneously encourage adoption, provide a sense of anonymity, and regardless of the context, enable agency for individuals in regard to exclusion (addressing strictly rural or low connectivity), and full participation.

By 2030: A Potential Future of the Digital Rupee

The image of a digital rupee accepted by village sprouts, loaded via an sms, distributed as MGNREGA wages, held in an offline, secure wallet. The digital rupee has the potential to be India's boldest effort toward financial equity in the twenty-first century if scaled inclusively.

Conclusion

The digital rupee is not a fintech upgrade. It represents an opportunity to harmonize India's development with principles of inclusion and access. CBDCs can be more than a currency, by engaging with the unbanked, enhancing transaction transparency, and providing a low-cost vehicle for welfare distribution, they can be a means for economic justice.

In a world economy where exclusion and obscurity exist because of innovation, India's digital rupee can serve as a reference for emerging economies exploring or redefining financial sovereignty. This is not simply a method of exchange. It is the hope of a future, where financial dignity is a right and not selective privilege.

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SUSTAINABLE DEVELOPMENT IN A GLOBALIZED WORLD: ANALYZING THE ROLE OF TECHNOLOGY AND INNOVATION

Sreeja Ghosh and Ahona Das
2nd Year, UG

Abstract

The concept of sustainable development was recognized in 1987 when the World Commission on Environment and Development introduced this term in its report 'Our Common Future'. There are three components of sustainable development: Economic sustainability, Social sustainability and Environmental sustainability. At present, sustainable development is one of the most important objectives of the nations. On the other hand, Globalization is a term that describes the interconnectedness among different parts of the world, social, cultural and economic integration among the nations. Globalization leads to economic growth and people can achieve higher living standards.

Besides giving these growth opportunities, globalization often causes inequality among the nations. Our objective is to eliminate these inequalities and achieve equitable and sustainable growth. The challenges that nations face in achieving sustainable development are addressed by the Sustainable Development Goals (SDGs). So, there is a strong and vital relationship between Sustainable Development and Globalization. One of the major factors that help us achieve sustainable growth is Technology and Innovation. This article aims to analyze the contribution of technology and innovation to the three pillars of sustainability in a globalized world and also study the global challenges in the path of technological development and how these challenges can be overcome.

JEL Classification

Q01, Q55, O30, O13

Introduction

Sustainable development is rooted in the principle of meeting the needs of the present without compromising the ability of future generations to meet their own needs (UN). Agenda 2030 for sustainable development adopted by United Nations member states in 2015 offered a shared perspective of growth and development worldwide. To meet the global challenges, 17 Sustainable Development Goals (SDGs) and their 169 targets were adopted in 2015. The potential of technology and innovation needs to be increased to achieve these goals. The United Nations Industrial Development Organization states that Science, Technology and Innovation play a crucial role in achieving sustainable development. Globalization facilitates the propagation of new technologies both in developed and developing countries, providing new growth opportunities. Our objective is to analyze how technological innovations help in achieving different sustainable development goals in a globalized world.

Role of Technological Innovation in Stimulating Sustainable Development and Economic Growth

Renewable Energy Technology

Renewable energy technologies play an important role in sustainable development and economic growth. The usage of renewable energy technologies is crucial as these energy technologies emit less greenhouse gases and thus contribute less in greenhouse effect and climate change compared to non-renewable energy. SDG 7 deals with the access to clean and affordable energy for all.

- Renewable energy technology improves energy security in a country by reducing its dependence on imported fuels and enhances the reliability of energy supply. Technological innovation in the solar power industry, wind power industry and in other renewable energy industries make a country self-sufficient, reducing its reliance on foreign countries for fuel.
- Technological innovations ensure that energy access can be provided to rural communities who lack it, especially in developing countries and thus help to eradicate inequality and poverty and support rural development.
- Another major role of technological innovation is that it creates jobs and reduces unemployment. In the solar industry, many jobs are created globally related to manufacturing, installation of solar panels, maintenance etc. Thus it stimulates economic growth.

The latest innovation in solar energy production is Next-generation photovoltaic technologies. This technology is building the path for more efficient and cost effective energy production. Moreover innovations like perovskite solar cells, multi-junction solar cells are increasing energy efficiency. Not only in the solar industry, but also innovations are taking place in other renewable energy industries as well.

Digitalization for Sustainability and Sustainable Digitalization

Digitalization plays an important role in boosting sustainable development globally as it provides opportunities to improve efficiency, cost-effectiveness, and resource management. There are two aspects of this: Digitalization for Sustainability and Sustainable Digitalization. The former is the idea of using digitalization to advance sustainability and the latter is the idea of encouraging the progress of technologies and innovations with sustainable considerations.

- **The Coalition for Digital Environmental Sustainability (CODES)** is a global, multi-stakeholder federation launched in 2021. Its objective is to promote digital advancement for a sustainable world. It facilitates digital technologies to achieve the Sustainable Development Goals. CODES has adopted an action plan to precipitate sustainable development through digitalization.
- Digital technologies help in optimizing crop production, reducing water consumption and can minimize the usage of pesticides that spoils the fertility of land. A significant example of the role of technological advancement in agricultural growth is the usage of Internet of Things (IoT) technology. It optimizes irrigation and promotes sustainable agriculture by monitoring soil conditions, and increases efficiency and productivity. Sustainable agriculture plays a crucial role in eradicating poverty and hunger, especially in developing countries. SDG 1 (No poverty) and SDG 2 (Zero hunger) can be achieved by sustainable agriculture which is advanced by digital technologies.

Green Transportation

- Green transportation means the eco-friendly modes of transportation that minimizes pollution and helps in climate change mitigation.
- The development of green transportation broadly depends on technological advancement. All electric vehicles (EVs) including cars, buses, bicycles (e-bikes) are the results of technological innovations. They don't burn fossil fuels. Thus these vehicles provide a sustainable mode of travel both by reducing greenhouse effect and by conserving non-renewable energy resources (fossil fuels).

Case Studies

- Tesla's Automobile Industry brought a major economic revolution in sustainable innovation. It was founded in the year 2003 by Elon Musk and had the objective to accelerate the global transition to sustainable energy. The industry's Electric Vehicles (EVs) has proved that sustainability and innovation can go hand in hand. Over the years the demand for EVs has increased which gave tough competition to the traditional automobile industries. These EVs have decreased the emissions of greenhouse gases and also broken the orthodox beliefs about the capabilities of an electric vehicle. Starting from sports cars to regular affordable models, Tesla has made it possible for the common people to access sustainable transportation globally.
- Patagonia is a renowned company that has been a way setter in sustainable business. Their innovative approach to sustainability is based on the belief that, 'less harm means more good for the world'. Their program, 'Worn Wear' promotes and encourages people to buy second hand Patagonia products, recycle their old clothes or trade in used products for store points. This helped to minimise waste and promotes responsible consumption and reuse of products, thus promoting maximum utilisation of resources. They also encourage people to buy less and high quality clothes that last long. Their growing revenue have set a perfect example for industries on how to balance sustainability with profitability.

The Challenges in the Path of Technological Advancement

Now we will discuss some challenges faced while pursuing technological changes for sustainability. These challenges need to be properly addressed by the policymakers and professionals at various aspects.

- With the advancement of modern technology the risks caused by diffuse emissions have also accelerated. Pollution from diffuse sources affects large areas and causes severe impacts on people and the environment.

- Another challenge is the advent of green capitalism. Often economic and environmental goals conflict with each other. While business decisions aim to maximize profit and minimize cost, it may happen that they adopt certain technological innovative ideas to gain more profit, without consideration for the environment.

Remedy For The Challenges and Policy Frameworks for Technological Innovations

Finding remedy for the drawbacks faced by the technological advancements is the ultimate challenge. Here we will discuss remedies of a few challenges faced by sustainable innovation and the policy instruments that support technological innovations for sustainable growth.

- Improving relations and access to many suppliers encourages communication across all channels of the product lifecycle which also includes suppliers. Thus waste and thus pollution is reduced and time for market rises. Because of these relations manufacturers might work closely with the suppliers which in turn can certify sustainability within the organizations.
- To minimize the gap in conflict between the economic and environmental goals, economic models should be redesigned. Designing products and processes to minimize waste, encouraging recycling and reuse etc can help keep balance between sustainability and profitability.

Here are some policy decisions that help in achieving technological advancement.

A range of policy frameworks to encourage innovation has been classified by The 2010 World Development Report according to national income levels. It suggests improvements in the research institutions.

In countries with low income level, effective policies are - investing in management skills, increasing funding to research programmes, providing subsidies for adopting new technologies.

In countries with medium income levels, initiatives such as creating incentives for imports of mitigation technologies, climate-smart venture capital can be taken.

In countries with high levels of income, Govt. can provide incentives to raise mitigation and adaptation innovations and diffusion through subsidies, and support middle-income country participation.

Conclusion

Models of economic growth, the idea of equitable and sustainable development, energy innovations - all are interrelated and dependent on one another. This interdependence creates interconnection in their development. Technological innovation is a key driver of sustainable development in this globalized world. The innovations, mostly studied in accordance with achieving sustainable development are - Social innovations, Digital innovations, agricultural innovations, green innovations etc. These play a prominent role in achieving the SDGs, which are interconnected and require integrated approaches.

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THE GROWTH WE DESERVE: RETHINKING PROGRESS IN A GLOBALIZED WORLD

*Diya Agarwal
3rd Year, UG*

*Saman Quasim, Harshita Bhojania
2nd Year, UG*

Abstract

This article reconsiders traditional economic growth with a view to globalization and the pressing issues of justice and environmental harm. While it is good for wealth creation, the GDP growth paradigm has often failed to foster ecological integrity and inclusion. This essay surveys a substantial literature on economic development, assessing how globalization has both aided and inhibited equitable development. It looks at the social and environmental costs of growth and critiques the uneven distribution of the benefits of globalization. Throughout the article issues of inequality between countries, regions, and socio-economic classifications are highlighted using comparative scatter, bar, and column charts. Beyond the normative imperative of equity, it also looks at other paradigms such as Gross National Happiness of Bhutan, Kate Raworth's Doughnut Economics, Amartya Sen's capabilities, and New Zealand's Wellbeing Budget. A new framework called the Sustainability - Equity Growth Matrix is offered as a device to discriminate between policies that include social inclusion and their environmental consequences. This article argues that growth should never come at the cost of planetary health or human dignity, and instead development needs to be reconfigured to prioritize justice, sustainability, and well-being. It calls for an evolutionary shift in both policy and thinking; instead of analyzing our capacity to produce, we should analyze how sustainably and fairly we live. In a globalized world, this rethinking is not just desirable - it is essential.

JEL Classification

F63, O44, Q01, I31

Introduction

For many years, the main way to gauge a nation's progress has been to measure economic growth, or GDP. These effects have brought great prosperity, intertwined economies and increased globalisation, but have also accelerated environmental degradation, deepened inequalities, and undervalued many aspects of human happiness. It is time - more than ever - to rethink what growth means as we continue down the path of globalization, as a multidimensional approach to a brand new concept of growth that is fair and sustainable in which the values of people and the planet are simultaneously embodied into a new approach to growth.

This article is directly within the theme, "Rethinking Economic Growth in a Globalized World: For an Equitable and Sustainable Future", as it asks: Can we redefine success in a way that values both fairness and environmental viability as much as GDP?

Globalization and Growth: A Double-Edged Sword

Although globalization makes growth fast, through commerce, technology transfer and flows of investments, it also creates global structural inequalities. For example, nations such as Vietnam, India, and China have been transforming their economies rapidly as they have found themselves linked to global supply chains. On the other hand, globalization creates structural inequalities by pressuring states to prioritize cost-competitiveness over social rights and environmental standards — what Dani Rodrik (2011) has termed the "globalization trilemma," a scenario in which countries must choose among hyper-globalization, democratic politics, or national sovereignty whenever they are faced with global pressures.

In order to layer the analysis of globalization, it can be disentangled into three overlapping channels:

- **Trade Globalization:** The globalization of goods and services through integration, while resulting in some jobs, in many cases, also results in widening inequalities through the employment of cheaper labour through supply chains.
- **Financial Globalization:** The globalization of capital flows that carry investment across national borders, and resulting capital but also much greater risk of exposure to global shocks.
- **Technology Globalization:** The globalization of digital tools and innovations that have either the potential to diminish or exacerbate the digital divide depending on the situation.

Globalization has created neglected individuals, it has created new economic opportunities for some, but certain rural low-income communities, as well as certain country destinations, are excluded from the benefits of international trade conditions. In addition, while financial globalization has increased economic mobility, potential capital mobility in turn undermines the domestic economy and exacerbates already at risk economies.

When Growth Excludes People: The Equity Crisis

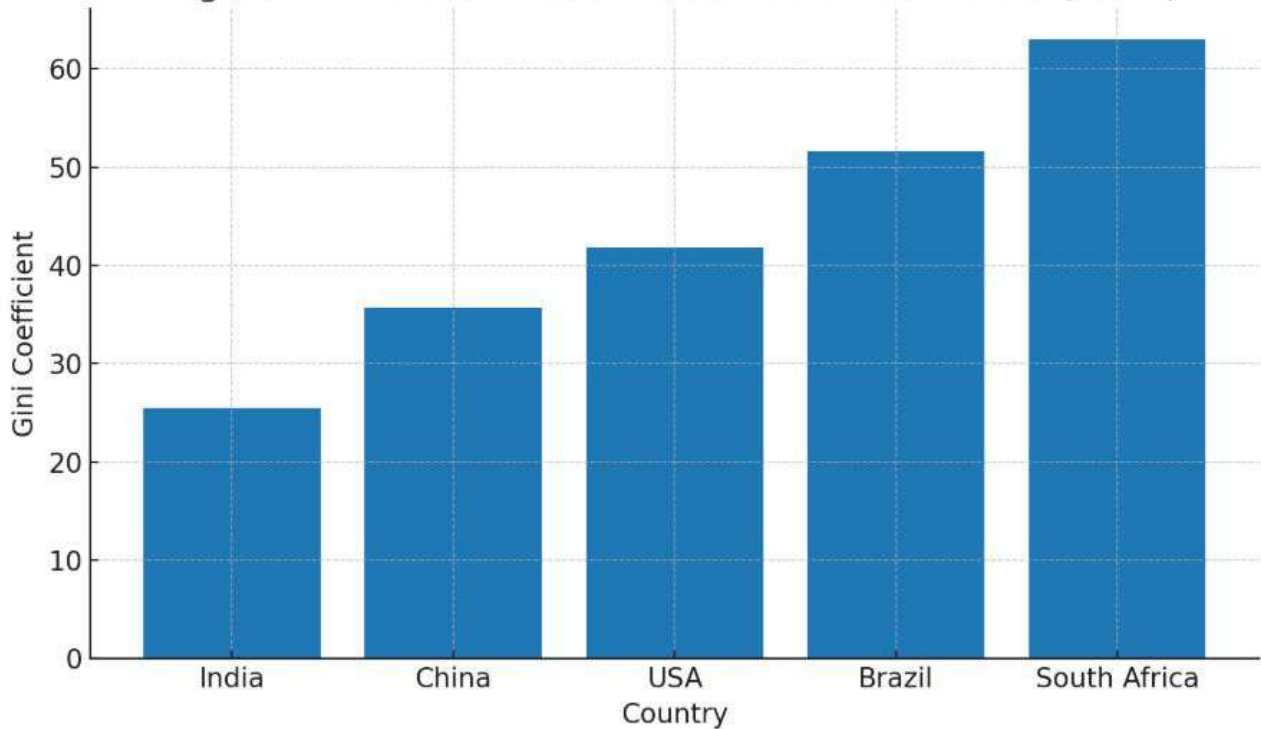
One of the many problems with the current growth models is that they miss the issue of increasing income inequality (even with rising GDP).

Gini coefficients for 2025 show large gap(s) in income distribution:

According to the Gini coefficient, India, at 25.5, has become one of the most equitable large economies in the world (after Slovakia, Slovenia, and Belarus). South Africa is the most unequal of all the usual suspects, with a Gini of 63.0.

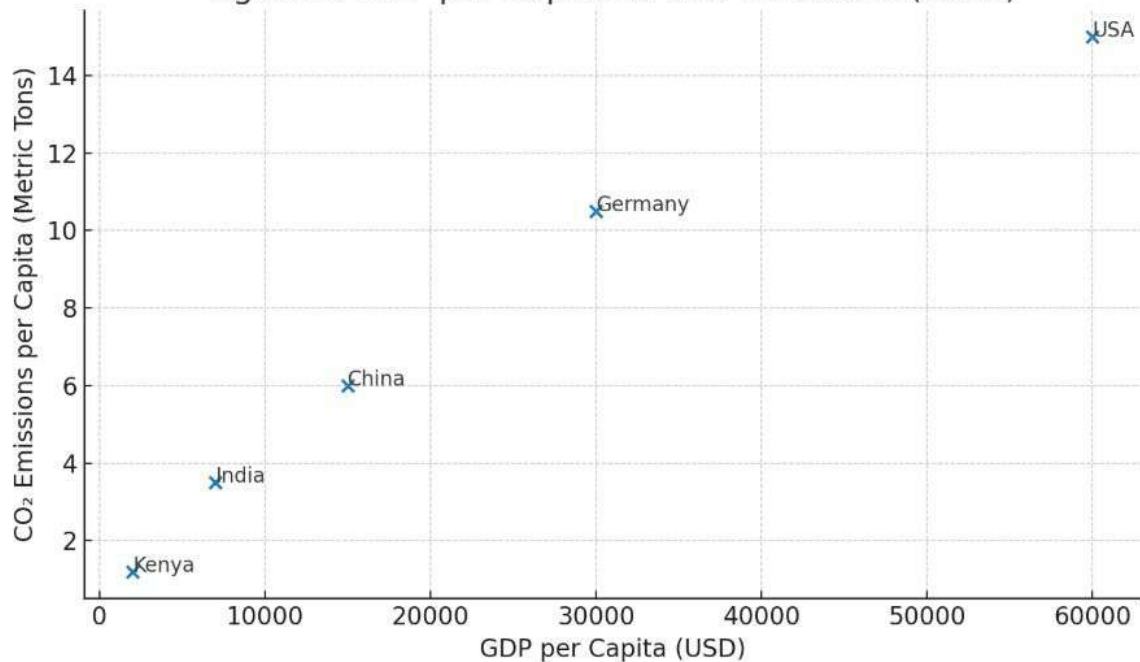
As Piketty (2014) explains, the high rates of return on capital lead to concentration of wealth, and informal economies produce patterns of inequality in general (in places where social protection is weak). Because they lack progressive taxation and universal safety nets, GDP growth disproportionately favors elites and retains a configuration of inequity.

Figure 1. Gini Coefficient Across Select Countries (2025)



Unsustainable Growth: The Ecological Constraint

The environmental cost of pursuing unattainable growth is also alarming. Urbanization, Through consumption and industrialization, extraction of natural resources and size, global carbon emissions and natural resource extraction are constrained beyond ecological capacities.

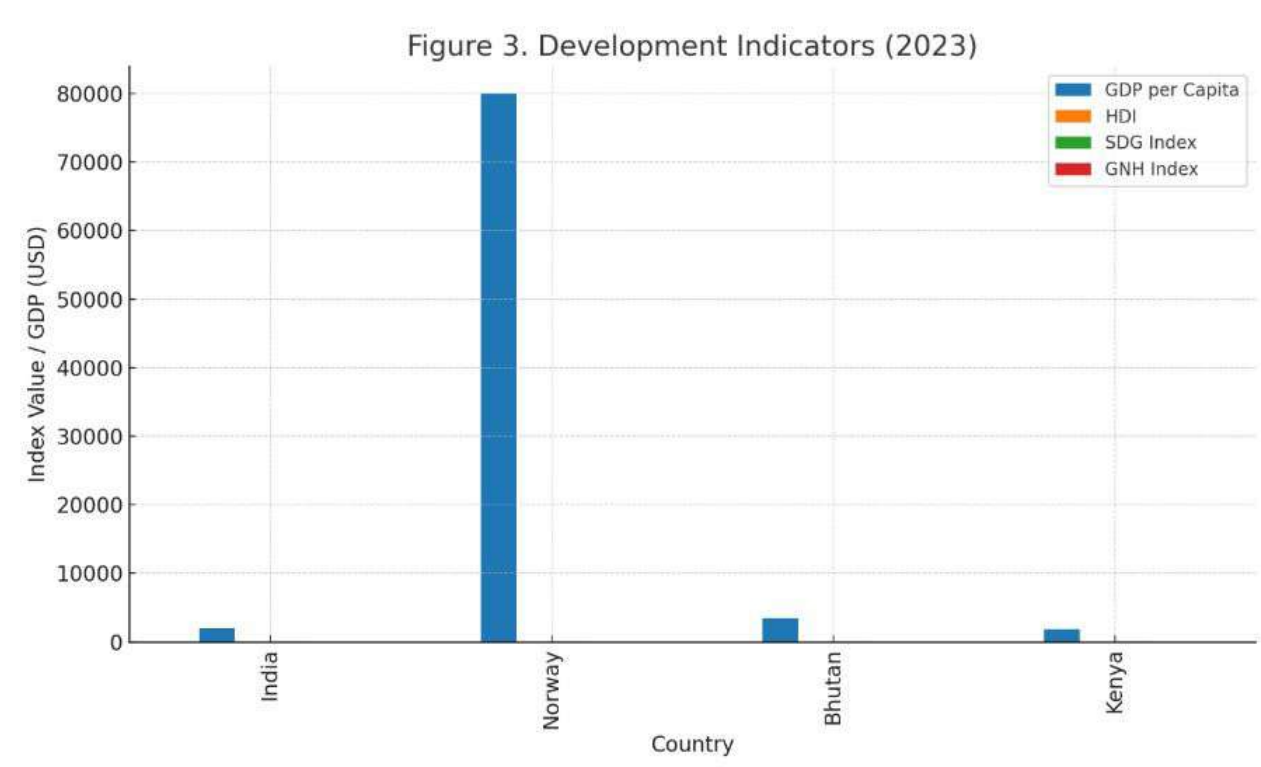
Figure 2. GDP per Capita vs CO₂ Emissions (2022)

Kate Raworth's Doughnut Economics (2017) model operates within an ecological ceiling and a social foundation for safe and just economies. There are very few high-income countries that remain of their ecological limits and most low-income countries are unable to meet basic human needs. Climate change, biodiversity loss and environmental injustice are not simply ecological crises, but failure-scenarios in the design of economic systems.

According to the IMF (2024), an inadequate response to climate action could result in an overall reduction of 7% to GDP by 2050. South Asian countries are likely to be the most affected, as agriculture will be unable to cope with the impacts of extreme weather events leading to GDP losses greater than 10%, reduced agricultural productivity and increased costs in health care.

Rethinking What Progress Means: Clarifying Beyond GDP

The importance of GDP as a measure of progress is being more widely questioned within the economic literature. Amartya Sen (1999) argues that development should be approached more from the perspective of human freedoms and capabilities being expanded.



Schemes like the Human Development Index (HDI), Sustainable Development Goals (SDGs), and Bhutan's Gross National Happiness (GNH) provide broader perspectives than GDP does, New Zealand's Wellbeing Budget is a strong example of this: the allocation of funds is made on the basis of the mental health of the population, child poverty rates and domestic violence prevention work, not economic output. It can be argued that economic policy making should seek to enhance people's lives, not just strive to expand markets.

Table 1 below provides a comparative overview of the four alternative frameworks (GNH, Doughnut Economics, Sen's Capabilities and the Wellbeing Budget) on the basis of their focus, key indicators, and alignment with equity and sustainability. The table provides an integrated view regarding overlaps and gaps, which we will seek to provide with Equality-Sustainability Matrix.

Table 1: Comparative Overview of GNH, Doughnut Economics, Sen's Capabilities and Wellbeing Budget

Framework	Main Focus	Key Indicators	Relevance to Equity	Sustainability
Gross National Happiness (Bhutan)	Well-Balanced economic growth, cultural preservation and overall holistic well-being	Strengthened communities, ecological health, diversity in culture and mental well-being	Strong - includes the allocation of services and happiness	High - gives environmental preservation and growth top priority.
Doughnut Economics (Kate Raworth)	Meeting social needs while staying within ecological limits	The ecological ceiling includes pollution, biodiversity, and climate. The social foundation covers housing, education, and health.	Strong - emphasizes universal access to necessities	Extremely High - the model's central ecological boundaries
Amartya Sen's Capabilities Approach	Increasing people's freedoms and ability to lead satisfying lives.	Access to social opportunities, political freedom, health care, and education	Extremely strong - equality of opportunity is paramount	Medium - environmental factors indirectly included
New Zealand Wellbeing Budget	Putting money into quality of life instead of just GDP	Indigenous rights, the environment, mental health, and the welfare of children	Strong - targets vulnerable groups	High -incorporates objectives for environmental preservation and climate change

Global Examples: Engineer a New Paradigm

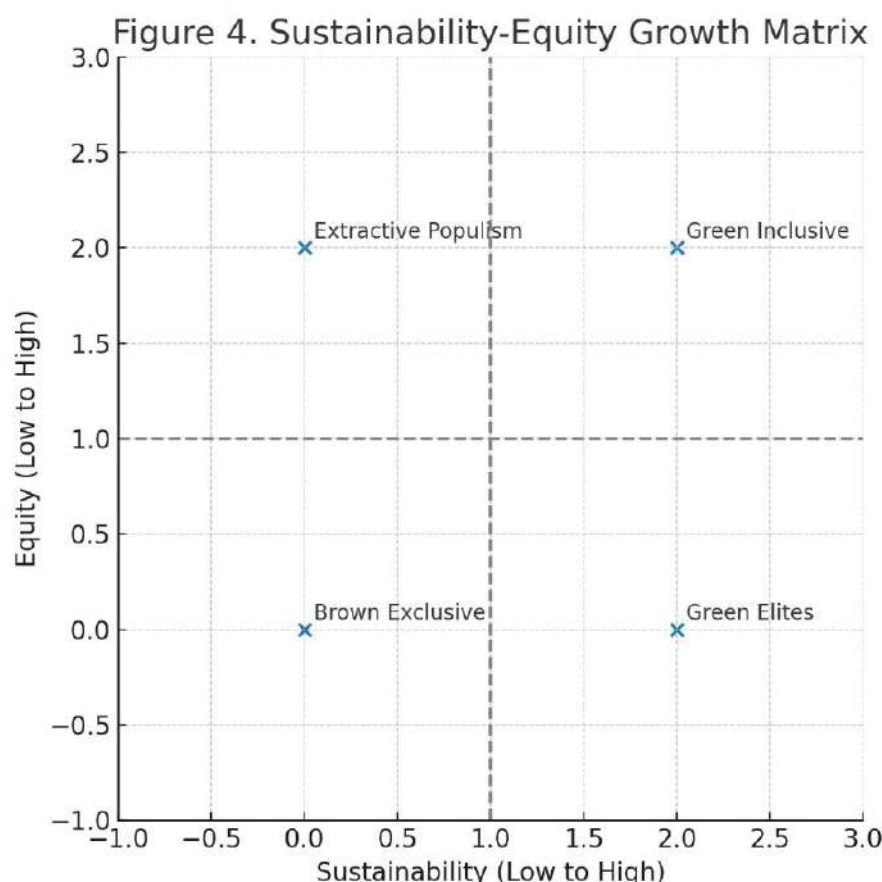
Bhutan has institutionalized GNH so that the economic needs of society are balanced with the spiritual and ecological well-being of society. New Zealand connects public expenditure to well-being indicators rather than output metrics. The European Union's Green Deal aims for climate neutrality by 2050 through green innovation and Just Transition Fund.

In rural Vietnam, since the inception of solar powered irrigation in 2018, smallholder farmers have doubled rice cultivation while cutting down on diesel fuel use by around 80%. This shows green investments can lead to higher incomes and lower emissions at the same time.

The Sustainability-Equity Growth Matrix

We created a Sustainability-Equity Growth Matrix to assess policy frameworks. The matrix classifies policies based on their environmental degree of impact and the social inclusiveness of the policy design.

Figure 4: Sustainability-Equity Growth Matrix



Column Diagram with four quadrants:

1. Green Inclusive (e.g., green jobs, circular economy)
 2. Brown Exclusive (e.g., fossil fuel subsidies)
 3. Green Elites (e.g., green tech benefiting a small group)
 4. Extractive Populism (e.g., unsustainable resource extraction used for short-term capital accumulation).
- (Source: Author's Conceptual Framework, 2025)

We should scale policies that measure in the "Green Inclusive" quadrant, and look to reform or phase out the policies that do not measure in that quadrant. The matrix is a useful tool for policymakers seeking to balance sustainability with justice.

The table below highlights countries representing certain sustainable-Equity Growth Matrix quadrants. Finland features Green Inclusive economies, with a strong environmental record and substantial social equity. Germany measures as Green Elite, as they are leading in sustainability, but the benefits of that

sustainability are clustered amongst select groups. India falls into brown Exclusivity as a country dealing with issues in terms of environmental health with social equity as well. Venezuela spotlights an example of Extractive Populism for example of Extractive Populism creating social benefits financed by the unsustainable extraction of resources.

QUADRANTS	EXAMPLE COUNTRY	SUSTAINABILITY (EPI)	EQUITY	NOTES
Green Inclusive	Finland	73.8 (7 th largest)	High IHDI(0.94) and low inequality	Strong environmental performance and social equality.
Green Elites	Germany	77.2 (6 th largest)	High IHDI(0.942)(slightly more than Finland)	Strong sustainability and moderate disparity.
Brown Exclusives	India	27.6 (176 th)	High Inequality (Gini Index- 35.7)	Low Environmental rank and high inequality.
Extractive Populism	Venezuela	30.6 (169 th)	Very high inequality	Oil wealth with weak equitable distribution.

NOTE: The sustainability and climate action scores are from the 2024 Environmental Performance Index (EPI) on a scale of 0-100. Equity scores are estimated using available information from the IHDI and Gini coefficients.

Conclusion: The Growth We Need

The world economy is at a unique point in time that requires us to think about economic growth differently, following years of fragile economic recovery, growing inequalities, ongoing technological upheavals, ecological emergencies, and the threat of possible more pandemics. Growth that postpones crises by plundering the common-pool resources of the planet and denying vulnerable communities access cannot be seen as development.

This essay has argued that we need to reconceptualize growth not as the expansion of production but as improving human dignity in the ecological limits of the planet. Well-being must be coupled with ecological regeneration, while globalization must be tempered by inclusion.

As Amartya Sen counsels, development is the freedom to live a life you have reason to value. For the world to achieve this, it must transition from measuring wealth to enabling well-being. That is the growth we deserve.

5 policy recommendations to create a more just and sustainable future

- Develop national green job training programs for vulnerable population groups
- Eliminate fossil fuel subsidies within a five year period and reinvest those resources into renewable energy sources
- Institute a progressive environmental footprint tax
- Develop national wellbeing accounts and account for these in GDP
- Increase climate financing (outside of future payments from rich to poor countries) for low-income, high-risk countries

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FREE TRADE AGREEMENTS AND RULES OF ORIGIN: RETHINKING GROWTH, EQUITY, AND SUSTAINABILITY IN THE GLOBALIZED WORLD

*Rosy Sardar,
2nd Year, UG*

Abstract

In the current wave of globalization, Free Trade Agreements (FTAs) have emerged as powerful instruments shaping the global economic landscape. While designed to liberalize markets, at least within region, FTAs are often embedded with regulatory provisions like Rules of Origin (RoO) that act as concealed protectionist tools and hindrance to optimal trade flows. This paper examines the evolution and role of FTAs in context of globalization and evaluates how RoOs, although intended to prevent trade deflection, frequently provoke discriminating effects both between and within economies. This study highlights how restrictive RoOs can generate unequal distribution of trade benefits by imposing high compliance costs and inducing trade diversion. Furthermore, the environmental dimension is also explored, revealing how RoO related production relocations may reinforce “Pollution Haven” dynamics and challenge the achievement of sustainability goals. The findings underscore the need to redesign trade rules to align liberalization with the twin imperatives of equity and sustainability.

JEL Classification

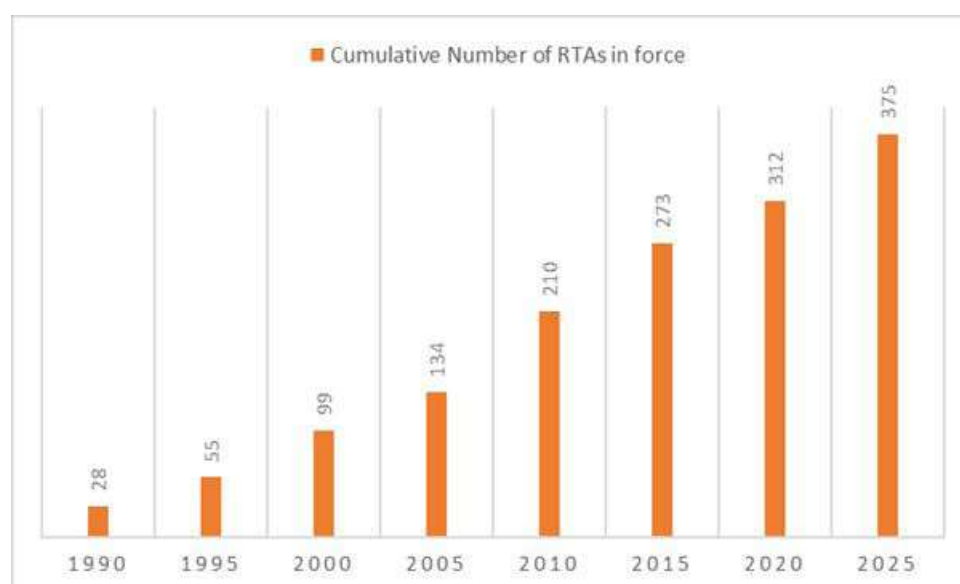
F13, F15, O19, Q56

Introduction

Since the 1990s several inter-governmental institutions like the World Bank, International Monetary Fund (IMF) and World Trade Organization (WTO) have widely prescribed free trade policy as developmental measures. Concurrently, discourses on globalization as a policy paradigm, alongside disputes concerning the magnitude of true potential benefits derived from trade liberalization, have intensified to an unprecedented degree given the structure of the world trading system.

These reservations, compounded by political imperatives and the parochial economic interests of trading nations, have constituted significant drivers of the recent proliferation of bilateral and regional trade agreements. The post-globalization world has evidenced a striking growth in the number of bilateral and multilateral regional trade agreements among both small and large countries starting from the formation of the first PTA, the European Communities, in 1958. The following figure 1 depicts the upsurge of PTAs in the globalized world.

Figure 1: Cumulative Number of RTAs in force post 1990s



Source: World Trade Organization Regional Trade Agreements Database

There are different stages of international economic integration. Among all these stages, the most widely growing is FTA, which involves the removal of all tariff and non-tariff barriers on mutual trade between the member countries. Some examples include: ASEAN, CKFTA, USMCA etc. The rapid rise in FTAs indicates a more flexible and regionally focused trade arrangement. Strategically, FTAs ensure a reciprocated market access argument, allowing a country to liberalize its imports without facing intense competition. Additionally, FTAs are used to link non-trade issues – such as environmental standards, labour standards, and TRIPS with trade gains, helping to enforce broader coordination and cooperation. Besides these welfare and strategic motives, many recent FTAs between the North-South countries aim at locking in the Southern partner's economic reforms and stimulating inflows of Foreign Direct Investment (FDI).

FTAs have emerged as crucial instruments for countries seeking to navigate and benefit from global economic integration in context of Globalization, which is otherwise marked by a series of economic, political, technological, and cultural changes, increasing the interconnectedness between countries. The main objective of Globalization was the removal of trade and non-tariff barriers for ultimately achieving global free trade.

The regional approach conversely is a mix of trade cooperation among member countries and trade discrimination against non-member countries.

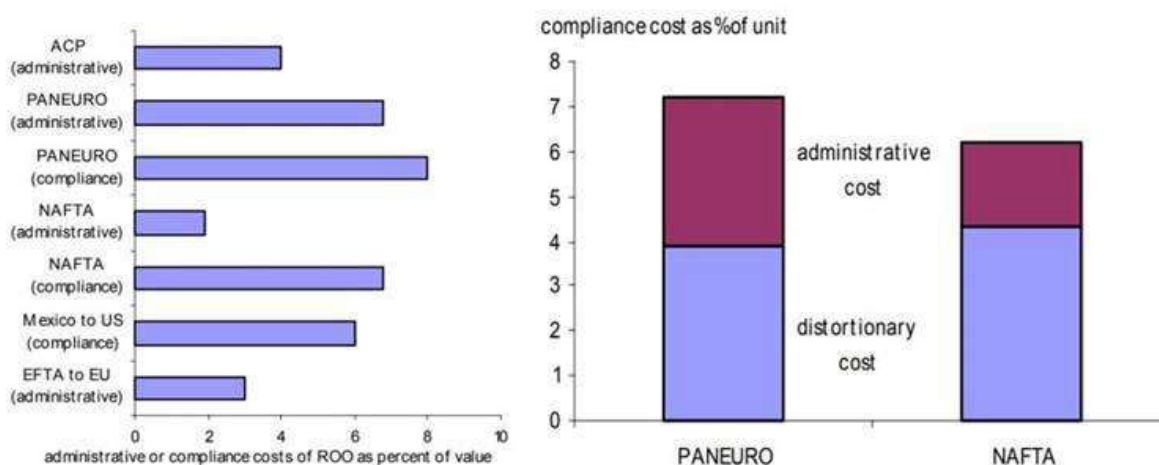
Rules of Origin as Hidden Protectionism and its Discriminating effects

While such an intense web of FTAs is supposed to be trade liberalizing among economies, they are often not. The prime reason behind this is the working of veiled protectionist policies like: “Rules of Origin (RoO)”. It has eventually become an integral component of FTAs since they are frequently used as a means of discrimination between nations. Generally, a product is considered to originate from a country if the imported components undergo significant transformation there. The originating country enjoys tariff free trade, limited quotas, safeguard measures to combat anti-dumping policies, greater access to foreign direct investments (FDI) and other Most Favoured Nations (MFN) benefits.

Globalization, ICT revolution and geopolitical strategies have led businesses of all sizes to source materials and components from various countries, making it essential to determine the actual origin country in order to provide true benefits to the deserving partner. RoOs were primarily designed to prevent trade deflection, wherein non-FTA member countries route exports through low-tariff member countries for re-export, thereby circumventing the high tariff rate in the final destination country. In spite of targeting such objectives, the RoOs are often used as veiled protectionist policy and thereby create regional bias and discrimination (Krueger, 2012).

Restrictive Rules of Origin (RoOs) generate asymmetrical gains not only across countries but also within domestic economies. It enforces high local content ratio, which raises compliance costs and thus acts as hidden protectionism for the domestic input producing industries. These costs are estimated to be as high as 6-10% of the export value, which is higher than the average preferential margin of 4% (Anson et. al., 2003). Left panel of figure 2 shows the administrative and compliance costs of different FTAs as percentages of values and the right panel gives an estimated decomposition of compliance costs in NAFTA and EU.

Figure 2: Compliance Cost as percent of Value and its Decomposition

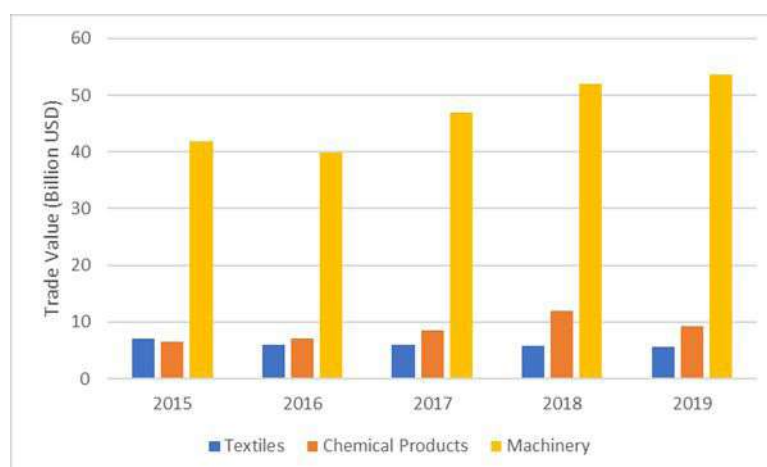


Source: Manchin, M and Pelkmans-Balaoing, A (2007)

Such high restrictiveness may even evade the profit margin and other benefits completely for the final good producers at the cost of gains of domestic industries. On the other hand, these local requirements displace the market of efficient industries of non-member countries to inefficient domestic industries following trade-diversion effect (Viner, 1950).

Such inconsistent interpretations discourage use of FTAs. Agreements like NAFTA and AFTA show evidence that complex RoO significantly contributes to the underutilisation of FTAs, undermining their potential benefits. Figure 3 portrays the trade values in Billion USD under CKFTA for three specific sectors.

Figure 3: Trade Volume in CKFTA for Textiles, Chemical Products and Machinery



Source: Qu et. al. (2025)

Interestingly, the estimated values of RoO restrictiveness index by Yang et. al. (2025) for these three sectors are 4.48 for Textiles, 4.07 for Chemical products and 3.24 for Machinery. As can be seen from the graph, with less restrictiveness trade volume rises within FTA.

Rules of Origin and Sustainability: Environmental outcomes of Trade Rules

As previously discussed, RoO criteria frequently mandate localization of content requirements which alters the optimal sourcing path. Such stipulations may, at times, prioritize trade complaints over environmental efficacy. However, in order to seek origin and qualify for FTA benefits, firms often relocate into the countries with weaker environmental regulations within the regional bloc, reinforcing “Pollution Haven” dynamics. Thus, RoO can directly or indirectly encourage pollution aggravating activities in countries with weak environmental standards, i.e. mainly in developing economies. Environmental outcomes within the FTA bloc depend on the stringency of restrictiveness of RoOs apart from the technology adoption, comparative advantage and presence of strict pollution penalties. If RoOs are more liberal and tailored for green goods, they can facilitate the spread of sustainable technologies substantially. Conversely, highly restrictive RoOs can discourage firms from utilizing FTA benefits, which may otherwise lead to suboptimal production patterns which are less sustainable not only economically but also environmentally and can discourage the diffusion of environment friendly goods.

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ACCELERATING INDIA'S ELECTRIC VEHICLE REVOLUTION: LESSONS FROM NORWAY

*Sneha Ghosh and Soha Ghosh
2nd Year, UG*

Abstract

As countries implement climate commitments and invest in clean technology, the transportation sector is leading this change with a transition to electric vehicles. Norway is a global leader, with the world's highest per capita rate of EV ownership. This has been driven by a combination of factors such as government incentives, investments in charging infrastructure and growing consumer demand. This article explores the key factors behind Norway's success as a mature, advanced economy with widespread EV adoption, and contrasts them with India, which is still in the early stages of this transition. By comparing the EV markets in Norway and India, this study argues that for India EV adoption is not only an environmental imperative but also a necessity for sustainable development. This article also stresses on the challenges and opportunities of a similar incentive-based approach. This study serves as a useful resource for both policymakers and decision makers working toward sustainable development in India.

Keywords

Electric Vehicle (EV), Battery Electric Vehicle (BEV), Zero Emission Vehicles (ZEV), Greenhouse Gas (GHG), incentives, charging stations.

JEL Classification

H2, Q42, Q48, Q55

Introduction

In today's world economic growth cannot be achieved solely by rising GDP or industrial expansion. With the intensification of environmental degradation, climate change is widening, and the world is compelled to rethink the foundation for development. Here comes the need for 'sustainable development'. It has become very essential to reduce the emission of Greenhouse Gas (GHG) to make the world cleaner, healthier and more sustainable for future generations. The transportation sector plays a major role in emission of GHG which accounts for about 23% of global CO₂ emissions (2022). Majority of the nations have committed to attain net zero GHG emission by the year 2050. The transition from conventional vehicles to electric vehicles (EV) can be a key strategy in reducing the emission of GHG. The question is how to achieve the transition — and that's where Norway's journey in achieving 100 % EV sales can be taken as an example. As the world's most successful EV market, Norway has shown how a perfect combination of government policies and public commitment can bring the transition within less than two decades. This article explores the factors contributing to high rates of EV adoption in Norway, necessity for EVs in India and how India can draw lessons from Norway's policy and market strategies.

The need for EV transition in India

In recent times Indian cities are ranking among the ones with very poor Air Quality Index (AQI) in the world. This has been due to the emission of GHG on a large extent. The ICV (Internal Combustion Vehicles) are the major contributors to this pollution. Hence, there is an immediate need to come up with alternatives to these fuel - based vehicles. The best solution to these ICVs are EVs as they do not emit GHG. Shifting to these vehicles can directly improve the AQI of our country, and provide us with a healthier atmosphere for living, reducing illnesses and healthcare costs. During the pandemic situation, India witnessed clear skies within a few days of lockdown because there was a restriction on the transport sector. Clearly, making a transition to EVs would create a difference in air quality.

Norway's Path to Success

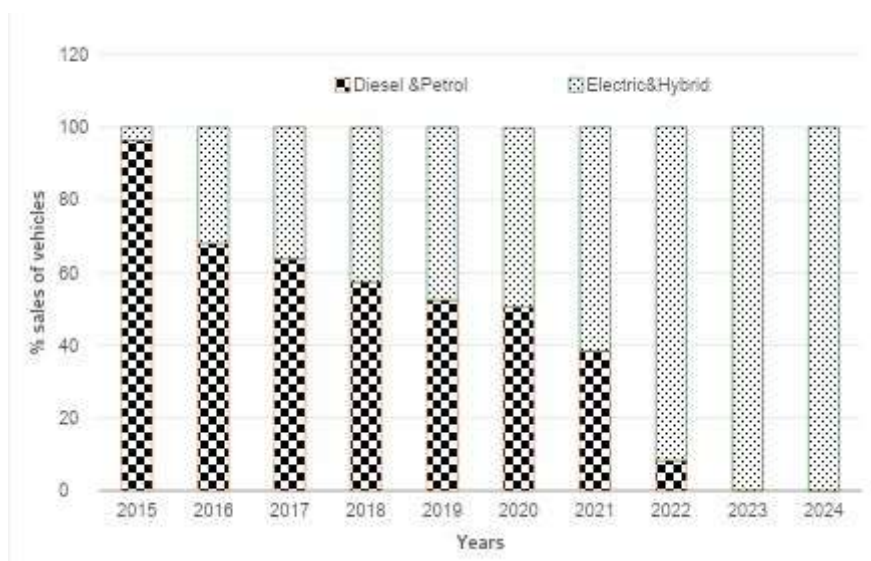
Norway supported the adoption of Zero Emission Vehicle (ZEV) since the 1990s. A practical solution was needed to reduce GHG emissions. Taxing the transport sector in a correct way is an important step towards reducing GHG emissions. With the help of various consumer surveys, it was found that additional purchase cost, lack of information, preference for home charging, acted as barriers for Norwegians to purchase Battery Electric Vehicle (BEV). For a country like Norway which is a major producer of oil, shifting completely to electric vehicles was far more challenging. Norway, an important supplier of oil and gas to the global market, does not burn their oil domestically. In 2024, Norway collected NOK 1100 billion or 61% of the total value of Norway's export of goods came from exporting crude oil. Norway's oil and gas is exported as its renewable power and EV use keep the domestic demand low. In the 1990s the Norwegian parliament began implementing economic policies to encourage the adoption of EVs.

Policies & Incentives taken by the Norwegian government in accelerating EV adoption

Several policies were adopted by the Norwegian government to increase the purchase of EV all over the country.

- 1. Exemption from Registration Tax and VAT:** This policy was adopted in the 1990s. Eliminated significant upfront cost barriers making EVs competitive with petrol & diesel vehicles.
- 2. Free Public Parking:** Oslo and other cities in Norway offered free parking spaces for EV for years. This is a low-cost, smart, high-impact policy, which is valuable in the early phase of EV transition.
- 3. Toll Exemptions:** Norway offered electric vehicle drivers toll-free road access from 1997 to 2017 as part of a comprehensive incentive program to promote EV adoption.
- 4. Bus lane access:** Reduced travel time for EV users, adding a practical commuting advantage.
- 5. Charging Infrastructure:** Early public investment (2009–2011), mandatory EV-ready new buildings (2016), retrofitting of existing housing cooperatives (2020), and subsidies for smart home chargers (2022) collectively accelerated Norway's transition to electric mobility.

Fig 1: Passenger Car Sales by Fuel Type (%) in Norway (2015-2024)



Source: Statista

It is observed that the market that was once dominated by diesel and petrol vehicles at the decade's outset has transformed decisively toward electric and hybrid alternatives by its end. Norway's policy incentives, infrastructure support, and environmental awareness have been driving factors in one of the fastest transitions to electric mobility in the world, achieving almost full adoption by the end of 2024.

Challenges of EV adoption in India

The electric vehicle industry in India is still emerging. The country has set a target of all public vehicles and 30% of all private vehicle sales to be electric by 2030. While the aim is admirable, the road to achieving is challenging. The significant barriers are:

- **Affordability** – India is a country with a per capita income around \$2,880 (2025). Buying an EV for an average Indian is very costly.
- **Charging Infrastructure** – The number of public charging stations are sparse in India, and longer charging times can create bottlenecks in busy areas.
- **Battery Costs** – High-capacity batteries drive up prices, even though many Indian commuters do not need the extended range they provide due to the highly dense population in India.

These challenges are real but not insurmountable as India's underlying strength creates pathways for a better future.

Opportunities of EV adoption in India

India's market, geography and existing transport patterns give it certain built in advantages for EV adoption:

- **Shorter daily commutes:** In India, most people do not need to drive long distances daily, which means we necessarily do not require massive, costly battery packs. This alone can make EVs more practical and affordable here in India than in countries with different driving patterns.
- **High oil import dependence:** Nearly 88 % of crude oil demand are met through imports from different countries. So, transition to EVs directly reduces heavy dependency on oil imports.
- **Abundant Renewable Energy:** India ranks fourth in both wind power and solar power capacity, and is blessed with abundant resources of both. If these renewable energies are utilised wisely to generate more electricity, driving an EV could become much cheaper in India.
- **Two and Three-wheeler Dominance:** Scooters, motorcycles and auto-rickshaws are major components of India's transportation unit.

If these factors can be strategically applied India can overcome many obstacles that other countries are facing in adopting EVs.

Conclusion

Let's imagine a future where India's vibrant streets hum quietly with clean energy, the air is noticeably clearer and the most vehicles we see around are electric. This is more than a dream — it's a realistic path forward if we choose it. This can happen if we can walk on Norway's footsteps. India's EV revolution will not happen through market forces alone, it will require some deliberate actions like – financial incentives, expanding charging infrastructure across cities and highways, enforcing EV ready building, regulatory mandates, public engagement. The road to net zero emission in transportation sector is challenging but Norway's remarkable success in EV adoption demonstrates what is possible when ambitious long-term goals are blended with strategic policy interventions. If India follows a similar path, it can not only revolutionize its transport sector by 2035 but also lead the way for other developing nations in achieving a greener, cleaner and sustainable future.

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THE UK-INDIA FTA AND ITS RIPPLE EFFECTS ON INDIA'S ECONOMIC TRANSFORMATION: IMPACT ON MANUFACTURING AND SERVICES

Mihika Bajoria, Samast Bahri and Vidisha Jagnani
2nd Year, UG

Abstract

India and the United Kingdom represent the fourth and fifth largest economic powers of the world respectively and the culmination of the UK-India Comprehensive Economic and Trade Agreement (CETA), a multisectoral and multidimensional free trade accord, signals one of the most significant geo-economic events of 2025. As two huge economic powerhouses embrace liberalisation of barriers and governments accord free flow of goods and services across borders, both economies foresee an unprecedented bilateral economic engagement in the upcoming years with the Agreement moving into implementation. This exploratory research attempts to analyse the gains of the Free Trade Agreement (FTA) on the manufacturing and services of India, colossal drivers of the nation's aggregate output. It focused particularly on manufacturing avenues such as textiles, leather, automobile, jewellery, electronics and pharmaceuticals and on services such as IT, finance, consulting and professional services. The study also outlines the FTA's contribution towards employment, export earnings, international investments and India's strategic projects like Atmanirbhar Bharat and Viksit Bharat by 2047. Private sector initiatives and certain plausible challenges have also been articulated alongside vital policy recommendations to ensure the FTA's success.

JEL Classification

F13, F14, F15, L60, L80, O24

Introduction

The UK-India Free Trade Agreement, referred by the UK government as "the most ambitious bilateral trade deal signed by the UK since it left the EU", with an estimated £4.8 billion a year increase in UK GDP and a £25–34 billion bilateral trade boost in the first 10–15 years, in line with the UK's post-Brexit trade diversification policy. (GOV UK, 2025)

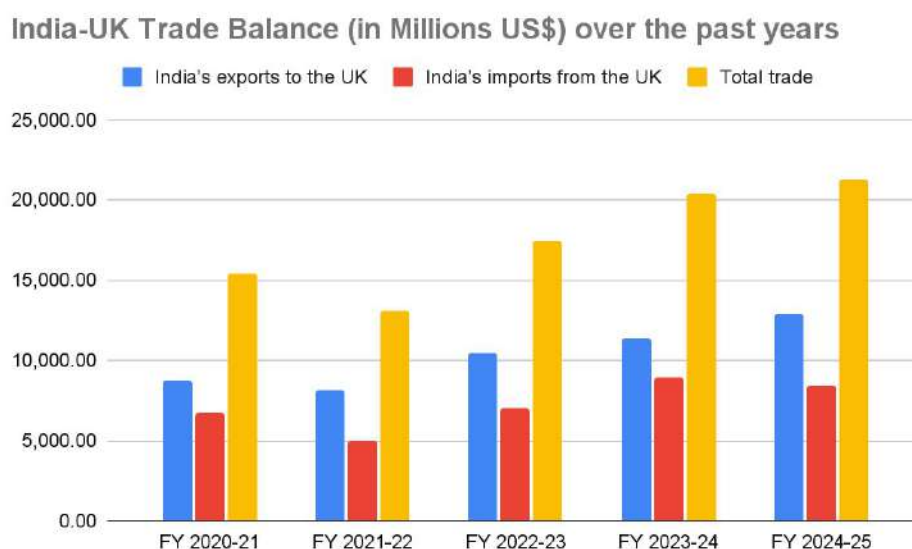
Agreed on 6 May 2025 after 14 rounds of negotiations over three years, the FTA has announced tariff liberalisation and reduces regulatory, mobility, and investment barriers. India's Ministry of Commerce observes, the FTA aims at "deepening economic integration across goods, services, and technology sectors" and improving bilateral cooperation in sustainable trade, innovation, and skills development.

Overview of the UK–India FTA

The key commitments include removing tariffs on 99% of Indian exports including textiles, gems, jewellery, leather products, engineering products and tariff reductions on 90% of UK exports, including automobiles, electronics, whiskey and medical equipment. The agreement also deals with non-tariff barriers in the form of harmonised standards, streamlined customs procedures, and clear rules of origin. The Double Contribution Convention (DCC) shall "relieve up to 75,000 Indian professionals and over 900 companies each year from dual social security contributions" in the UK, minimizing expenses and enhancing employee mobility. (PIB, 2025)

Sector-specific pledges extend beyond trade in merchandise. The UK will open 36 service sectors to Indian businesses, such as IT, financial services, consultancy, and environmental services, and recognize Indian professional qualifications (except for legal). Short-term visas for 1800 chefs, yoga teachers, and contractual service providers are also facilitated through the agreement, annually on a contractual basis. Under manufacturing, it encourages inclusion in global value chains along with UK investment under Make in India, coordinating industrial growth with sustainability and innovation objectives.

Fig 1: India-UK Trade Balance (in million US\$) over the past years



Source:- India Briefing, 2025

Manufacturing Sector

India's manufacturing sector contributes 17% to the domestic output, employs 27.3 million workers and is heading to touch \$1 trillion by 2025-26. (IBEF, 2025) The FTA presents a unique avenue for capital inflow, investments, market access and opportunities that shall fuel India's manufacturing rise. Some key avenues that find pivotal mentions in the FTA are :-

a) Textiles

The FTA dismantles 10-12% textiles import duty that had disadvantaged India from duty-exempt states like Bangladesh and Pakistan. With India exporting merely \$1.79 billion of \$27 billion worth of UK's textile imports in 2024 despite being its 4th largest textile import partner, the FTA unlocks channels of expansion for textiles that is anticipated to touch \$350 billion by 2030 and create 3.5 crore jobs. (Economics Times, 2025)

b) Leather and Footwear

The Indian government foresees leather and footwear exports to nearly double from \$494 million in 2024 to \$1 billion within 3 years. (ETRetail, 2025) India expects at least 5% market share rise in the UK in 1-2 years. The Indian Geographical Indication (GI) products like Kolhapuri and Mojari also enjoy identity protection for differentiated visibility.

c) Engineering and Chemical Goods

The FTA encompasses zero duty for 1659 engineering and 1206 chemical and petrochemical tariff lines, aiding mining, refining, processing, metallurgical and other allied industries and MSMEs in India. Engineering exports to the UK are expected to almost double in 5 years, touching \$7.5 billion and chemical exports to rise by 30-40% to \$650-750 million in 2025-26. (PIB, 2025) Organic chemical exports are expected to shoot by 130% from \$420 to \$966 by 2027.

d) Electronics

The UK currently imports \$80.5 billion worth of electronics out of which scarcely \$2 billion are from India. (ET Telecom, 2025) The FTA provides new wings to electronic manufacturing in India producing smartphones, household appliances, optic fibre, microchips, green electronics and assembling inputs.

e) Luxury Goods

Articles of conspicuous consumption ranging from whiskys, jewellery, gemstones and furniture to expensive cars and cosmetics produced in India shall have seamless access to UK markets. Bilateral gemstone and jewellery trade is likely to double to \$6 billion in 2 years with Indian gem and jewellery exports touching \$2.5 billion, boosting producers in Gujarat and Maharashtra. (GJEPC, 2025) Scotch whisky sees an immediate import duty drop from 150% to 75% that shall within qp years be dropped to 40%, allowing Indian hospitality and hotel sector cheaper beverage options.

Service Sector

The service sector now contributes over 55% of India's Gross Value Added (GVA). (IBEF, 2025). The FTA grants the UK market access in 137 service sub-sectors, including education, healthcare, IT/ITeS, finance, telecommunication, consultancy, and aviation support, covering over 99% of India's export interests. Conversely, India provides access in 108 sub-sectors such as financial services (with a cap of 74% FDI), accounting, auditing, telecom (100% FDI), environmental services, and auxiliary air transport. (PIB, 2025)

In the era of stringent immigration, there has been a landmark shift in the mobility of Indian professionals to the UK. No particular numerical cap or the need of an Economics Needs Test has been subjected to businesses. The FTA permits 90-day business visits, 3-year corporate transfers, 1-year investor stays, and 12-month service/professional work in 24 months, with Mutual Recognition Agreements in key professions such as nursing, accountancy, and architecture planned within a year.

While these developments benefit Indian professionals, The UK government has emphasised the FTA won't alter immigration rules, add visas, or create settlement routes, only allowing temporary, specific-purpose business travel. (Business Standard, 2025).

Overall, the FTA enhances competitiveness and financial benefits for Indian workers and employers while providing UK financial and legal services greater market certainty in India's expanding economy. (EY, 2025)

Digital Trade

The digital trade chapter of the UK-India FTA comprehensively addresses modern trade challenges, including electronic trade facilitation, open government data access, online consumer protection, source code protection, and cybersecurity. It features a forward-looking review mechanism allowing either party to request reciprocal commitments if the other enters agreements with third countries on personal data protection, cross-border data flows, or data localization.

India's digital trade policy shifts by abolishing customs duties on electronic transmissions, allowing unrestricted cross-border data flows, and banning compulsory source code sharing—setting a precedent for upcoming EU and US negotiations. (ORF America, 2025)

Private Sector Response

Various private corporations and MSMEs in India are likely to witness substantial gains. Tirupur Exports Association projects UK knitwear exports rising from Rs 8000 crore to Rs 1300 crore. (Economics Times, 2025) 2000 Tirupur units plan expansions over six months. GJEPC's Executive Director Sabyasachi Ray said that similar to the UAE-India CEPA that resulted in Titan to acquire 67% stake in UAE-based Damas Jewellery, Indian jewellery retail brands would be able to expand in UK markets. (The Financial Express, 2025) 26 UK companies have recently signed agreements with Indian counterparts. In chemicals, Johnson Matthey plans to invest £4 million thereby raising 20000 jobs post acquiring £20 million contracts while business services firm Marcus Evans Group holds a £69 million investment pipeline spread out over 5 years. (Manufacturing Today, 2025)

Strategic and Economic Impacts

A 2023 Grant Thornton UK LLP Tracker Outlook report surveying 608 mid-sized businesses found that 64% already had a presence in India, and 94% of these planned further expansion- most within two years. Nearly 72% of respondents believed the FTA would help boost business. (Grand Thornton, 2023)

The UK now secures unprecedented access to India's vast public procurement market, long protected for domestic manufacturers. UK firms can bid for high-value Indian government contracts by meeting a local content requirement of just 20%, unlocking opportunities in advanced manufacturing, green technology, and healthcare. This procurement market encompasses around 40,000 central government tenders annually, valued at £38 billion, with the lower threshold enabling participation in smaller projects previously closed to foreign bidders (BBC, 2025).

This is the most extensive government procurement concession India has offered in any FTA, marking a shift from the rigid protectionism of Atmanirbhar Bharat. The government frames it as part of a broader global integration strategy (Moneycontrol, 2025), with reciprocal UK market access and alignment to domestic initiatives like the Production Linked Incentive (PLI) scheme. These steps aim to boost bilateral trade to \$100 billion by 2030 while protecting sensitive sectors such as health, agriculture, and MSMEs (PHDCCI, 2025).

Geopolitically, the FTA marks India's pivot to Western alliances post-RCEP and advances the UK's Indo-Pacific reach, with £42.6 billion trade in 2024 positioning it as a model for future FTAs.

Challenges

The FTA's success depends on overcoming several key challenges. Notably, the implementation framework for quota-based tariff reductions on UK automotive exports remains ambiguous, while important sectors such as pharmaceuticals are excluded, limiting full market access opportunities (India Briefing, 2025). Additional obstacles include legal and regulatory delays, complex land laws, tax compliance issues, and policy unpredictability, which collectively heighten business risks. Moreover, global economic headwinds, including inflation and climate-related vulnerabilities, add layers of uncertainty. (McKinsey, 2025)

Conclusion

Massive macroeconomic and geo-strategic outcomes await India's manufacturing and service sectors which shall certainly boost production, job growth, intersectoral and international engagement in technology, business and innovation and pave the way for India to achieve milestones. Many manufacturing industries expect a doubling of exports within a few years attracting FDI while digital trade also sees major growth. Domestic challenges and private sector opportunities both shall play a role in shaping the FTA's long term success.

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EXPLORING THE TRADE-OFF BETWEEN ECONOMIC GROWTH AND ENVIRONMENTAL POLLUTION/HEALTH HAZARDS IN INDIA'S SERICULTURE SECTOR

*Aradhita Ray
2nd Year UG*

Abstract

This article reviews the trade-offs within India's sericulture industry focusing on the contrast between its economic contributions and the environmental and health costs it generates. The industry plays a vital role in boosting rural livelihoods and supporting national income through employment creation and commercial opportunities. However, its operations also give rise to ecological degradation and health-related risks which in many cases impose heavier burdens on the economy than the benefits it delivers. The discussion closes with proposed measures to reduce these adverse impacts. It highlights the necessity of aligning industrial growth, human well-being, and ecological sustainability together.

JEL Classification

O44, Q53, Q56, Q57, I18

Keywords

Indian Sericulture, Economic growth, Environmental pollution, Occupational health hazards, Opportunity cost, Labour Productivity

Introduction

In India, Sericulture is one of the leading sectors that has significant social, economic and environmental implications. India ranks as the second largest producer of silk in the world (*MoSPI*), contributing approximately 18% of global silk production (*Harishkumar, 2023*). The Sericulture Industry in India employs about 9.76 million people contributing particularly in rural and women employment (*Pangotra, 2024*). India's position as an exporter of silk is quite decent as it accounted for 0.04 % of the country's total export earnings worth Rs 1848.96 crores in 2021-22 (*Dasari & Venkataramana, 2023*).

Despite being one of the largest industry and foreign exchange earners for the country, it involves environmental degradation and health risk factors. Agrochemical compounds used by this sector create respiratory issues and are carcinogenic to humans (*Harishkumar, 2023*). At the same time it can cause damage to the environment through land, air, water pollution etc (*Wani, 2011*).

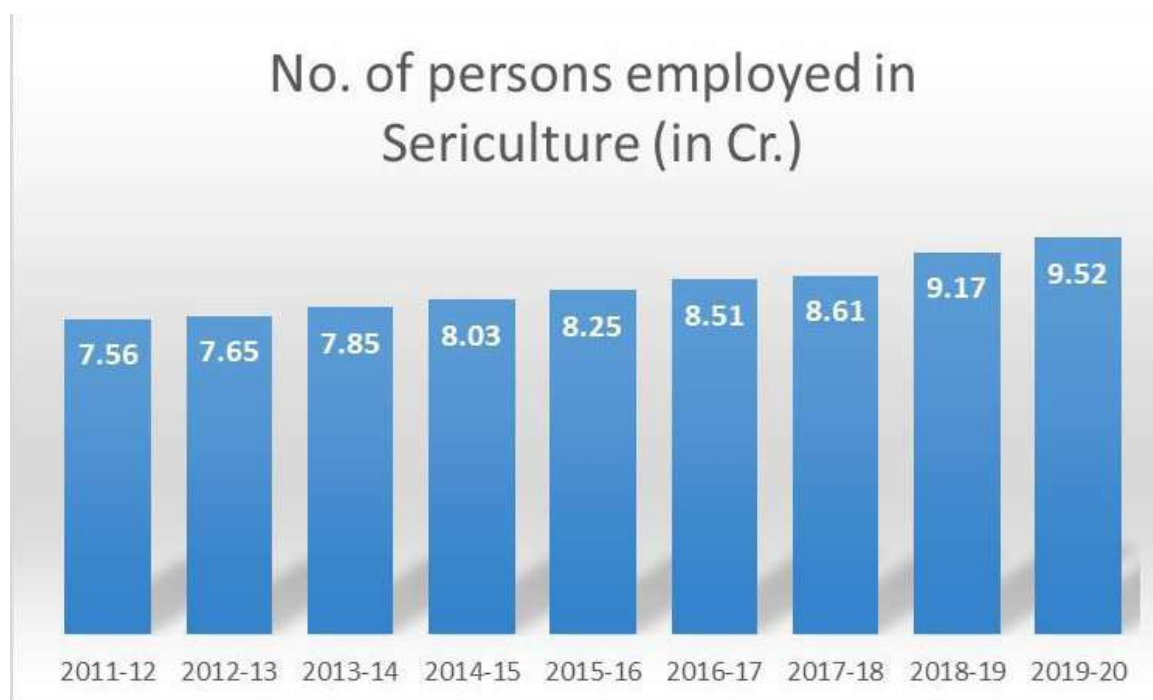
This study is chosen to analyse the trade off between economic gains and health/environment costs of the Sericulture Industry.

The primary objectives are to study the economic growth of the Sericulture Industry, to study the environmental and health damages created by Sericulture.

Hypothesis: Healthy environment is an opportunity cost to the economic growth contributed by the sericulture sector, there will be a fall in labour productivity due to the exposed health hazards.

1. Opportunity Cost of Sericulture in India

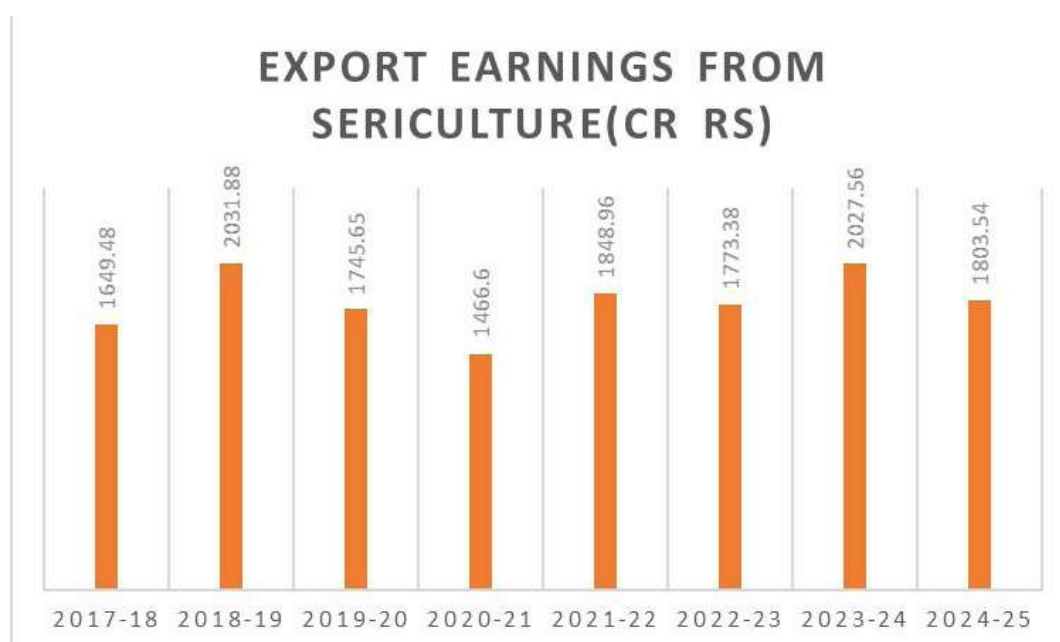
Fig 1: Bar Chart showing Distribution of Persons Employed in Sericulture from 2011-2020



Source - Development of Sericulture Industry in HP

The scope and the economic contribution of the Sericulture Industry has been good throughout these years ranging from employment generation, export potential, value addition etc. It is labour intensive and offers a sustainable source of income for women and rural youth in India. As shown in figure 1, the employment trend in India is gradually increasing over the years from 2011-2020, marking 2019-20 the highest.

Figure 2: Bar Chart showing distribution of export earnings from 2017-2025



Source: Ministry of Textiles

India's silk exports have high demand in international markets, and also the value added products like silk-based cosmetics, pharmaceuticals etc open new avenues in the economy (*Harishkumar, 2023*). The export earnings from sericulture is quite decent marking 2018-19 the highest which recorded export earnings of 2031.88 Cr Rs from Sericulture as shown in figure 2.

Even though silk and silk goods production can bring economic growth in the country, it creates significant environmental damages by waste production and water pollution. The total amount of waste generated by the silk industry is 55% (*Pooja M, 2024*)

In Mulberry production, one hectare of land produces about 15 MT of sericultural waste that is equivalent to 280-300 kg of nitrogen, 90-100 kg of phosphorus and 150-200 kg of potash. Further fermentation of silkworm breeding produces 256.59 m³ /Mg TS of methane and 489.24 m³ /Mg TS of biogas (*Pooja M, 2024*).

In reeling, high concentration of waste water reduces plant growth because of the presence of excess nutrients (*Bhuvana, 2024*) and also chemicals from the reeling contribute to the general chemicalization of the aquatic environment and can cause several direct and indirect effects in the same (*Khattab, 2019*).

Similarly the degumming process in silk production results in effluents containing gum residues and contaminants (*Pooja M, 2024*).

Further during dyeing process, existence of naphthol, vat dyestuffs, nitrates, acetic acid, soaping chemicals, enzymatic substrates, chromium-based materials, and heavy metals as well as other dyeing auxiliaries, makes the textile dyeing water effluent extremely toxic (*Khattab, 2019*). Also, when the textile dyes effluents are used for irrigation, it alters the soil chemistry and disrupts the balance of the soil microbial flora (*Harishkumar, 2023*).

Environmental Impacts: Solid wastes generated from each stage of silk production are untreated and dumped or thrown in open land which can alter soil fertility, texture and permeability of soils. This in turn will affect the surrounding environment and ecosystem. Water pollution may happen because of the surface run off of the toxic chemicals produced and through infiltration of chemical residues into the groundwater. Air pollution may happen when oxides of nitrogen, sulphur, carbon etc are emitted into the air. (*Wani, 2011*)

Opportunity cost in economics is the loss of potential gain from other alternatives when one alternative is chosen. It is known that the economic growth in the Sericulture Sector is happening at the cost of environmental well-being. The sector is forgoing the gain from a healthy environment in choosing the economic benefit generated by the sericulture industry. Hence, it can be concluded that a healthy environment is an opportunity cost of the sector as it loses the potential gain from this alternative.

2. Loss in Labour Productivity

The sericulture industry generates employment to about 9 million, creates income opportunities to the rural people, controls migration of people from rural to urban, is one of the most suitable occupations from the economic point of view. The employment generation is classified into direct employment and indirect employment; a study revealed that 26.66% respondents had annual income between 50,000/- to 1,00,000/- and 20% had 1,00,000/- to 1,50,000/- . In India, Sericulture is fairly organized, rural and labor intensive in the cottage industry segment. 74% respondents as per the study received 151-200 days employment from sericulture. (*Bhuvana, 2024*) 'The sector generates employment to more than 7,52,600 farmers and 15,453 reelers in 51,000 communities in India. 56.8%, 6.8%, 9.1%, 10.7% and 16.6% of the gross value of fabric is shared among cocoon grower, reeler, twister, weaver and trader respectively. (*Harishkumar, 2023*)

But, the silk industry uses some health hazardous substances in all stages that create a negative impact on the worker's productivity. The use of agro-chemicals in mulberry production produce herbicides which are carcinogenic chemicals. Besides, it also induces endocrine disruption, reproductive consequences in human cell lines and causes irritation in respiratory tract and gastrointestinal tract. Pesticides like Chloropyrifos and Dichlorvos are used here which affect the central nervous system, cardiovascular system, respiratory system in people and animals and causes depressed motor functions, seizures, nausea etc. Similarly fungicides used here can be detrimental to humans. Workers exposed to silk reeling can develop respiratory allergies like asthma, rhinitis and skin diseases like dermatitis etc. (*Harishkumar, 2023*). Workers involved in rearing mentioned that they suffer from respiratory problems, musculoskeletal disorders, eye irritation, allergies and injuries (*Wani, 2011*). Further textile dyes can cause diseases ranging from dermatitis to problems with the central nervous system (*Harishkumar, 2023*).

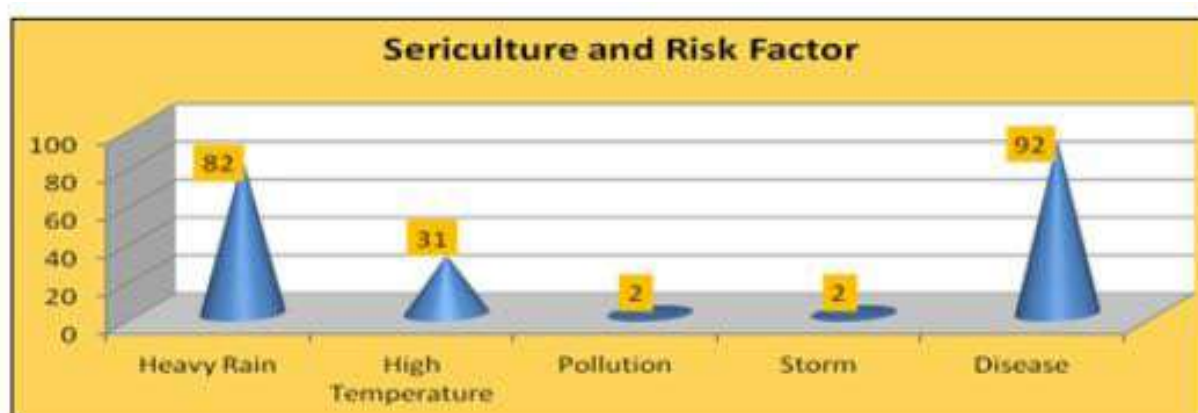
Table 1: Overall morbidity profile of the study subjects ($n=194$)

Ailment	Males (%)	Females (%)	Total (%)
Eye ailments	75 (38.6)	23 (11.8)	98 (50.4)
Ear problems	38 (19.6)	12 (6.2)	50 (25.8)
Low back ache and joint pains	101 (52)	25 (12.8)	126 (67.8)
Physical injuries	23 (11.8)	10 (5.1)	33 (16.9)
Headache	94 (48.4)	18 (9.2)	112 (57.6)
Hypertension	56 (28.8)	9 (4.6)	65 (33.4)
Diabetes mellitus	38 (19.6)	12 (6.2)	50 (25.8)

Source: Indian Journal of Community Medicine

Table 1 shows the overall prevalence of health hazards among workers of the sericulture industry which is considerably high

Figure 3: Shows Responses recorded by respondents



Source: International Journal of Academic Research and Development

Figure 3 shows the responses recorded in the study on the risk factors of sericulture. 92 respondents in the study responded that it happens due to diseases of the workers.

From these findings we can say that not only is the health of the workers getting affected but it is also affecting the quality of their lives, reducing their productivity and increasing their liability. Reduction in health hazards among workers can lead to a reduction in occupational problems (M, J.,2019). Their medical expenses increase, reducing their income and the diseases impact the quality of their work. Hence, there is a loss in productivity in the form of labour in the sericulture sector.

Conclusion

To conclude, it can be said that a healthy environment acts as an opportunity cost for the Sericulture sector and that there is a fall in productivity of labour due to health hazards. The trade off between economic growth and environment/health lies in short term economic gain and long term environmental/health costs.

The environmental impacts can be reduced by proper treatment of toxic wastes, emissions and effluence. The health hazards can be reduced by improvement in awareness level, access to free medical advice and treatment and government intervention. There is a need to halt acceleration in economic growth at the cost of the environment and health

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GLOBALISATION'S UNEVEN FOOTPRINT IN THE GLOBAL SOUTH

*Anushree Karmakar,
2nd Year, UG*

Abstract

This article examines the uneven distribution of economic benefits that results from globalisation. Despite being considered an overall boon for the world economy, the benefits of such liberalisation have often been inequitably shared, with the Global South, despite being rich in raw materials, frequently at a disadvantage. Case studies highlight how global supply chains and outsourcing practices exploit weaker labour protections and environmental regulations. The article further explores how governments in developing nations, such as India, can help bridge this economic divide.

Keywords

Developing Countries, Globalization, Inequality, Development, Employment, Wage, Labor Costs, Exploitation

JEL Classification

J30, F63, F66, Q56

Introduction

Globalisation has blurred borders, weaving nations into a tightly linked system of trade, investment, and resources. Proponents claim it delivers GDP growth and greater employment opportunities. Yet, for many in the developing world, reality is far less promising. Despite being resource-rich, these countries face mounting environmental harm, unfair trade practices, and widening economic inequality. The following sections examine how the benefits of globalisation have been largely unequally distributed, exploring their impact on labour, productivity, and the environment.

The Environmental Burden Faced by the Global South

In Ghana's Densu Delta, there lie wetlands and beaches, once teeming with wildlife, now suffocating under mountains of textile waste shipped in every few days by corporations that have never set foot on its shores. From UK high-street names and fast-fashion giants like Marks & Spencer, Zara, and H&M, Ghana's shores have become their international dumping ground. A joint investigation by Unerthed and Greenpeace Africa found that roughly 15 million garments reach Ghana each week, making it the largest importer of second-hand clothing globally. To put this into perspective, this weekly inflow is nearly half the size of the nation's population of 35 million. Yet almost 40% of each shipment is unusable, either ripped, soiled, or wholly unsuitable for Ghana's tropical climate. As quoted in the Unerthed / Greenpeace Africa investigation, Dr. Jones Quartley, a wetland ecologist at the University of Ghana, warned: "This is dangerous...the bioaccumulation of microplastics in aquatic organisms and humans could pose serious risks."

Labour Exploitation in Globalised Supply Chains

The Global South is especially vulnerable to economic shocks like COVID-19. A 2023 study of 1,000 Bangladeshi factories found widespread unfair and exploitative practices during the abovementioned outbreak. Suppliers recounted how global retailers cancelled orders, withheld payments, and demanded price cuts on pre-pandemic contracts. By late 2021, the pressure only intensified: costs had surged, but 70% of brands were still paying factories little more than they had in early 2020.

The table below shows the challenges faced by seller companies, by the size of the factory:

Key challenges faced by suppliers	Small	Medium	Large	Total
Temporary production shutdown due to lockdown restrictions in April-June 2020?	80.1% (157)	80.0% (463)	80.9% (182)	80.2% (802)
Reduction in the availability of raw material inputs (supplies, cloth, wool, thread etc.) since 2020	54.1% (106)	50.1% (290)	53.3% (120)	51.6% (216)
Price increase in main inputs (supplies, cloth, wool, thread etc.)	73% (143)	68% (394)	68.9% (155)	69.2% (692)
Depreciation of machinery due to inaction	31.6% (62)	28% (162)	28.9% (65)	28.9% (289)
Challenge of securing access to finance (e.g., banks)	34.2% (67)	43.9% (254)	47.1% (106)	42.7% (427)
Additional cost to comply with buyers' (ethical/social) compliance requirements due to Covid-19	8.2% (16)	12.8% (74)	14.7% (33)	12.3% (123)
Employee absenteeism – all causes, including temporary lockdowns ¹⁵ , Covid-19 & other causes	34.2% (67)	42% (243)	46.2% (414)	41.4% (724)

Source: Impact of Global Clothing Retailers' Unfair Practices on Bangladeshi Suppliers During COVID-19, 2023

The Shifting Geography of Manufacturing Hubs

For decades, 'Made in China' has been stamped across goods sold worldwide, becoming shorthand for the global outsourcing boom. However, reports from the International Trade Union Confederation (ITUC) allege the continued use of forced labour in Xinjiang under the guise of "reeducation" or "poverty alleviation" programmes targeting Uighur, Turkic, and other Muslim minorities. And yet, with rising labour costs in recent years, China is said to have killed its comparative economic advantage in manufacturing, devaluing its role as the "World's Factory". A 2021 study found that rising minimum wage largely reduces exports in unskilled, labour-intensive industries. Nike offers a clear example: while China once supplied over 40% of its global footwear production in 2001, it was overtaken by Vietnam in 2009. Between 2007 and 2012, Chinese labour productivity rose by 11% annually – significantly above Thailand's 7% and Indonesia's 8% – but with higher output came demands for higher pay. This pushed multinationalists to seek cheaper alternatives. FDI in China's manufacturing fell 20% between 2010 and 2014.

Globalisation's Bargain: Who Pays the Price?

Globalisation is often portrayed as a free-trade haven, promising growth for all, with minimal government disruptions and significant GDP growth for globally integrated nations. For still developing countries, they are seen as a boon, with outsourcing allowing for greater employment opportunities, urbanisation, and overall increased economic activity.

Yet, as nations compete to attract foreign investment by lowering labour standards and regulations, they erode protections and weaken labour standards. If workers demand higher wages or improved working conditions, corporations threaten relocation.

India: Building a 5 Trillion-Dollar Economy on Underpaid Labour

As India seeks to reassure global investors of its business profitability – another step toward its goal of becoming a 5 trillion-dollar economy by 2027-28 – millions of workers continue to face withheld wages, endless toil, and systemic coercion.

According to a 2025 study published in the Indian Journal of Legal Review, many workers face exploitation through unfair contracts, wage theft, and forced labour due to the absence of written agreements. These practices have a disproportionate effect on more vulnerable groups like migrants, women, and low-skilled workers, who often have limited access to legal recourse.

Despite Indian workers averaging 47.7 hours per week, among the world's highest, labour productivity remains low at just \$8 GDP per hour, ranking 133rd globally.

Rank	Country	Region	International \$
1	Luxembourg	Europe	\$146
2	Ireland	Europe	\$143
3	Norway	Europe	\$93
4	Netherlands	Europe	\$92
5	Denmark	Europe	\$80
6	Switzerland	Europe	\$78
7	Belgium	Europe	\$76
8	Austria	Europe	\$74
9	Singapore	Asia	\$74
10	Sweden	Europe	\$70

Source: ILO, 2022

Notably, nine of the top ten most productive countries, based on GDP per hour, are in Europe, where nations are known for their healthy workplace culture, with the EU enforcing stronger worker protections and mandates for a significant amount of paid time off.

Towards Equitable Growth

Globalisation-driven foreign investment has been a key driver of economic growth in many emerging markets. According to data by the United Nations Conference on Trade and Development (UNCTAD), foreign direct investment (FDI) inflows to developing countries increased from \$23 billion in 1990 to \$665 billion in 2019. This investment has naturally led to the growth of new industries, created employment opportunities, and increased economic competitiveness.

In India, foreign investment has fuelled the explosive growth of the Information Technology (IT) and Business Process Management (BPM) sector. As of FY 2023, the IT-BPM industry generated approximately USD 194 billion in export revenues and employed around 5.4 million people. This has led to rising digital expertise among India's working population and the emergence of IT hubs like Bengaluru and Hyderabad.

Furthermore, the Indian tech sector's revenues are projected to grow 5.1 % to USD 282.6 billion in FY25. They are likely to increase further to USD 300 billion in FY26, as stated at the Nasscom Technology Leadership Forum by its President, Rajesh Nambiar.

Country	FDI Inflows (2019)	GDP Growth Rate (2019)
China	\$141 billion	6.1%
India	\$51 billion	5.0%
Brazil	\$69 billion	1.1%
South Africa	\$5 billion	0.2%

Source: UNCTAD, 2019

However, these gains are not evenly spread out. For instance, a study by the International Labour Organisation (ILO) found that in 2019, an estimated 40.3 million people were trapped in modern slavery, with many working in industries such as agriculture, construction, and manufacturing – sectors heavily linked to global supply chains.

From Exploitation to Equity: Policy Pathways

With reducing inequality being a key priority of the UN's SDGs, inclusive economic growth should be the norm, treated and implemented as a worldwide policy objective.

A multifaceted approach is needed to address global income disparity. Governments should enforce supply chain accountability laws to hold multinationals responsible for any breaches abroad. Stronger domestic safeguards are equally vital: prosecuting wage theft, mandating written contracts, and expanding minimum wage coverage would help protect the most vulnerable workers.

From an Indian standpoint, rather than simply inflating employment numbers through India's advantageous demographic dividend, the focus should be on investing further in education, skill development, and labour productivity – working towards economic growth that is both equitable and sustainable.

Conclusion

While globalisation has generated wealth, it has deepened divides between the developed and developing worlds, the Global North and South. Ghana's textile waste crisis, the pandemic's toll on Bangladeshi garment workers, and India's low productivity despite long work hours all reveal systemic imbalances in the global economy.

In the 21st century, true economic growth will not come from accumulating a higher GDP or cutting labour costs to the bone. It will come from coordinated action at both global and local levels to ensure that economic gains are shared fairly, resources are managed sustainably, and workers – whether in Beijing, Dhaka, or Bengaluru – are valued not just as units of labour, but as individuals integral to growth.

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RESOURCE EFFICIENCY AND BUTTERFLY ECONOMY

Sneha Agarwal, Surosmi Biswas
2nd Year, UG

Abstract

The existing measures of the economy do not consider environmental costs and use increases in GDP as an indicator of resource extraction and waste. This article reviews how prosperity can become decoupled from the model of the circular economy with resource depletion. We explore international and local case studies of the resulting combined macroeconomic advantages (an output gain of USD 4.5 trillion by 2030, resource savings of USD 2.9-3.7 trillion annually, and the creation of 9.25 million jobs) as well as firm-level benefits including cost-cutting, resilience across the supply chain, and new revenues through product-as-a-service. Circular strategies are in line with the idea of Doughnut Economics, as they keep the well-being of society within the threshold of planetary boundaries. We describe sectoral applications in electronics, fashion, and construction and suggest policy instruments, Extended Producer Responsibility, eco-taxes, and material-efficiency standards, to meet the regenerative, distributive, and net-positive economic paradigm.

JEL CLASSIFICATION

Q01, Q56, L51, L67, O13

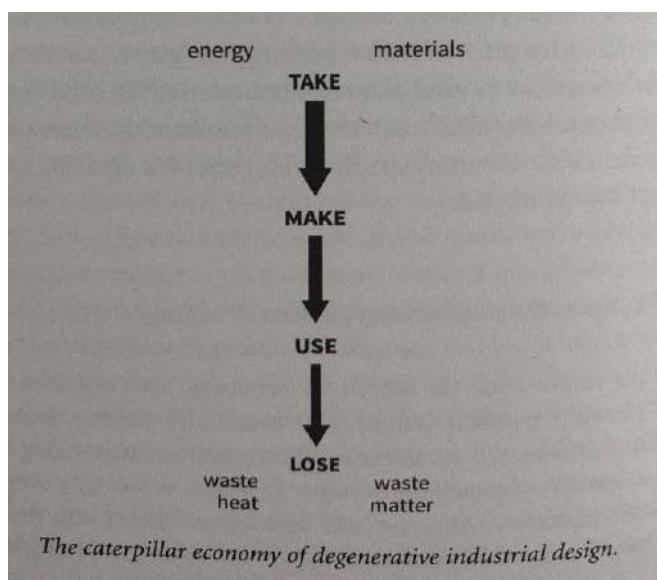
Introduction

For decades, economists have measured economic prosperity by a single metric that ignores a fundamental reality: every dollar of GDP growth extracts resources from the earth and generates waste.

The Global Resources Outlook 2024 reports that resource extraction more than tripled - from 30 to 106 billion tonnes - from 1970 to the present, i.e. from 23 to 39 kilograms per person/day. Such resource extraction contributes 60% of global warming emissions (1). Moreover, E-waste generation reached 62 million tonnes in 2022 (2).

Since calculating the economic value of environmental resources and pollution is complicated, they have been termed "negative externalities". For example, a study on Indonesia claims that accounting for environmental degradation would decrease the measured economic growth rate by 3% (3).

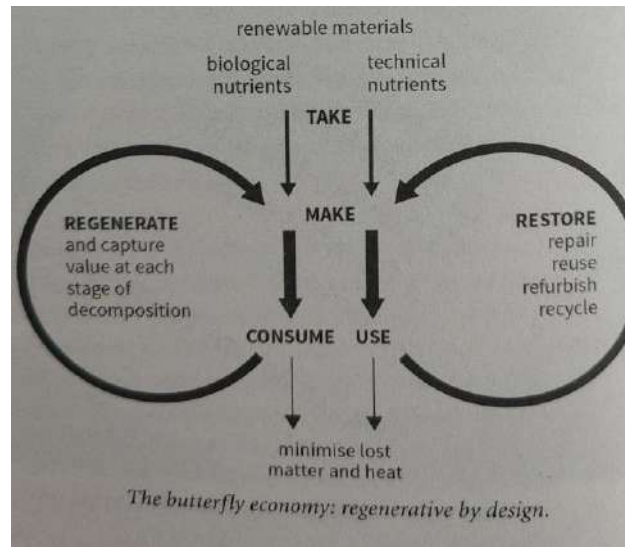
This systematic blindness is born from a fundamental flaw in our economic structures. In her book, *Doughnut Economics*, Kate Raworth mentions that our economies follow a "degenerative linear economy of take, make, use and lose" which resembles an "industrial caterpillar".



Moving forward, we must redesign our economies to be fundamentally regenerative by design, creating a system that restores the very nature that sustains us.

The Butterfly Economy

Kate Raworth, in her book *Doughnut Economics*, presents a new economic structure called the Butterfly Economy.



The Butterfly Economy, Page 220, *Doughnut Economics*

In this economy, most processes run on renewable energy, which eliminates all toxic chemicals and eradicates waste by design. This is because, instead of the leftovers from various production processes becoming the source materials for the following process.

To make this function, we must consider all materials as part of two nutrient cycles: biological nutrients and technical nutrients (such as plastics). These "wings" of the butterfly represent the processes by which materials are used again and again through cycles of reuse and renewal.

On the biological wing, the key to using nutrients endlessly and sustainably is to design ways so that nutrients return to nature.

On the butterfly's other wing, products made using technical nutrients such as synthetic fibres must be designed for restoration through repair, reuse, reimbursement, and, as a last resort, recycling.

Sectoral Applications: Where Circular Models Reduce Costs and Emissions

A. Electronics Sector: Harnessing the E-Waste Opportunity

The electronics industry also offers one of the very near and measurable opportunities to put in place business in the circular economy. Accenture & ICEA, 2021, presume that congruent forms in Indian electronics industry might comprise roughly USD 7 billion in annual income per year by 2035, more than 110,000 formalized employment, and the avoidance of 1.6 million tonnes of CO₂-equivalent emissions (Bald et al., 2020).

Currently, less than 1 -3% of the recoverable value of the electronics that have been discarded is retrieved in the formal recycling ecosystem (EMF, 2020).

Following the principles of the generous design by Raworth, the modular architecture of devices simplifies the upgrade process and repair, thus lengthening product use cycles and beyond recovery yields (Bakker et al., 2019).

B. Fashion Industry: Decoupling Growth from Resource Use



The second-hand apparel market of the world, including resale, rental, repair, and remanufacturing, doubled in size (an amount of USD 73 billion in 2023) and vastly outpaced the traditional fashion industry 10 (ThredUp, 2023). Ellen MacArthur Foundation (2021) points out that circular business models may represent 23% of the total global fashion market in 10 years and USD 700 billion in value.

Up to 47% of greenhouse emissions could be eliminated by prolonging the garment lifespan through repair and resale as opposed to the model of production-consumption as a straight line (Sandin & Peters, 2018).

The case of H&M Group, which has published take-back and resale schemes, demonstrates that commercial viability of such schemes exists, and it is possible to have reduced usage of virgin inputs in conjunction with even enhanced value propositions to consumers.

C. Construction Sector: Buildings as Material Banks

Concrete and demolition waste (CDW) composition constitutes more than 30 per cent of overall solid waste flows in most economies (European Commission, 2019). Analyses of composition determine the rich composite fractions that can be recovered in its composition; examples include 25% concrete, 38% wood, and 6% metals (Chaturvedi et al., 2020).

Experiential (McKinsey, 2019) research indicates that current modular construction practices can save on a project cost by as much as 20% and shave precious time to the project because it helps cut down waste creation.

Policy Levers: Enabling the Circular Transition

A. Extended Producer Responsibility (EPR)

EPR is a form of regulation that internalises the end-of-life costs of products into producer operations and thus leads to the employability of designing towards durability, repairability, and recyclability (OECD, 2016).

According to comparative analyses (Walls, 2020), strong EPR systems have a positive effect in terms of collection, investments in recycling infrastructure, and eco-design channelling.

B. Eco-Taxes

The policy instruments available to the economy are taxes, including landfill tax and incineration tax, to produce the appropriate price signals in the waste hierarchy. The increased landfill tax in the UK (1998 onwards) by 800 per cent (GBP 10/tonne to GBP 80/tonne) was related to 65% decrease in waste disposed in landfills (HM Treasury, 2014).

The design of eco-taxes should focus on variation in rates based on environmental effect, predictable escalation scales and harmonisation among jurisdictions in order to prevent market distortion.

C. Material Efficiency Standards

There is a growing incorporation of material efficiency aspects into regulatory frameworks, in addition to energy performance levels, such as durability, reparability and recyclability included in the EU Ecodesign Directive (Dalhammar et al., 2021).

The M/543 requirement has helped in the emergence of horizontal standards, especially the EN 45554, thus allowing harmonised measurement and enforcement of the standards applicable to a variety of products. As evidence gathered in the course of surveillance on the European market indicates, the required standards would lessen the uncertainty of compliance, trigger invention concerning circular design, and establish a competitive level playing field (BIO by Deloitte, 2016).

Economic Benefits: Decoupling Prosperity from Resource Depletion

A. Macro-Economic Value Creation

The potential impact of a global shift to circular economies has been estimated in analyses to be a worldwide economic output increase of around USD 4.5 trillion in 2030. Commercially viable over the next decade are measures to increase energy and water use efficiency by 60-80% with potential savings of USD 2.9-3.7 trillion annually. According to modelling by the International Resource Panel at the UN Environment Programme, an investment of around USD 900 billion in circular and resource-efficient infrastructure could mean 9-25 million new jobs and result in cost savings that amount to an annual financial return of well over 10% coupled with a far lower consumption of raw materials.

B. Societal Benefits Alignment

Doughnut Economics model introduced by Kate Raworth defines a safe and equitable space of humanity with bottom of society's capacity and top of environmental capacity. Circular management of resources has a direct positive influence on this vision through the fact that it keeps materials in circulation and thus satisfies human needs with the non-surpassing of the planetary boundaries. Circular economies allow societies to operate within Earth's safe operating space and to further equity and environmental sustainability by recovering and regenerating resources at each stage.

Conclusion: The Path Forward

It is not only feasible that global economies uncouple economic growth and resource depletion, but this process is already implemented in innovative sectors and countries. Circular models decouple GDP growth from extraction of raw materials and disposal of waste, allowing sustained gains to the living standards, without worsening the environment. Such paradigm change is in line with demand of Doughnut Economics that we shift to economies that not only regenerative (restoring our natural world), but are also distributive (making social equity a reality). This transition requires comprehensive, coordinated action: policymakers must enact complementary policies like EPR schemes, smart taxation, and the introduction of circular product standards to integrate environmental costs into prices. Public-private partnership will be essential to scale up the circular solutions. There can be varying degrees of ambition between the developing and the developed economies, but there can be a common path as long as resilient, inclusive, and net-positive economy is achieved.

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**THE UNEQUAL GEOGRAPHY OF GREEN TRANSITIONS: RETHINKING
SUSTAINABLE GROWTH IN A DIVIDED GLOBAL ECONOMY**

*Preyashi Agarwal and Tanvi Jain
2nd Year, UG*

Abstract

This article aims to establish the unequal burden of sustainable development between the Global North and the Global South, highlighting how the nations least responsible for climate change face the gravest impacts, while the wealthier and industrialised nations continue to set the tone and direction of global development policies. Using the concepts of triple bottom line and ecological debt, the article connects present inequalities to a history of colonial exploitation and resource extraction. It also examines how the present-day economic gaps and policy differences make it harder for many Southern countries to implement climate policies. The article also looks at how intellectual property rules and patent control maintain economic dependence, including cases of biopiracy. On an international scale, the article discusses how carbon pricing is inculcated into global trade and critiques the execution of the European Union's Carbon Border Adjustment Mechanism (CBAM) concerning Southern countries.

JEL Classification

F18, F54, O13, Q54, Q56, Q58, N55

Introduction

The discourse around the burden of sustainable development and its disparity between the Global North and Global South has been prevalent for a long time. It is seen that the section of the population that is the least responsible for climate change continues to remain the most vulnerable to its harmful effects. The narrative around sustainable development is mostly controlled by the developed Western world, which, in turn, neglects the priorities of the developing nations in this context. As the West remains focused on environmental preservation, developing countries prioritise socio-economic problems, including poverty, starvation, unemployment, water shortages, etc., all included in the Sustainable Development Goals (SDGs) set by the United Nations.

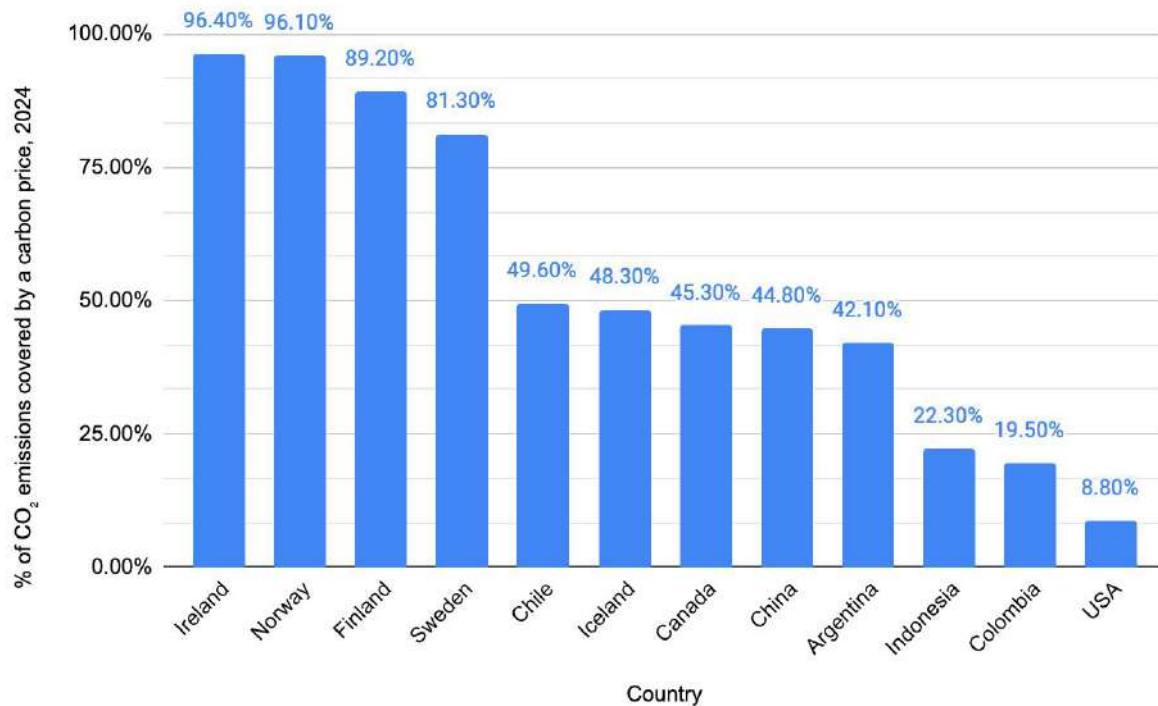
With the Global North framing the dialogue around topics such as carbon emissions, responsible consumption, etc., developing nations are left overburdened with problems that do not align with their more immediate priorities. The difference in materiality of the problems surrounding sustainable development can be observed through the “triple bottom line”, a concept introduced by John Elkington. The phrase triple bottom line (TBL) refers to “People, Planet and Profit”, which in turn represents the three spheres of social, environmental and economic development, respectively. This article aims to bring to light the disproportionate distribution of sustainable economic growth between developed and developing countries against the background of globalisation.

Historical Context

To understand the unequal burden, the historical context is of utmost importance and gives rise to another concept of ‘ecological debt’. Throughout the colonial period and the Industrial Revolution, Southern countries were drained of resources by the Northern countries, while simultaneously causing immense environmental damage and social injustice. Thus, the ecological debt refers to the collective responsibility of these Northern colonial countries for the indiscriminate exploitation of resources, making the Southern countries ‘creditors’. Most of these Southern developing countries are considered ‘debtors’ due to the large foreign financial debt they bear; however, this lens of ecological debt displays a creditor-debtor relationship between the Global North and South as the former remain indebted to the latter for the plundering of resources and impoverishing the people (Goeminne and Paredis, 2009). As reiterated, the North controls the narrative around the sustainable debate and constantly pushes a future-oriented outlook, ignoring the past actions that have resulted in present conditions. Ecological debt provides a historical perspective that is essential to consider while discussing the just utilisation of resources and who bears the onus of restoration and climate action.

Fiscal Divide in Carbon Pricing

Moving into the present, we take a look at the current fiscal capacities of different countries. We discuss some highly popular sustainable fiscal policies and their varied implementation across countries with different profiles. The first policy is the carbon tax, a concept originating in Finland, where now nearly 100% of the carbon emissions are covered under this taxation system. Carbon tax is a form of penalty paid by businesses or individuals for excessive emission of greenhouse gases, the metric of which depends on the particular government. Currently, the Nordic countries hold the title for the most successful implementation of a carbon tax.

Fig 1: % of CO₂ Emissions

Source: Dolphin and Merkle (2024)

Even though many Global South countries are becoming more advanced in technology and industry, most key patents are still owned by companies in the Global North, which means that the third countries pay ongoing fees for medicines, software, telecom equipment and agricultural products. Although these nations have developed infrastructure and green technology, they often rely on Northern-owned patents for important parts. This happens because many Southern countries lack strong research & development systems, and the Northern companies control the rules on intellectual property. This gap is linked to colonial history, weak education and the migration of skilled workers to the north.

In 1986, during GATT trade talks, the developing countries were pushed to change their laws, giving richer nations easier market access and stronger patent rights, thereby creating an advantage for the northern companies. Eventually, the issue of ‘biopiracy’ was being raised by the Global South governments. This is because many of the so-called modern innovations, in the fields of pharmaceuticals and agriculture, had their origin in the traditional practices developed by people in Africa, Asia and Latin America, and the global rules often let companies use such knowledge without fairly rewarding the communities it came from.

CBAM and the Unequal Burden of Carbon Regulation

The trend of offshoring production to developing countries in an attempt to maximise profits through cost reduction began in the early 2000s. By shifting manufacturing to developing countries which did not impose such stringent emission-related laws,

companies could produce using cheap labour, along with easy access to resources, without worrying about environmental compliance. This outsourcing of production to avoid strict environmental regulations came to be known as ‘carbon leakage’.

Carbon leakage is viewed as a global problem since emissions are disguised to be decreased when they have simply been relocated. To level the playing field and remove the competitive edge posed by foreign competitors operating under lenient environmental regulations, the European Union(EU) introduced the Carbon Border Adjustment Mechanism (CBAM). It applies to certain carbon-intensive sectors that are producing large amounts of GHG emissions during production in their respective country without any carbon price. So, to ensure that EU domestic companies do not fall behind in the internal markets, this policy was implemented. CBAM aims to combat the phenomenon of carbon leakage while simultaneously incentivising third-world countries to implement carbon pricing themselves. However, it is seen that this is not an equitable policy for Southern exporters. While CBAM intends to equalise carbon pricing for domestic and foreign competitors, it disregards limited production technologies, capacities and degree of development under which the Southern exporters operate.

India’s exported finished steel to the EU is worth approximately INR 29,534 crores (PIB, 2024), with Italy and Belgium as the largest importers of Indian steel(Kumar, 2024). Currently, the mechanism that is implemented involves an import quota, where, after a certain limit, tariffs are imposed on further quantities for carbon emissions. The EU is a crucial market for Indian exports, and this hike in export costs (almost 25%) would adversely affect several heavy industry sectors and more. Along with this, another potential mechanism that may be implemented involves carbon pricing directly based on the quantity of emissions. For Global North countries to expect and impose the same carbon pricing on Southern countries would be unfair and an ignorance of the historical consequences these countries face.

Conclusion

Addressing the uneven burden of sustainable development between the global north and south requires moving to policies rooted in mutual and equal benefits. Moreover, a shift in narrative is crucial for countries to gain equal representation and make strides in the sustainability discourse. Implementation of policies like CBAM should include processes of exemption and revenue redistribution, and a conditional approach is required. Although sustainable development concerns the present and future generations, its problems are rooted in the past and thus, centuries of colonial history, occupation and industrialisation must be an integral part of the debate; otherwise, there is no room for equity between the Global North and Global South.

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Protectionist trade policies by US and its Impacts

*Aradhita Ray, Sneha Agarwal, Manya Panjwani
2nd Year, UG*

Abstract

The U.S.-China and U.S.-India tariff disputes are the main topics of this article's analysis of the rise of protectionist policies on trade and their effects on international economic interdependence. It portrays by what method tariff wars upset supply chains, discourage offshore investment, and lead to retaliatory conduct by examining trade flows, employment effects, and investing trends. Such policies put the world economy under recessionary pressure though they attempt to safeguard home industries and close trade shortfalls. The study highlights the necessity of fair trade tactics that defend governmental interests without endangering long-term growth and global business-related balance.

Keywords

Protectionism · Tariffs · Trade Wars · Economic Interdependence · US–China Trade · US–India Trade · Environmental Impacts

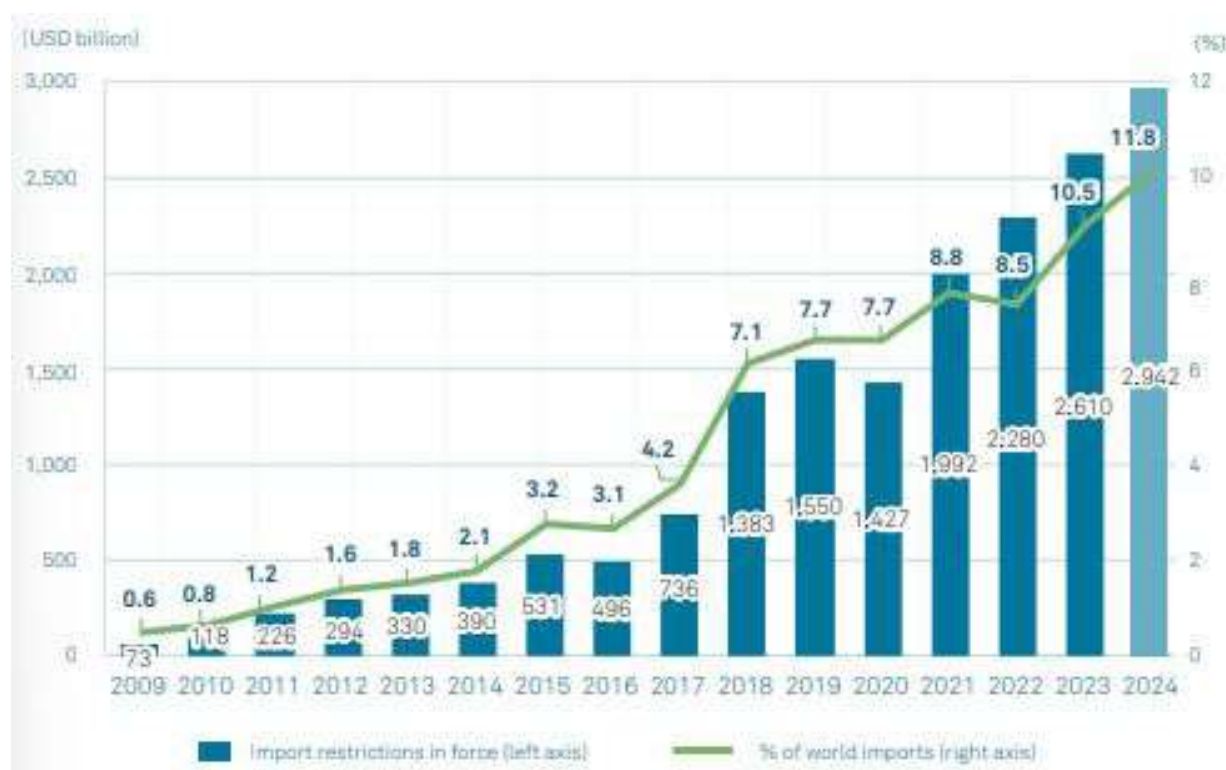
JEL Classification

F13, F14, F15, Q56, L16

Introduction

A protectionist trade policy enables a country's government to support and bolster its domestic producers by implementing tariffs and quotas on goods and services brought in from other countries (CFI). Following the swift growth of globalization and free trade between the 1990s and the mid-2000s, several major events such as the 2008 Global Financial Crisis, the prolonged US-China trade war, the COVID-19 pandemic, and the Russia-Ukraine War have contributed to a global increase in protectionist measures (MDPI). According to the WTO Trade Monitoring Report 2024, the number of import restrictions has been consistently rising since 2009, as illustrated in the chart below.

Figure 1- Cumulative trade coverage of import-restrictive measures on goods since 2009



Source: WTO Trade Monitoring Report 2024

An increase in cumulative import-restrictive measures is significantly marked by the US-China Trade War since 2018. The protectionist trade policy by the US government has been implemented due to the melting down of the industrial core and associated loss of US jobs (SCIRP 2152-7261). The US increased tariffs on import items from China targeting the same in early 2018. It targeted around \$350 billion of imports from China, to which China retaliated and targeted about \$100 billion of US exports (NBER 29315).

In August 2025, the US government introduced a 50% tariff on imports from India, which will take effect on 27 August 2025. This decision was made in response to India's growing oil imports from Russia. The aim of this action is to support the US economy by reducing the \$45 billion trade deficit with India, which is Asia's third-largest economy. (BBC)

This study aims to explore the research question: "How do protectionist trade policies, such as the recent US tariff disputes, influence the foundations of global economic interdependence?"

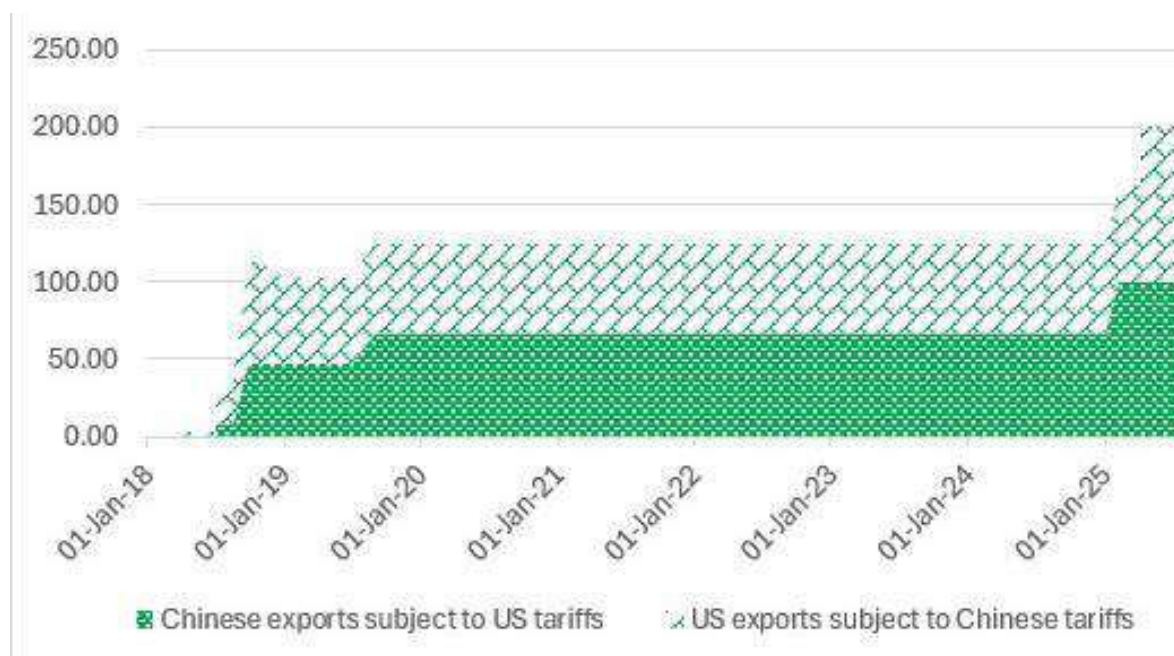
The objective is to analyze the effects of US protectionist trade policies on the global economy, with a specific emphasis on the impact on China and India.

CASE STUDY ANALYSIS

CASE 1 : US-CHINA TRADE WAR

US-China trade war in 2018 the work conflict not for the record and china begun when the us dictated duties on cosmic panels, washing machines and further on brace and aluminium china reciprocated accompanying taxes on aluminium core crop and color of blood imports from the usa the conflict middle from two points two together severed when the usa dictated supplementary 25 levies on imports from china and china exchanged accompanying 25 excises on us imports (aepr12286) further in 2025 the profession war afterwards a inactivity increased when the us set 10 rates on all imports from china under IEEPA.

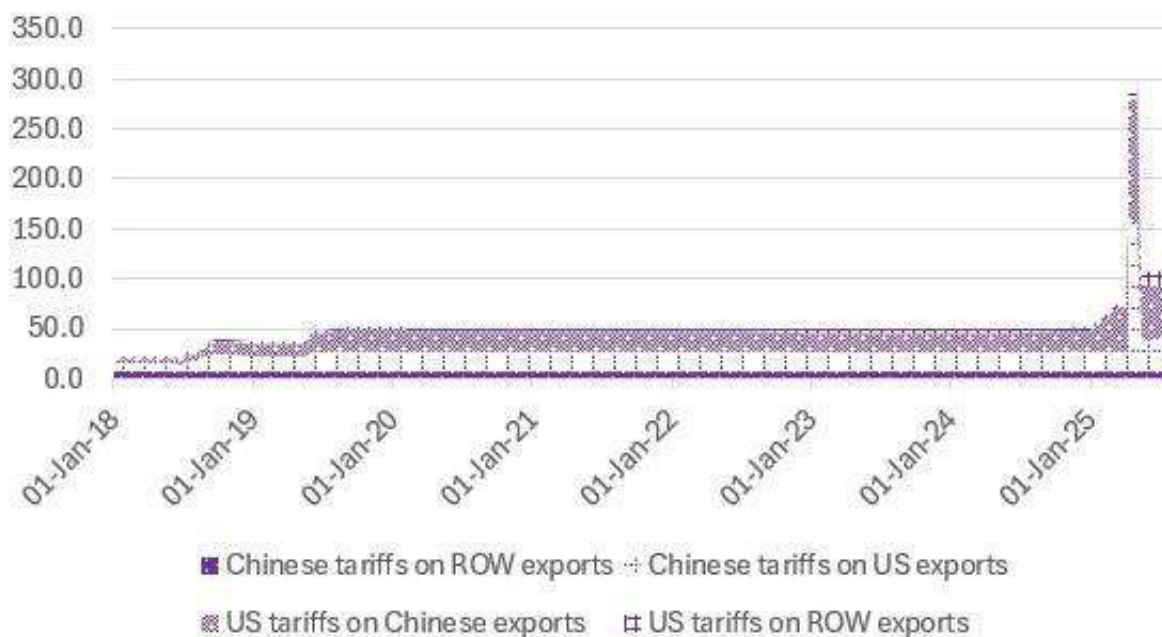
Figure 2 : Graph showing percentage of US-China trade subject to trade war tariffs



Source: US-China Trade War PIIE

Figure 2 illustrates how the U.S.-China trade war has escalated: tariffs covering over \$200 billion in U.S. exports and \$100 billion in Chinese exports have rapidly increased between 2018 and 2020, stabilized for a number of years, and then sharply increased again in 2024 and 2025.

Figure 3: Graph showing percentage of US-China tariff rates towards each other and ROW



Source: US-China Trade War PIIE

Figure 3 illustrates the escalation of the U.S.-China tariffs: starting in 2018, both nations significantly increased their tariffs on each other's exports, while maintaining comparatively stable rates for the rest of the world until 2024–2025, when U.S. tariffs on China skyrocketed around 300%.

To some extent, the decrease in US imports from China (amounting to act on US-China Economy (an economic analysis of us-china profession conflict WTO))

1. Contraction in Bilateral Trade: The rise in prices for both US and China's imports led to higher overall prices, which in turn reduced the demand for these goods.

2. Trade Diversion 1 billion) was due to an increase in imports from other developing countries. Price increases and welfare effects: The entire burden of the tariffs was borne by US importers, as the US tariffs were fully passed through to import prices, with no significant reduction in export prices from China. Decline in GDP- It decreased the GDP by altering the allocation of production and trade.

Impact on Global Economy:

1. It devised trade opportunities as exports of commodities taxed by the US or China expanded from observer nations to the rest of the world. (The US-China Trade War and Global Reallocations)

2. Larger beneficiaries of the trade war are the nations who function along downward sloping supplies, whose exports substitute US and China. (The US-China Trade War and Global Reallocations)

3. International Market Saturation and the Displacement of Producers: China has nearly a one trillion dollar surplus of merchandise on its hands, when not sold to the US, is entered into the world market at subsidized prices and lower costs removing local jobs and wages of steelworkers and fabricators everywhere. (BBC News - What would a China-US business war do to experience saving)

4. Cascading Recessionary Effects: US and China rule the world GDP combining 43 percent of the economy in worldwide trade, thus, their trade war has domino effects that do away with tinier economies dependent on them leading to economic downturns and loss of opportunities in the highly interconnected worldwide economy. (BBC News - What would a China -US trade war do to world economy)

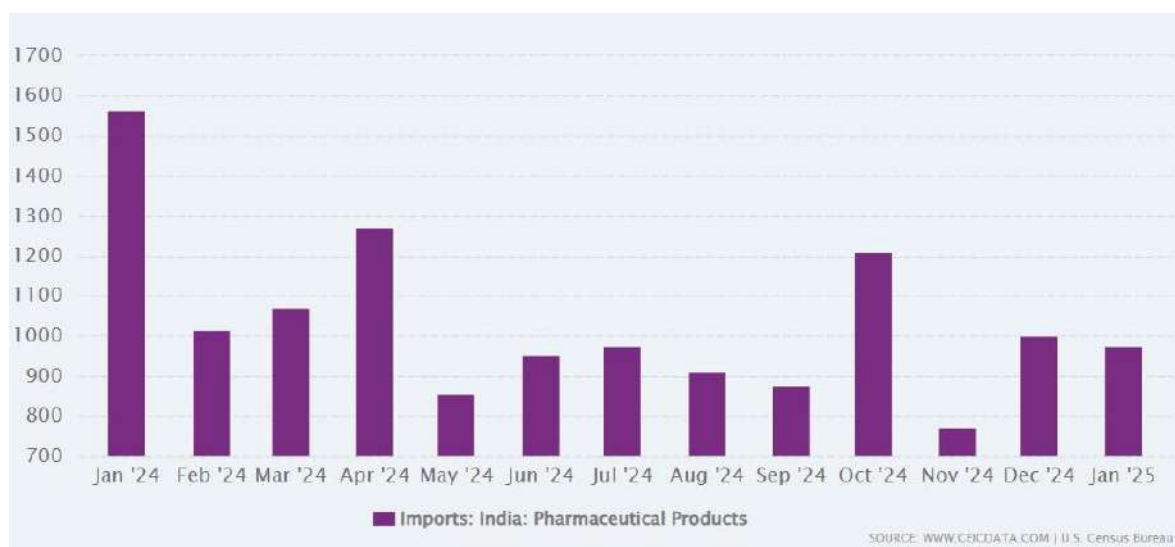
CASE 2 : US-INDIA TRADE WAR

The beginning of trade tensions between US and India happened when the US government announced an additional tariff of 25% on Indian imports for its crude oil trade with Russia. The total tariff on Indian goods will rise to 50% making India the highest tariffed country in the US.

Impact on Indian Economy:

The US introducing a 25% tariff on pharma would lead to long-term supply chain issues. The US is a 30 trillion, whereas India is a 4 trillion economy, and the US can diversify their supply chain if India chose to ban on the exports of pharma products (The US has started to move a lot of supply chain to Puerto Rico which seeks to lure manufacturing to boost its economy as the US's tariff war deepens). A lot of investors who were willing to invest in pharma build factories in India and manufacture APIs which would eventually get exported to a market like the US will prefer not to invest and hence the growth will stop because in India, the growth options are limited.

Figure 4: Bar Chart showing the US' Import of Pharmaceutical Products from India



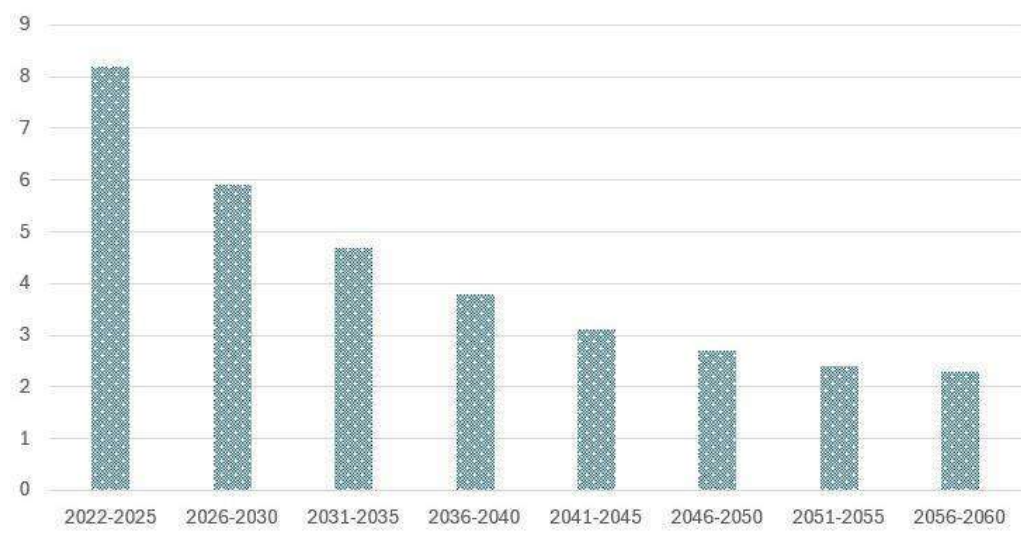
Source: CEIC, US Census Bureau

Figure 4 above, displays the monthly pharmaceutical imports from India to the United States from January 2024 to January 2025. The volatility of trade flows was highlighted by imports, which peaked in January and April 2024, declined in the middle of the year and in November, and then partially recovered toward the beginning of 2025. The graph in Figure 5 below displays the performance of Nifty Pharma on August 6th: following a steep initial decline, the index dropped 2.03% (-446.40 points) to 21,523.75, continuing its downward trend throughout the trading day.

Figure 5: Shows the Nifty Pharma in August 2025

Source: NSE

The Governor of RBI has remarked that the recent US tariffs are not likely to cause any significant short-term disruption to India's economy. India's real GDP growth was projected at 6.5% in the fiscal year 2024-25, being one of the fast-growing economies on the global platform. However, the ongoing tariff tensions between India and the US pose concerns, as they could disturb the pace of future growth. Over the years, economic expansion is expected to decelerate, with forecasts indicating a decline in GDP growth from over 8% during 2022-2025 to nearly 2% in the period 2056-2060, as illustrated in Figure 6.

Figure 6: Bar graph showing the projected growth of GDP in India from 2022-2060

Source: Projected Growth of India, EY

The price-to-earnings ratio of the Indian market is approximately 23 to 24, which is regarded as relatively high. If the Indian economy slows down and there is a lack of reasonable valuation standards, many individuals who were planning to invest growth capital in India may choose not to proceed. The net foreign direct investment during the period of April to November 2024 was very low, amounting to just 0.5 billion dollars. This figure is one of the lowest observed in recent times, which contradicts India's aspiration to transition from a low-income to a middle-income country.

Figure 7: FDI Inflows in India



Source: IMF

Conclusion

Observation of the latest protectionism trade policies of the US unravels that the global economic interdependence is facing worrisome setbacks. Even though the tariff on the imports of the Chinese and Indian commodities is meant to guard the local industries and help to reduce the trade deficits, the policy has caused retaliatory tariffs, impeded bilateral trade, and slowed investment. The US-China trade war, especially, has resulted in lowered exporting and layoff of workers and a decline in GDP. Equally, Indian export industries have found volatility in vital sectors owing to US tariffs on India which have discouraged foreign direct investment in the country posing a threat to long-term growth. Since the US and China jointly make almost half of the global GDP, the trade tensions between them worsens recessionary pressures all around. The article points to an immediate necessity of balanced trade policy that will secure the interests of the country, but not out through the overthrow of success of the global economic stability and cooperation to sustain the growth in a new globalized world economy.

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FROM MINES TO MIGHT: RARE EARTH, RESOURCE NATIONALISM AND GLOBAL POWER

Rajveer Motwani, Ribhav Parasramka, & Rishiraj Mishra
2nd Year, UG

Abstract

Rare earth elements (here on REEs) are at the center of 21st-century technological and geopolitical rivalry. Here, we theoretically examine how resource nationalism remakes the global REE market, from U.S. preeminence in the 1970s to China's de facto near-monopoly over mining, refining, and downstream manufacturing today. Analysing the scale free nature of the network we demonstrate how supply concentration and unbalanced power generate vulnerabilities for manufacturing countries. Case histories of Japan, the United States, and India demonstrate strategies from diversification, substitution, and alliances to indigenous innovation. These reactions demonstrate how REEs are turning resource control into international strategic leverage.

JEL Classification

Q32, Q34, Q37, F51, & O13

Introduction

In the 21st century, control over critical resources is as much about political leverage as it is about economic value. This strategic use of natural wealth is captured by the term resource nationalism- the assertion by governments and peoples that the benefits of resources within their territory should accrue to them, rather than to foreign corporations or states (Koch & Perreault, 2019). While the phenomenon has a long history- from the nationalisation of oil assets in the Middle East and North Africa to renegotiations of extraction contracts- its modern drivers are more varied. Today, resource nationalism is shaped not only by global price swings, but also by concerns over resource security, climate change, sustainable development, and poverty reduction (Ward, 2009). Rare Earth Elements (REEs) sit at the centre of this renewed contest for control. These minerals are indispensable for clean energy, defence systems, and high-tech manufacturing and a handful of countries dominate their production. This article examines how a major REE exporter leverages resource nationalism to strengthen its geopolitical position, and explores the ripple effects on the rest of the world with a particular focus on developing economies like India.

Global Rare Earth Market Dynamics and the Rise of Resource Nationalism

1. Market History and Shift: The global rare earth minerals (REE) market is a critical factor in international policy-making. In the 1970s, the United States leveraged the Mountain Pass mine to dominate global REE production, while China was quietly building mining, separation, and recycling capacity. By the late 1990s, China had overtaken the U.S., driving down prices and forcing many Western mines out of operation. This marked a decisive shift from a U.S.-led to a China-dominated supply chain.

2. Current Market Dynamics: While global supply is slow to change, demand for rare earths has surged across most trading nations (Hurst, 2010; Mancheri, 2012). As economic integration deepens, countries have sought to broaden trade relations, forming clusters not only regionally but strategically—such as the U.S. strengthening REE trade with Malaysia and Japan to diversify supply and improve resilience.

- **Hub producers: China (mining and refining)** - 70-80% market dominance, Australia (mining), USA (mostly mining, limited processing), Myanmar, Malaysia, Vietnam.
- **Hub consumers:** USA, Japan, EU, South Korea (for electronics, EVs, wind turbines), India, Vietnam.

The U.S. has adopted strategic stockpiling as a national security measure, as the Department of Defense notes: “Continued U.S. reliance on foreign sources for rare earth products poses a risk to national security.” Chinese export restrictions (notably on exports rather than production) and policies in countries such as Russia and Burundi—both prioritizing domestic industries or renegotiating contracts—reflect the growing trend of resource nationalism shaping the global REE market.

REE Value Chain Analysis

While called “rare”, they are not in fact rare in the Earth’s crust and can be found in many places around the earth but are not concentrated enough to undertake viable extraction. These REE’s move through a concentrated global value chain, spanning mining and extraction, processing and refining, and high-value manufacturing.

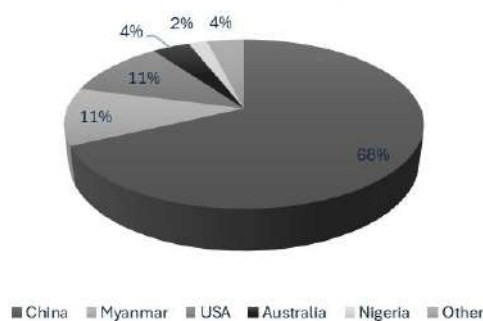
Table 1: REE Value Chain across countries

Country	Major Extraction Points	Operational Level of Extraction	Processing Capabilities	End-Product Manufacturing
China	Bayan Obo, ion-absorption clays (Southern China)	Fully operational, Scaled up	World leading: 85-90% refining, >90% NdFeB magnet production	Fully vertically integrate- produces 90% of permanent magnets
USA	Mountain Pass (California)	Partial capacity; ramping up	Rebuilding: MP Materials currently mining, beginning separation/ refinement, new investments underway.	End- Product buildout underway, Texas plant launching, Startup Vulcan and others building magnet capacity

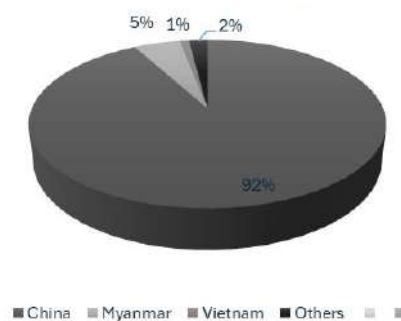
Australia	Mt. Weld under Lynas, Eneabba (Illuka), Nolans (Arafura)	Active mining, scale expanding	Outsources processing to Myanmar, refining planning begins at illuka, oxide separation at Arafura	Limited end-product capability; primarily sells oxides; downstream magnet integration still under development
EU	No notable extraction (imports)	N/A upstream	Solvay (France) refining; Neo Performance Materials (Estonia) magnets, Vacuumschmelze (Germany) alloys; nascent separation hubs	Growing magnet production and recycling; still far behind China
India	Ambadongar (Gujarat), IREL operations	Early-stage development	Planning for refining facilities for the long-term future, looking to develop partnerships with other nations	Working to establish domestic magnet production capabilities apart from sole producer IREL
Vietnam	Dong Pao deposit	Developing; early stage	Limited to no processing yet	No downstream capabilities yet

As illustrated by the table, we observe the REE supply chain to be majorly concentrated in

Mining Ratio of Rare Earths by Country (2023) Percentage



Processing Ratio of Rare Earths by Country (2023) Percentage



China when we consider a fully integrated value chain. A good number of countries tend to excel in either mining or refining, but rarely both. China's advantage lies in its dominance across all stages, granting it near-monopoly control over the REE market.

The 2010 Rare Earth Shock: Japan's Supply Chain Wake-Up Call

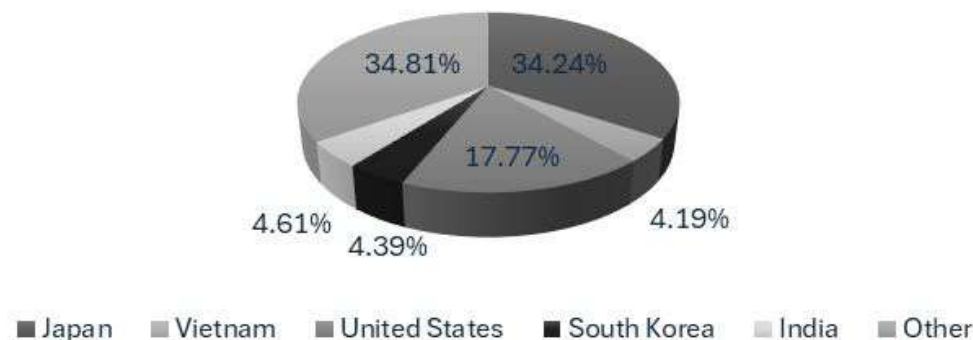
In September 2010, amid escalating geopolitical tensions, China, exporter of nearly 90% of Japan's rare earths—imposed an export ban on REE. The move delivered a severe blow to Japan's automotive and electronics sectors. In response, Japan adopted a two fold strategy to reduce reliance on Chinese imports. First, the Japan Oil, Gas and Metals National Corporation (JOGMEC) and trading firm Sojitz invested in Australian miner Lynas, securing 65% of its heavy rare earth output, processed in Malaysia. In March 2025, Japanese energy firms and JOGMEC further invested over €100 million in France-based refiner Caremag. Additionally, Tokyo launched a \$1.2 billion program in October 2010 to develop rare earth substitutes, expand recycling, and build stockpiles. Strategic partnerships with multiple countries further strengthened supply security. As part of its R&D initiative, the New Energy and Industrial Development Organization (NEDO) has started to develop motors that do not require usage of rare earths. These initiatives have enabled Japan to reduce its dependency on Chinese imports from alarming 90% to 50% in recent times. This way Japan has set the precedent on how economies deal with cases of resource nationalism which will be instrumental in analysing the current impact of the Chinese export ban on RRE.

The Current Rare Earth Standoff: China at the Center

The opening months of 2025 have been marked by acute volatility in global trade, triggered by a series of tariff sanctions from the world's largest importer—the United States. The first strike came in February, when the US imposed a 10% tariff on Chinese imports tied to fentanyl supply chains. Beijing retaliated swiftly, targeting US coal, LNG, agricultural machinery, and other key exports. What began as a targeted measure rapidly escalated into a tariff war, with rates surging to 145% on Chinese goods entering the US and 125% on American goods bound for China.

Amid this escalating standoff, April brought a disruptive shock when China imposed export restrictions on rare earth elements. With over 90% control over global heavy rare earth production, China's move sent shockwaves through the automotive and heavy electronics industries worldwide. The ban exposed deep vulnerabilities in global supply chains, forcing corporations into a scramble for alternative sources to keep production lines running.

China's Export of REE Products by Country (2023) Volume



The sections ahead assess how the world's major import-reliant economies are confronting this supply shock—and the strategies that may determine their future position in the global market.

Strategic REE Dependencies in Key Manufacturing Nations: Supply Chains, Trade Pacts, and Elasticity Outlook

In this section, we conduct a theoretical examination, focusing on the ability of a developing and a developed country, namely USA and India to reduce reliance on concentrated supply nodes like China. We assess their potential to diversify towards a broader, more reliable supplier base capable of meeting the growing demand for critical minerals.

United States of America:

- 1. Existing Capacity and Import Dependence:** China has built dominant capacity across the rare earth supply chain—mining, separation, metals, and magnets—leveraging low costs, accessibility and integrated industrial clusters to secure global customers. Rebuilding each stage in the U.S. has proven capital, skill, and time-intensive, leaving the nation reliant on China for 70–80% of REE imports. While domestic mining exists, processing capacity remains minimal.
- 2. Substitution, Innovation, and Domestic Projects:** Efforts for substitution and development of alternatives are being undertaken, both, by companies in the U.S. and by the government itself.
 - Toyota has developed a magnet that does not require HREs, while also reducing the Nd content, though it is not currently being used in their HEVs due to lower performance. Urban Mining Company also recycles NdFeB domestically.
 - Some companies including MP Materials, USA Rare Earths, Noveon and Quadrant are focused on building U.S. magnet capacity while,
 - In the automotive industry, Tesla, BorgWarner, Arnold Magnetic Technologies and Turntide are working in order to advance REE-free motor designs and applications.
- 3. Treaties, Alliances, and Policy Reform:**
 - The Infrastructure Investment and Jobs Act (IIJA) of 2021 (IIJA) establishes a new rare earth program, with \$140 Million funding.
 - USA Rare Earth–ASM (Australia): Secured non-Chinese rare-earth feedstock for U.S. magnet manufacturing. ASM–U.S. DoD Talks reflect the aim to build rare-earth alloy production in the U.S. by 2030.
 - Minerals Security Partnership (MSP) - Coalition of 14 nations including Australia–Japan–U.S are deepening cooperation on processing capacity and stockpiling via shared investments and reciprocal financing tools.
 - G7 rare-earth action plan, U.S.–Canada–Brazil–India dialogues, and U.S.–Australia–Kenya mining/pipeline collaboration further broadens the alliance network.

India:

- 1. Existing Capacity and Import Dependence:**
 - Although India possesses considerable light rare earth deposits, the absence of adequate refining and magnet-manufacturing capacity has historically necessitated imports.
 - Indian Rare Earths Limited (IREL) has been the primary extractor of placer sands, but without downstream processing of heavy rare- earth magnets, strategic industries such as defense and electric mobility remained structurally dependent on Chinese permanent magnets.

2. Substitution, Innovation, and Domestic Projects:

- Recent Government initiatives now emphasize both resource expansion and technological substitution. The private sector also participated with Gujarat Mineral Development Corporation's (GMDC) Ambadongar project in Gujarat, projected to be operational by FY 2028, and is positioned as the first large-scale indigenous rare earth mining venture.
- Similarly, Sona Comstar is investing in localized rare earth magnet production and in-house R&D for next-generation permanent magnets.
- Parallel to this, Indian firms are pursuing alternatives to reduce vulnerability. OLA Electric is developing rare-earth-free motor technologies, integrating ferrite motor design innovations that circumvent magnet dependency. These parallel strategies illustrate a dual emphasis on resource mobilization and technological autonomy.

3. Treaties, Alliances, and Policy Reforms:

- India has initiated a 7-year National Critical Mineral Mission and amendments to the Mines and Minerals Act provide frameworks for accelerated exploration, recycling, and overseas acquisitions. Under this mission, the Geological Survey of India will undertake 1200 mineral exploration projects.
- The India Ministry of Heavy industries has announced a Rs. 1345 crore PLI Scheme to encourage rare earth magnet manufacturing.
- In July 2025, the Quad group- USA, Japan, India and Australia launched a joint Critical Minerals Initiative to coordinate investments and technology in mining and processing of REE.

Our Analysis of the REE Market:

1. Scale - Free Network: The market remains structurally concentrated in supply but diversified in demand, where a few trade countries act as major trade hubs. The market can be seen as a hub and spoke network, where few nodes have many connections - few exporting countries are connected to multiple importers and most countries trade only with a few partners. This resembles a scale-free trade network (Newman, 2001). Certain characteristics thus observed in this market are:

- **Robust, yet fragile** - Withdrawal of participation by a peripheral node (a small producer) has limited impact on global flows. However, any volatility or change by a major hub can disrupt global trade flow.
- **Path Dependent Access** - Small REE producers can access the global market by linking through hubs, without building multiple and complex bilateral agreements.
- **Asymmetric Power** - Major hubs or nodes hold a lot of leverage in the market. They can influence prices, supply, and even the performance of domestic industries of other nations which are heavily reliant on their exports. They hold strategic power which is leveraged in international policy as well.

2. Armington Elasticity: Armington elasticity here refers to the economic parameter that measures how producers can substitute between products from different countries. We analyse this metric for short, medium and long term stages in REE consumption:

- **Short-term** - China's near-monopoly strengthened by its fully integrated mining to processing value chain, results in extremely limited substitutability. Limited processing capacity outside China makes reliance on Chinese imports unavoidable.
- **Medium-term** - As developing economies like India, Vietnam and others reach scalability in the light REE processing and as developed economies like the US and Japan boost internal manufacturing capacity and strategic investments in Myanmar, Malaysia, we can expect the elasticity to rise to moderate levels, even though facing environmental and regulatory constraints.

- **Long-term** - Technological advances in REE recycling, and development of substitute technologies for critical applications, and broader geographical distribution of processing could improve self-reliance. However, due to resource endowment constraints and imperfect substitutability, complete self-sufficiency for all major economies is unlikely; the market will probably retain some structural concentration.
- 3. Extraction and processing mismatch:** From our analysis, we have observed that a major reason for a concentrated global REE supply chain is not resource unavailability; instead, scalability of processing facilities have been the primary concern. Historically we have seen that Japan-Vietnam REE collaboration had to be drawn back since Chinese supply kept prices at such levels which failed to justify the economic viability of the project. However with increasing applications of critical minerals in electric mobility, aerospace (drone manufacturing) and defence and improved capital mobility we can expect reasonable capacity enhancement. **Strategic Partnerships, private enterprise and public sector involvement** will play a pivotal role in bridging this mismatch.

Conclusion

From our analysis of the market, we see that the Chinese-held near monopoly acts as a major advantage to the nation, and is an important issue that other nations are trying to deal with, by diversifying their supply chain and developing new technologies. We come to certain conclusions about the REE market from here:

1. The scale-free trade network structure acts as an economic and geopolitical liability to all nations, other than China, where it is the inverse.
2. We come to conclude that this commodity market is unique in the sense that it is not vulnerable to demand shocks (until the development of perfect or close enough substitutes – in terms of efficiency, performance and economic viability), however it is majorly affected by supply disruptions.
3. We see that, although, not in the short-term, but in the medium to long-term, countries are working to develop their domestic capacities, and technologies, to be able to compete or at least stabilize their supply chain and reduce their dependency on China.
4. A major issue in the market exists, not in the availability of REE resources, but in the extraction, processing and end-product manufacturing together. The fact that China has already attained economies of scale to a great extent and undercut global prices, does not allow other nations to compete feasibly due to their inability to attain such scale and price - losing a lot of money in the process.

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MANAGING DEMAND UNCERTAINTY IN GREEN SUPPLY CHAINS: A PROBABILISTIC APPROACH

*Sneha Agarwal, Harshita Bhojania, Nandini Singh
2nd Year, UG*

Abstract

Stock imbalances, wastages, and increased emissions are all variables that could be brought about by uncertainty of demands in the green supply chains. The probabilistic models, that is, Monte Carlo simulation, Bayesian updating, and two stage stochastic programming counter these problems by directly considering the variability of the demands and preferences of the environment. In this article I compare the strengths of each framework in creating scenarios, real time data inclusion and strategic capacity planning. We provide viable recommendations on how to pick and implement such methods to increase the accuracy of forecasting, streamline resources, and boost sustainability programs within the green supply chains.

JEL Classification

C15, Q56, D81, L91

Keywords

Green Supply Chain Management, Demand Uncertainty, Probabilistic Models, Risk Management, Sustainability

Introduction

With the increasing importance of being sustainable in order to decrease the impact on the environment without sacrificing effectiveness, supply chains are under increased pressure to pursue green practices. Current developments indicate that 80 percent of supply chain leaders are increasing environmental performance. Green Supply Chain Management (GSCM) factors in environmental friendliness into all their manufacturing process, logistic operations and product design, which also includes end-of-life awareness. However, in most organisations, GSCM seems to be a difficult task because of low motivation, minimal executive commitment, ineffective governmental support and expensive investment. The uncertainty of the demand that is frequently ignored may cause inefficiencies and waste. The article fills that gap by focusing on the probabilistic model of risk management in GSCM. By comparing the demand risk assessment, Bayes updating and Monte Carlo simulation, we determine the effectiveness of the three techniques in modelling the variability in demand and preferences in the environment. Our analysis provides practical decision recommendations on what is the best probabilistic model to adopt to increase the accuracy of forecasting, maximize resources, and maximize the sustainability results in green supply chains.

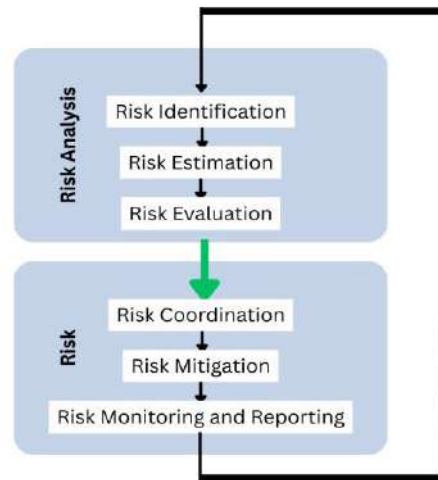
Risk Analysis Framework

Supply chain risk management process is a sequential procedure of risk identification, analysis and management of risks that may interfere with the business supply chain operations and performance.

The diagram shows the process of supply chain risk management, which consists of two principal stages:

- Risk Analysis: It looks into the risks in question, and it entails risk identification, estimation and assessment.
- Risk Control: This is the risk coordination, risk mitigation, risk reporting/monitoring.

The process starts with analyzing risks, followed by putting on controls to manage and constantly monitor the supply chain risks.

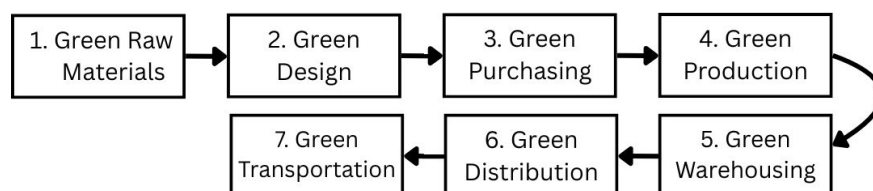
Figure 1: Supply Chain Risk Management Process

Source: Self Derived by Author

Demand uncertainty is directly applicable to the risk identification stage, where a variation in customer demand has been identified as a risk that may affect stability in the supply chain. During the risk assessment step, the consequence and probability of these demand changes will be determined, and this will be used by organizations to understand how the demand uncertainty might impact costs, stocks, or customer service levels and subsequently prioritize a mitigation action.

Green Supply Chain Integration

The green supply chain process entails the employment of sustainable activities at every stage of the process, which includes the sourcing of environmentally friendly raw materials to considerations in environmentally friendly product drafting, procurement and manufacturing.

Figure 2: Steps of green supply chain management

Source: Saada (2021).

The model has shown seven linked processes, namely: green raw materials, green design, green purchasing, green production, green warehousing, green distribution, and green transportation. Importantly, warehousing is connected to production as there are recapitulated improvements or returns. Every component is concerned about trying to have the least impact on the environment by trying to keep waste collection levels as low as possible, waste generation levels, emissions, and consumption of resources and promoting the idea of ethical sourcing and streamlined logistics. This strategy has helped in ensuring the effectiveness of operations as well as sustainability across the whole supply chain.

Probabilistic Modelling Approaches

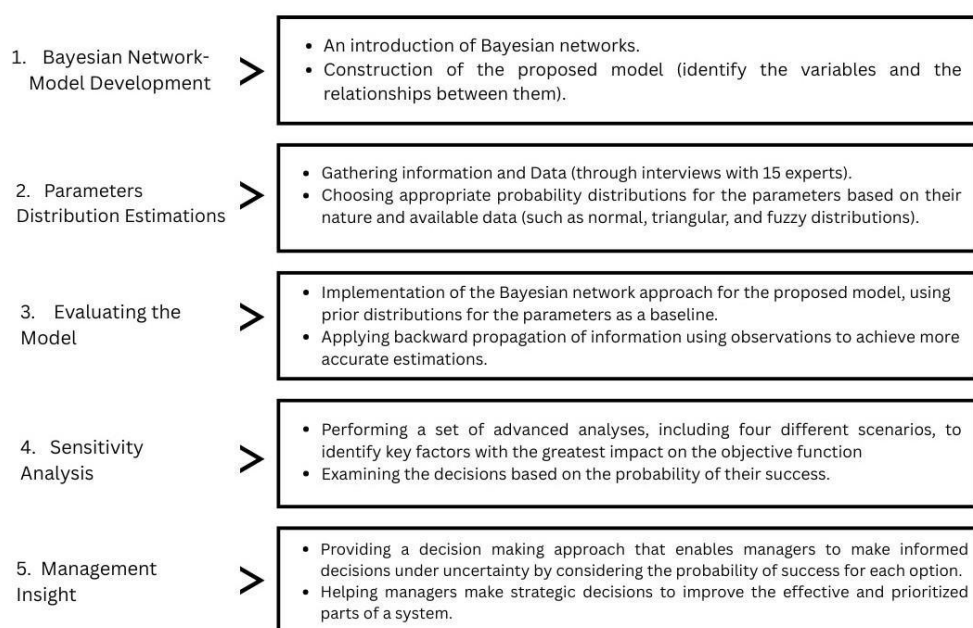
1. Monte Carlo Simulation

Monte Carlo Simulation is based on random sampling whereby thousands of scenarios are generated using probability distributions of the risks, costs and timings connected with disruption in the supply chain. The flowchart below is a mixture of a hybrid system in that heuristics inform the Fuzzy Logic or historical data can inform the Artificial Neural Networks to inform the risk estimation, which forms the driving influence in the Monte Carlo process, and thereby generating the risk cost versus security level graph. This allows for the simulation of demand scenarios and price sensitivity, taking into account price and environmental sensitivity by sampling distributions of these variables. This hybrid AI augmented way of supply chain risk management aims to respond to disruptions and calculate the cost and prevention strategies in one and the same package.

2. Bayesian Updating Models

Bayesian Updating Models integrate expert-elicited priors with incoming market observations to continually refine probability estimates. In the provided flowchart (Fig. 3), initial network structure and parameter priors are defined, then real-time sales or survey data are incorporated via Bayesian updating to generate posterior distributions. This iterative learning process is highly relevant for modelling sustainable product adoption patterns—by starting with market-research priors on eco-product uptake and updating them with live adoption metrics, firms can detect shifts in consumer preferences, forecast adoption curves more accurately, and tailor green marketing or production strategies in near real time.

Figure 3: Research Methodology



Source: Self Derived by Author

3. Demand Risk Assessment

Demand risk is associated with the abundance or shortage of the products in a green supply chain as compared to the predicted customer demand. Such practices in global procurement increase risks of supplier concentration and single sourcing and inspire new customer relations in need of sustainable products. Demand risks are classified as external supply chain risks, with the demand risk as having fluctuations and leading to stock-outs or overstock, and the factors that are associated with the demand risk include trust with customers and suppliers, supplier concentration, and single sourcing dependencies. Efficient evaluation synergizes these aspects diagnosis of accuracy of forecasts, the diversity of suppliers, and the trust of stakeholders to mitigate uncertainties in demand to aid green logistics.



Application and Discussions

Rising energy crises and environmental concerns are forcing governments to cut their carbon footprints. There is a boom in the popularity of green technologies, especially for EVs. The actual reduction in gas emissions, however, depends on the source of electricity used for charging. The risks faced by global supply chains are rising, due to economic, environmental and political factors. Traditional supply chains, which often focused on efficiency and minimising cost, usually ignored sustainability. However, green supply chains emphasise the reduction of impact on the environment by the use of materials that are sustainable, recycling them, and lowering emissions. Green supply chains, however, are much harder to manage than traditional ones. Companies need to mitigate risks like demand fluctuations, unexpected disruptions, etc. Additionally, renewable energy is a key component in green technology. For many companies that provide energy, it is a necessity to shift from fossil fuels to green sources of power, but due to the complex nature of the renewable energy supply chain, which involves actions from raw material sourcing to grid integrations, a successful navigation of this space in the economy is quite difficult. Some challenges identified by researchers in the past, of integrating green suppliers into the supply chain, include quality assurance issues, higher costs of procurement, and difficulty verifying the suppliers' green practices etc. Some of the proposed solutions to these problems include a diversification of the supplier base, increasing investment in development programs for suppliers, and clear evaluation criteria and supply chain audits.

An opportunity of this situation thus lies in the potential development of evaluation criteria and advancement in relevant technologies.

Probabilistic methods, like risk simulations, help analyse situations instead of relying on fixed predictions, and the use of such methods can allow firms to prepare for a range of possible outcomes. The goal is to balance sustainability with cost efficiency.

Conclusion

Monte Carlo simulation, Bayesian updating, and two-stage stochastic programming are the approaches to risk management in green supply chains, but with particular advantages related to managing plane demand. Cost-effective, environmentally friendly operations do occur through scenario analysis, real-time forecast optimization and capacity optimization. We offer comparative guidance, indicating to managers the right type of probabilistic approach concerning the availability of data and strategic objectives. The greater use of the models would enhance the resilience of the supply chains and contribute to the aim of sustainability.

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RETHINKING MSP: NAVIGATING INDIA'S AGRO FUTURE THROUGH LEGALISATION OF MSP: AN IMPACT ANALYSIS

Astha Thakur, Snigdha Das and Shaoni Makal
3rd Year, UG

Abstract

India, historically recognised as an agrarian country, has witnessed rapid productivity in its agricultural sector after implementation of Minimum Support Price (MSP), a crucial element of India's agricultural policy. However, it is observed that absence of legal backing has limited the effectiveness of the framework, leaving the farmers vulnerable to market exploitations and erratic climatic conditions. Recently in 2020-21 nationwide farmers' protest against the Central Government's regressive three farm laws, brought the demand for legalisation of MSP in the spotlight, which sparked a multifaceted debate on India's agricultural future across the country. This article aims to study the impact of legalising MSP, explore its merits and demerits and analyse its potential in India's agricultural landscape through a balanced lens.

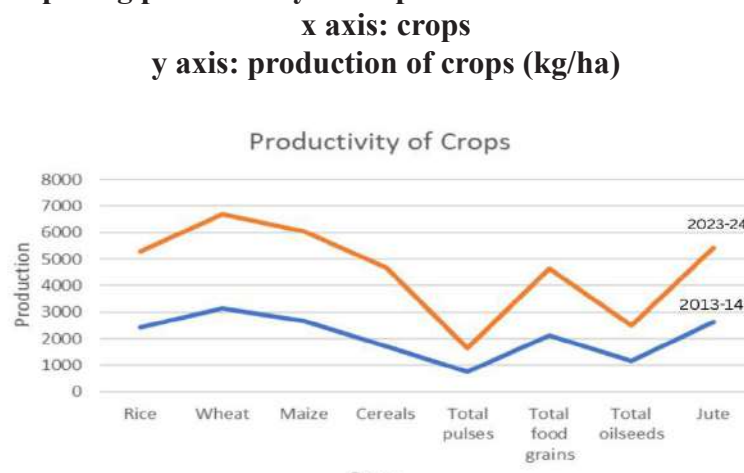
JEL Classification

Q11, Q13, H53

Introduction

India holds agriculture at the central place in its socio-economic fabric, providing livelihood to a significant portion of population. Despite its enormous contribution to the workforce, agricultural sector continues to face numerous challenges like climate change, low productivity, market inefficiencies, erratic monsoon, lower technological interventions, price volatility, etc. All these led to the introduction of MSP by the Indian government as an interventionist policy in the 1960s, in order to encourage farmers to grow staple crops like wheat and rice during the Green Revolution, thereby ensuring food security in the newly independent nation (Jana & Manna, 2024). Once established, MSP framework witnessed massive success including higher productivity, financial stability and food security across the country, which triggered the government to introduce various initiatives and reforms in order to boost the agricultural sector. One of these includes an increase in the budget allocation by the Department of Agriculture, Cooperation and Farmers Welfare from Rs 11915.22 crore in 2008-09 to Rs 21933.50 crore in 2013-14. This further was increased to 122528.77 crore in 2024-25, reflecting the government's positive approach towards agricultural development (<https://pib.gov.in>) Various schemes such as PMFBY (Pradhan Mantri Fasal Bima Yojana, 2016), PMKMY (Pradhan Mantri Kisan Maandhan Yojana), PM-KISAN, 2019 were also launched for the benefits of the small, marginal farmers.

Fig: Graph comparing productivity of crops between 2013-14 and 2023-24 (kg/ha).



Source: Authors' estimates based on PIB data

Flaws In The Safety Net

Though India undoubtedly reaped several benefits through the MSP mechanism, several loopholes hinder its utilization to full potential and erode its overall effectiveness. Few of them are listed below:

- Though MSP is announced for 23 crops, the actual procurement by the government remains heavily skewed towards wheat and paddy, leaving the remaining 21 crops with little to no support.
- The benefits of MSP often exclude small and marginal farmers, who typically lack the resources to meet the scale required for government procurement. As a result, these farmers are forced to rely on the local market and are vulnerable to exploitations by the intermediaries. Agricultural data analysis reveals that a mere 6% of India's total farmers receive MSP benefits, with the majority being large farmers.
- Foodgrain procurement in India is concentrated in only a few states, exacerbating regional disparities. This bias towards few states underscores the inequitable procurement system.
- Gradual deviation of MSP from the actual market prices also leads to the question of policy credibility and market inefficiency.

Fig: Graph representing the mismatch between MSP and Actual Market Prices

x axis: Years

y axis: price per quintal



Source: PIB

Given the adverse consequences and existing inefficiencies as mentioned above, the big question now emerges whether the MSP framework should be retained or reformed or removed. It is evident that MSP acts as a lifeline for small, marginal farmers, especially in times of recession. So, the removal of MSP without any strong alternative may lead to suicide of huge population of small farmers.

- In India, where agricultural markets are still developing and labour intensive, MSP provides price assurance and stability. It also acts as a safety net for farmers, ensuring them to receive a minimum guaranteed price for their produce.
- MSP incentivizes production of essential crops like wheat and rice, ensuring a stable supply and helps the government to continue the Public Distribution System (PDS), assuring food security for millions (Modi, R., & Shahenaj 2025).

- Thus, despite several loopholes, MSP, the cornerstone of India's agricultural policy, remains as an important benchmark in reducing rural distress, economic inequality and unemployment in the farming sector.

Hence, removing MSP would neither be an effective nor a justifiable solution, especially in current socio-economic context. The flaws in the MSP mechanism highlight the need for comprehensive reforms, not removal. In this context, demand for legalizing MSP has played a key role as one of the most debated and significant proposals for reforming the system.

MSP as a Legal Right: Innovation or Intervention?

The farmers protest of 2020-21, which was triggered by the regressive three farm laws by the central government, witnessed popularisation of the call for legalisation of MSP as a large section of farmers were demanding legal status of MSP. This would guarantee them price fairness, help them increase their incomes, and reduce their vulnerability towards market volatility and climatic distress. However, critics consider legalisation would lead to market distortion, promotion of overproduction resulting in intolerable fiscal burden on the government. Thus, in this section, we **analyse the impact of legalisation of MSP both in terms of potential benefits and drawbacks.**

- Legalization of MSP would provide a safety net to millions of small and marginal farmers against market fluctuations and price volatility, ensuring they would receive a minimum price for their crops and hence, safeguarding them from selling their products at very low prices (Gupta, P., Khera, R., & Narayanan, S., 2021).
- It would also minimize the exploitation of farmers by middlemen, where they buy farmers' produce at lower prices and sell it at high mark up prices in the market. This is a consequence of farmers' low bargaining power.
- MSP legalisation nationwide would lead to reduction in regional disparities and hence reassuring farmers from all over the country to continue their role in agriculture and satisfying their discontent.

Niti Aayog's study on the evaluation of MSP provides evidence that assured pricing would also encourage the farmers to involve themselves in better agricultural practices which would further increase their productivity. MSP backed procurement is also necessary to ensure food security through the Public Distribution System run by the government. Providing legal status to MSP would also facilitate in providing support to other crops and hence reducing the dependency of farmers on few crops specially rice and paddy. Legal status would also ensure that the benefits of the scheme are not restricted to the large farmers leading to equitable and inclusive growth. Overall, legalizing MSP would stimulate rural economic growth and development and hence bring revolution in the Indian agricultural sector.

Along with several advantages, backing MSP with legal status also brings certain disadvantages which are alarming and need critical examination. There is a growing argument that legalizing MSP would incur a huge fiscal cost on the government. Estimation says that the combined value of all crops covered under MSP may exceed rupees 11 lakh crore which constitutes a large portion of the Union budget and hence questioning legalization's feasibility. Critics also argue that statutory support to MSP would lead to reduction in market competitiveness due to crowding out of private members and hence cause market distortion undermining the efficiency of the overall agricultural sector. It would also be challenging to supervise the implementation of the policy due to vastness of the country

TABLE: Analysis of the impact of farmers income with and without legalizing MSP

Indicator	Before MSP Legalisation	After MSP Legalisation	% Change	Source
Average Farmers' Income (Rs/year)	50000	75000	+50%	NSSO Reports
Wheat Price (Rs/Quintal)	1500	2000	+33%	Agriculture market Data
Government Procurement (%)	30%	60%	+100%	FCI Annual Reports
Crop Yield	2000	2500	+25%	Ministry of Agriculture
Private Sector Investment	Moderate	Decreased	Negative	Legal Guarantee of Minimum Support Price (MSP) and Indian Agriculture: issues and options

Source: Author source from various: NSSO reports, Agricultural data, FCI annual reports, Ministry of Agriculture

Conclusion

MSP framework remains as an indispensable safety guard in India's agro sector. However, the existence of numerous structural and economic limitations over the years underscores the pressing need for a legal backup for MSP in the developing economy. Its implementation should ensure price stability, income assurance and rural development. Despite its benefits, legalisation of MSP comes with its own set of challenges which have been already mentioned in the above section. So instead of solely legalizing MSP, a more balanced approach can be adopted, which would include several reformations like increased agricultural investments, price stabilisation fund etc. Alternative support mechanisms like **income support schemes** can also be implemented.

Additionally, modernizing market infrastructure, enhancing the e-NAM network, and enforcing mechanisms to ensure MSP adherence will also ensure sustainable development in India's agricultural sector. To improve its efficacy, incorporating global best practices and tailoring them to local conditions can also be beneficial. For example, Thailand's guaranteed income scheme and Madhya Pradesh's Bhavantar Bhugtan Scheme present effective alternatives to the traditional MSP model by offering price deficiency payments that minimize market distortions (Jana & Manna, 2024). Thus, a reformed and legally backed MSP framework would be foundational in transforming Indian agriculture into a more efficient, inclusive and resilient sector.

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MILITARY KEYNESIANISM IN A GLOBALISED WORLD: TIME TO RETHINK

Ahona Acharya, Anushree Mondal, Neha Ann Abraham
3rd Year, UG

Abstract

“However little money there is for anything else, there’s always enough money for a war.”
- John Lanchester, London Review of Books

With growing global imbalances due to trade restrictions, policy unpredictability and geopolitical tensions, the old notion of Military Keynesianism, which saw its advent in the aftermath of World War II and strengthened during the Cold War, is resurfacing. But can this strategy of Military Keynesianism act as an economic stimulus to propel *growth and development* in the highly globalised and interdependent 21st century? This article critically examines who gains and who loses in the adoption of such a strategy in contemporary times. What are the tradeoffs involved: the rise in public debt, the deprivation of basic social needs and the environmental strain caused by the expansion of militarism. Hence, it aims to unravel the multifaceted dimensions and viability of Modern Military Keynesianism and offer a refined perspective on its practicality and limitations.

JEL Classification

H56, E62, O10, F52, O23

Introduction

From spending on the production of bullets, fighter jets, to military bases, the idea of government spending on defence has gone far beyond national security. For decades, countries have used such spending to stimulate economic growth, create jobs, and stabilise demand—a strategy known as Military Keynesianism, where defence expenditure becomes a tool of macroeconomic management. As Johnson (2004) defines it, *“Military Keynesianism is a system where a nation’s economic health depends on sustained military expenditure, not merely for defence, but as a tool of macroeconomic management.”*

Military Keynesianism is, however, different from Keynes's original idea or rather, military Keynesianism is an extended form of Keynes's thought. Keynes was in favour of peaceful, socially productive expenditures and not military buildup, which has long-term socioeconomic effects and destruction. The idea of military Keynesianism emerged with the Cold War, which was a power struggle between two ideologically opposed yet economically strong nations: the U.S. and the Soviet Union. Throughout the Cold War, US Military spending increased persistently in absolute terms from \$9 billion in 1948 to over \$300 billion by 1989 – but declined as a share of GDP from over 13% during the Korean War to around 5% by the cold war’s end, reflecting both sustained defense priorities and the rapid growth of the American economy. This contributed to the success of military Keynesianism for the United States as it could sustain economic growth, create employment with consistent military expenditure, but it saw the collapse of the USSR.

But what about the 21st century? With technological advancement, where modern defence is highly dependent on technologies like artificial intelligence, offering a limited job opportunity, and exhibiting high opportunity costs, does military Keynesianism still boost the economy is a question we cannot avoid.

Military Keynesianism: A Critical Analysis of Growth and Development

Governance, inflationary financing, and the crowding-out of productive investments. In contrast, developed countries show a mild positive association between military expenditure and growth, likely due to arms exports, military R&D spillovers, and stronger institutions. According to "Fiscal Multipliers in Advanced and Developing Countries: Evidence from Military Spending" In the past, when global conflicts led to increased government spending on defence to drive growth, similar conditions prevail today. Rising protectionism and geopolitical rivalries have created global economic uncertainty and have pushed countries to rely more on internal government spending (like military budgets) to keep their economies running. World military expenditure rose by 9.4 per cent in real terms to \$2718 billion in 2024, and the steepest year-on-year rise since at least the end of the Cold War. According to the SIPRI report, the top 5 military spenders are the United States, China, Russia, Germany and India, which account for 60 per cent of the total spending of \$1635 billion. The latest policies adopted by European countries suggest that Europe has entered a period of increased military spending that will likely continue for a while. Lately, the UK Government claims that military spending is its economic salvation while wearing fiscal handcuffs of its own making. Germany is shedding decades of fiscal conservatism in the hope of reviving economic growth, modernising its crumbling infrastructure, and scaling up military spending. NATO countries, under the initiative of ReArm Europe, committed in June to spend 2.8% of GDP on defence in 2026 and then increase it to 5% - a new target to be achieved over the next 10 years, representing a jump worth hundreds of billions of dollars a year from the current goal. The European Commission voices its opinion on the fact that ramped-up arms production will bring “benefits for all countries.” But such a diction, which may sound politically convincing, is economically futile. The Economist warns that the most visible macroeconomic consequence of larger defence budgets is likely not growth, but fiscal pressure. It argues that increased military outlays will strain public finances, widen deficits,

and put upward pressure on interest rates—all of which risk dampening long-term economic expansion.

The relationship between military expenditure and GDP growth is a matter of contest in economic literature, and the finding of such studies varies from country to country. A detailed meta-analysis of 243 estimates across 42 studies reveals that military expenditure as a share of GDP generally exerts a negative impact on economic growth, particularly in less developed countries (LDCs). This negative relationship is driven by factors such as corruption, inefficient by Viacheslav Sheremirov & Sandra Spirovska (Federal Reserve Bank of Boston Working Paper, 2019), government military spending is more effective in recessions than in expansions. The one-year response of output to a unit shock in government spending is 1.7 in recessions and 0.3 in expansions. The study also estimated one-year fiscal multipliers from military spending range between 0.75 -- 0.85, with cumulative impact approaching 1. Federal spending has ripple effects throughout the economy. When the military budget is increased it comes at the expense of cuts to domestic, foreign aid and other social projects. To increase military funding, other sectors, such as healthcare and education, see a decrease in funding. War spending is one of the ways to increase employment in the military itself as well as in the industries that supply goods and services to the military. But the real question is what is being sacrificed when defence spending is increased. When money is spent on the military and homeland security, we lose the opportunity to spend those funds on other things like education, healthcare, infrastructure, or clean energy. By forfeiting those opportunities, we lose the chance to fund programs that create even more jobs than military spending.

To understand the full effect of any federal spending, we need to estimate the direct jobs created by any type of spending, as well as the indirect jobs supported throughout the supply chain. Thus, the level of job creation depends on three key factors - labour intensity, domestic content, and average wage. In educational sectors, most of the fiscal spending directly goes to salaries, thus it produces more jobs for a given level of spending than the military, which is more capital-intensive. Thus, more job opportunities are created in a labour-intensive industry. Secondly, job creation is affected by the amount of spending that stays within the country rather than leaking overseas. Military spending has less domestic content than some of the alternatives, such as healthcare, education, infrastructure, or clean energy, all of which have a higher proportion of domestic production. Finally, wages are the third factor. A higher-paying industry will support fewer jobs per \$1 million of spending compared to an industry with lower average pay. So, we can see that military spending produces fewer jobs as it is an industry with higher pay.

The three reasons show that \$1 million of war-related spending supports fewer jobs than same amount spent on clean energy, healthcare, education, or infrastructure. Including both direct and indirect jobs, the military creates 6.9 jobs per \$1 million, while the clean energy industry and infrastructure each support 9.8 jobs, healthcare supports 14.3, and education supports 15.2. So, for the same amount of spending, clean energy and infrastructure create 40 per cent more jobs than the military, healthcare creates 100% more, and education 120% more.

Conclusion

Fueling demand, creating employment opportunities and advancing technology can still be achieved through military spending, but its promise for an equitable and sustainable growth remains uncertain. Resource diversion, opportunity costs and the risk of geopolitical instability can undermine its appeal as a long-term macroeconomic strategy. In an era shaped by cyber warfare, automation, and complex global supply chains, the link between military spending and domestic economic gains has shifted. Leaning on military expenditure too heavily is like trading the promise of progress for the illusion of security, while neglecting investments

that truly strengthen and unite society. The real debate today is not whether military Keynesianism works, but whether military Keynesianism remains the most effective and ethical choice in a globalized, interdependent world.

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OVERLAPPING GENERATIONS AND PENSION REFORM: EQUITABLY FINANCING AN AGING INDIA

Souradeep Bhattacharya and Ayush Narayan Ghosh
3rd Year, UG

Abstract

In today's globalized world, rapid developments and technological advancements are reshaping economies at an unprecedented pace. Addressing this shift demands reimagining sustainable growth by exploring how to equitably finance an aging India through comprehensive pension reform. In this context, our research studies the impact of a lagged version of a PAYG scheme, rather than the existing NPS scheme on the per capita capital growth rate. We utilize the Overlapping Generations (OLG) framework to study the impact of the scheme on capital accumulation and growth rates. The capital growth surface is simulated using synthetic data for different values of population growth rate, sectoral proportions and tax rates. Comparative Statics analysis is used to study the sensitivity of the growth rate to different parameters and policy levers. Lastly we have provided some policy recommendations for sustainable and effective integration of this scheme into the broader pension schemes framework.

JEL Classification

H55, J11, E21

Introduction

One of the major indicators of a country's development can be witnessed in the rising proportion of the elderly population. The population growth rate has declined from 2.5% in 1960 to 1.2% in 2015 and has been below 1% since 2020 (World Bank, n.d.). Despite a decline in the population growth rate, almost 68% of the total population in India lies in the working age group (Times of India, 2025). To properly and equitably finance the rising section of elderly population in the country, India must adopt efficient financing mechanisms to make full productive use of its large active workforce presently.

The Pay-As-You-Go (PAYG) scheme was in practice in India till late 2004, after which it was replaced by the New Pension Scheme (NPS). A major drawback of NPS is that it is susceptible to market risk. The PAYG scheme ensured that the contributions of the working population were immediately utilized to pay the pensions of the retirees, instead of accumulating the savings over a long period of time to deliver it as a 'pension fund' at the end of the maturity period. Another issue in India is the large proportion of the informal sector and it has severe implications for development and capital accumulation. 80% of manufacturing output is produced by the formal sector, but the majority of employment is in the informal sector, almost 80-90% (Ghani, E, 2015). However, such a shift in the demography of the country might not be well suited to the NPS scheme.

Temsumrit(2023) extends the overlapping generations (OLG) framework to incorporate the informal sector, highlighting its implications for unfunded pension systems and economic growth in emerging economies. Building on this foundation, our study adapts and modifies the OLG structure for the Indian context, comparing baseline and PAYG schemes by integrating both formal and informal sector dynamics to assess capital growth outcomes and policy implications.

Overlapping Generation Models

One of the most popular neoclassical models used to study the long run economic growth with two generations

is the Overlapping Generations (OLG) Model, which was developed by Diamond in 1965. This model is quite similar to the Solow-Swan model and assumes a closed economy and constant returns to scale (CRS). The OLG model deals with two agents - young and old instead of a single representative agent. We utilize this model with some modifications and then proceed in three steps - First we introduce a baseline model, without the PAYG scheme, then we introduce the PAYG scheme into the baseline model and lastly, model capital growth for an economy comprising both formal and informal sectors.

Baseline OLG Model

This model assumes that a representative agent has two distinct phases of life - work and retirement. He works in the first period and saves income, and lives off his saved income (dissaving) in the second period. This assumption is very similar to Modigliani's Life Cycle Hypothesis (Mankiw, 2010). We assume that an individual works in period t and enjoys retirement in period $t+1$. Let the exogenous rate of growth of the population be n . If L denotes the labour force population, then:

$$L_{t+1} = L_t(1 + n)$$

Let us assume a Cobb-Douglas production function:

$$Y_t = K_t^\alpha L_t^{(1-\alpha)}$$

Where, Y_t , K_t and L_t denote the output, capital stock and labour population at time t .

The production function is divided by L_t to obtain it in intensive form as follows:

$$y_t = k_t^\alpha$$

Let the wage rate be w_t . Hence the total wage earned by the labour force at time t is $w_t = \sum w_t L_t$

At the profit maximising level of output,

$$w_t = MP_L, \text{ i.e. } w_t = \frac{\partial Y_t}{\partial L_t} = (1-\alpha)k_t^\alpha$$

He consumes C_{1t} and saves S_t . On retiring at time $t+1$, he consumes his savings along with the interest. Let the rate of interest at time t be r_t . Therefore, $C_{1t} = w_t - S_t$ and $C_{2(t+1)} = (1 + r_{t+1})S_t$

We slightly modify the original utility function proposed by Diamond and assume a logarithmic utility function of the form:

$$U = \ln(C_{1t}) + \beta \ln(C_{2(t+1)})$$

where β is the rate of time preference, and it is the discounting factor for consumption in period 2. Plugging in the values of C_{1t} and $C_{2(t+1)}$ into the utility function, we get:

$$U = \ln(w_t - S_t) + \ln((1 + r_{t+1})S_t)$$

Now we determine the optimal savings in period 1 to maximize the intertemporal utility.

$$\frac{\partial U}{\partial S_t} = \frac{-1}{w_t - S_t} + \frac{\beta(1 + r_{t+1})}{S_t(1 + r_{t+1})} = 0$$

Solving the above equation, we get: $S_t = \frac{\beta w_t}{1 + \beta}$

Per capita capital stock at time $t+1$ becomes:

$$k_{t+1} = \frac{S_t L_t}{L_{t+1}} = \frac{\beta}{(1+\beta)(1+n)} w_t = \frac{\beta}{(1+\beta)(1+n)} (1-\alpha)k_t^\alpha$$

Hence the capital growth rate is defined as $g_b(t) = \frac{k_{t+1} - k_t}{k_t} = \left[\frac{\beta}{(1+\beta)(1+n)} \cdot (1 - \alpha)k_t^{\alpha-1} \right] - 1$

Incorporation of Lagged PAYG Scheme

This section incorporates the lagged PAYG scheme into the baseline model. This implies that the government will tax the working population and redistribute the revenue to the retirees in the next period. A lagged scheme is considered instead of the same period scheme to ensure a more equitable distribution of the tax revenue, after assessing the total tax revenue collected and population of retirees and administrative efficiency.

Let the tax rate for financing the PAYG scheme be τ .

The total tax collected from the working population at time period $t-1$ is given by $\tau w_{t-1} L_t$.

This tax revenue collected is equitably redistributed to the retirees in the next period t .

Each retiree receives $\frac{\tau w_{t-1} L_t}{L_{t-1}} = \tau w_{t-1}(1+n)$ under this scheme.

Now, the budget constraint can be defined as:-

For the individual at period t : $C_{1t} = w_t(1-\tau) - S_t$

For retirees at period $t+1$: $C_{2(t+1)} = (1+r_{t+1})S_t + \pi_{t+1}$, where $\pi_{t+1} = \tau w_t(1+n)$

Assuming utility function of the form:

$$U = \ln(C_{1t}) + \beta \ln(C_{2(t+1)})$$

Plugging in the values of C_{1t} and $C_{2(t+1)}$ into the utility function, we get:

$$U = \ln(w_t(1-\tau) - S_t) + \beta \ln((1+r_{t+1})S_t + \pi_{t+1})$$

We determine the optimal savings in period 1 to maximize the intertemporal utility.

$$U = \ln(w_t(1-\tau) - S_t) + \beta \ln((1+r_{t+1})S_t + \pi_{t+1})$$

Solving the above equation, we get: $S_t = \frac{\beta(1+r_{t+1})(1-\tau)w_t - \pi_{t+1}}{(1+r_{t+1})(1+\beta)}$

Per capita capital stock at time $t+1$ becomes:

$$k_{t+1} = \frac{S_t L_t}{L_{t+1}} = \frac{\beta(1-\tau)}{(1+\beta)(1+n)} \cdot (1-\alpha)k_t^\alpha - \frac{1}{(1+r_{t+1})(1+\beta)} \cdot \tau(1-\alpha)k_t^\alpha$$

Hence the capital growth rate is defined as

$$\begin{aligned} g_p(t) &= \frac{k_{t+1} - k_t}{k_t} \\ &= \left[\frac{\beta(1-\tau)}{(1+\beta)(1+n)} \cdot (1-\alpha)k_t^{\alpha-1} - \frac{1}{(1+r_{t+1})(1+\beta)} \cdot \tau(1-\alpha)k_t^{\alpha-1} \right] - 1 \end{aligned}$$

Sector - Weighted Growth Model

Let λ be the proportion of population employed in the formal sector and $(1-\lambda)$ be the proportion employed in the informal sector in India. It is assumed that the formal sector avails the benefits of the PAYG scheme and their intertemporal consumption is defined by the previous model, while the informal sector cannot not avail the benefits of the PAYG scheme and their consumption is defined by the baseline OLG model. The overall growth rate of the Indian economy can be considered to be a weighted average of the growth rates of these two sectors.

Comparative Statics Analysis

In this section, we present a comparative statics analysis of the evolution of growth dynamics w.r.t the population growth rate, imposed tax rate and the proportion of the formal sector.

$$\begin{aligned}\frac{\partial g(t)}{\partial n} &= -\frac{\lambda \beta (1-\tau)(1-\alpha)}{(1+\beta)(1+n)^2} k_t^{\alpha-1} - \frac{(1-\lambda)\beta(1-\alpha)}{(1+\beta)(1+n)^2} k_t^{\alpha-1} \\ &= -\frac{\beta(1-\alpha)}{(1+\beta)(1+n)^2} k_t^{\alpha-1} [1 - \lambda \tau] < 0\end{aligned}$$

In the PAYG scheme, the current workers (at time t) fund future retirees (at time period $t+1$). A higher n increases the number of workers today. Hence, the capital stock is spread over a larger proportion of the working force. A slower population growth rate implies reduction in loss from capital growth in PAYG. Thus, it becomes relatively more attractive than in case of higher population economies.

$$\begin{aligned}\frac{\partial g(t)}{\partial \tau} &= -\frac{\lambda \beta}{(1+\beta)(1+n)} \cdot (1-\alpha) k_t^{\alpha-1} - \frac{\lambda}{(1+rt+1)(1+\beta)} \cdot (1-\alpha) k_t^{\alpha-1} \\ &= -\frac{\lambda}{(1+\beta)} \cdot (1-\alpha) k_t^{\alpha-1} \left[\frac{\beta}{(1+n)} + \frac{1}{(1+rt+1)} \right] < 0\end{aligned}$$

A higher tax rate implies a greater shift from private savings to immediate transfers, thus lowering the pool of investments. This slows down the growth of capital.

While NPS helps in creation of a larger investment pool, the retirees are exposed to market risks and other volatilities. PAYG, on the other hand, offers predictable outcomes. The statistics tells us that a high tax rate can harm capital growth, but it doesn't imply non co-existence of manageable tax rates while ensuring the security provided by the PAYG scheme.

$$\begin{aligned}\frac{\partial g(t)}{\partial \lambda} &= \frac{\beta(1-\tau)}{(1+\beta)(1+n)} \cdot (1-\alpha) k_t^{\alpha-1} - \frac{1}{(1+rt+1)(1+\beta)} \cdot \tau(1-\alpha) k_t^{\alpha-1} - 1 - \frac{\beta}{(1+\beta)(1+n)} \cdot (1-\alpha) k_t^{\alpha-1} \\ &+ 1 \\ &= -\frac{1}{(1+\beta)} \cdot (1-\alpha) k_t^{\alpha-1} \left[\tau \left(\frac{\beta}{(1+n)} + \frac{1}{(1+rt+1)} \right) \right] < 0\end{aligned}$$

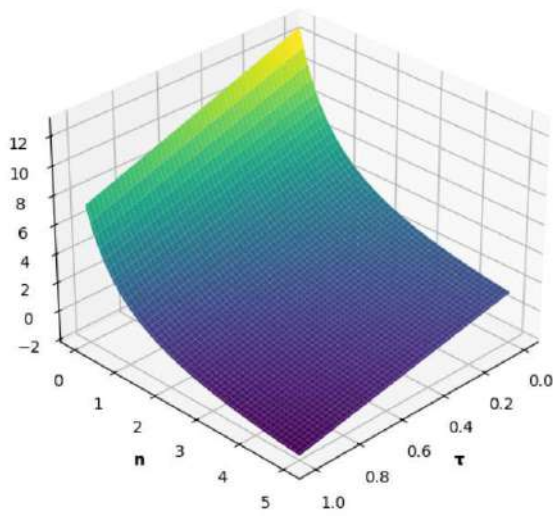
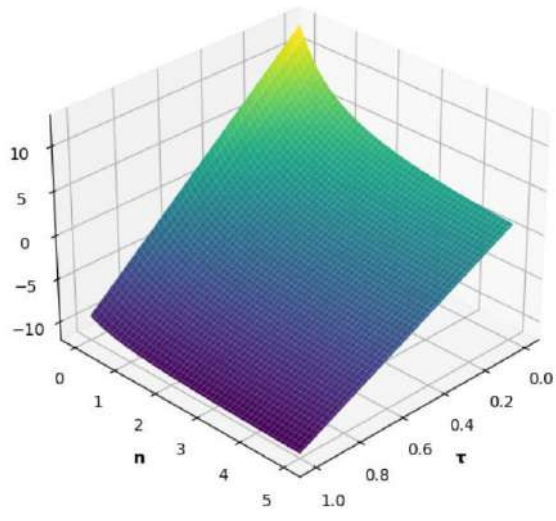
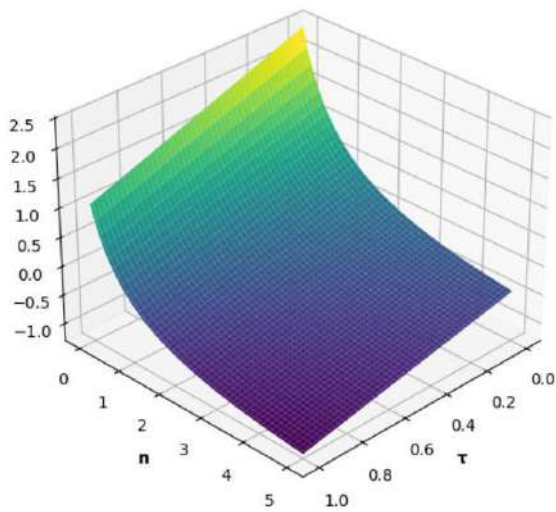
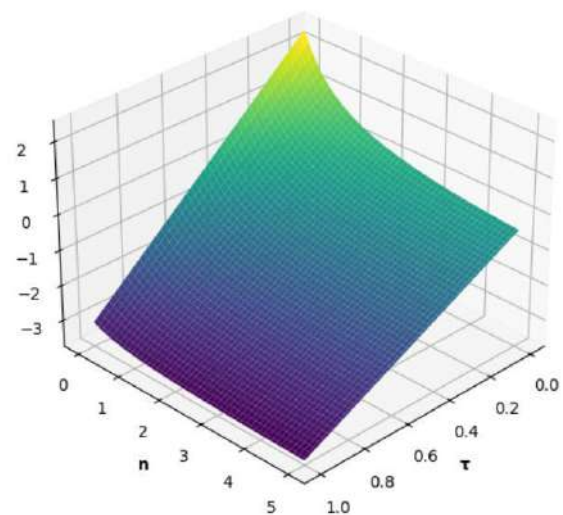
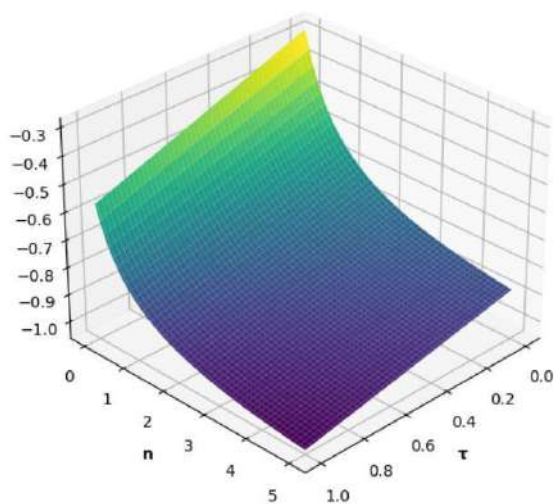
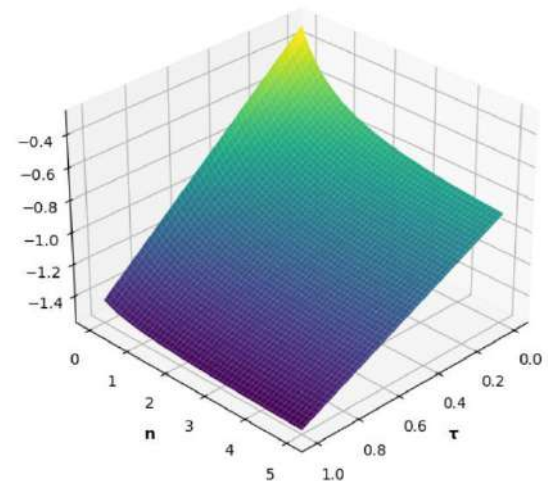
A rise in λ implies a shift to the formal sector, involving a greater share of immediate transfers instead of investment over a period of time. Unreformed PAYG schemes can prove to be harmful, hence re-designing them at a time when the formal sector seems to be on the rise is extremely important.

Simulation of Capital Growth Surface

In this section, we consider the closed-form capital growth rate equation obtained in the previous section and simulate the growth surface in two dimensions, namely the population growth rate (n) and the imposed tax rate (τ). Two values of λ [0.2, 0.8] and three values of α [0.3, 0.5, 0.7] are considered to provide a comprehensive analysis of how capital growth is expected to evolve for different relative proportions of the formal and informal sector. The λ will determine which factors have the most impact on growth rate for different parameter values. The interest rate is assumed to be 6%, discount rate is assumed to be 0.95 and the per capita capital is scaled to eliminate effects of the units.

From the plots, it is evident that for $\lambda = 0.2$, growth increases with fall in n and with fall in τ albeit at a lower rate. The fall in capital growth with rise in τ is due to the crowding out effect of private saving due to implicit pension (Feldstein, 1980).

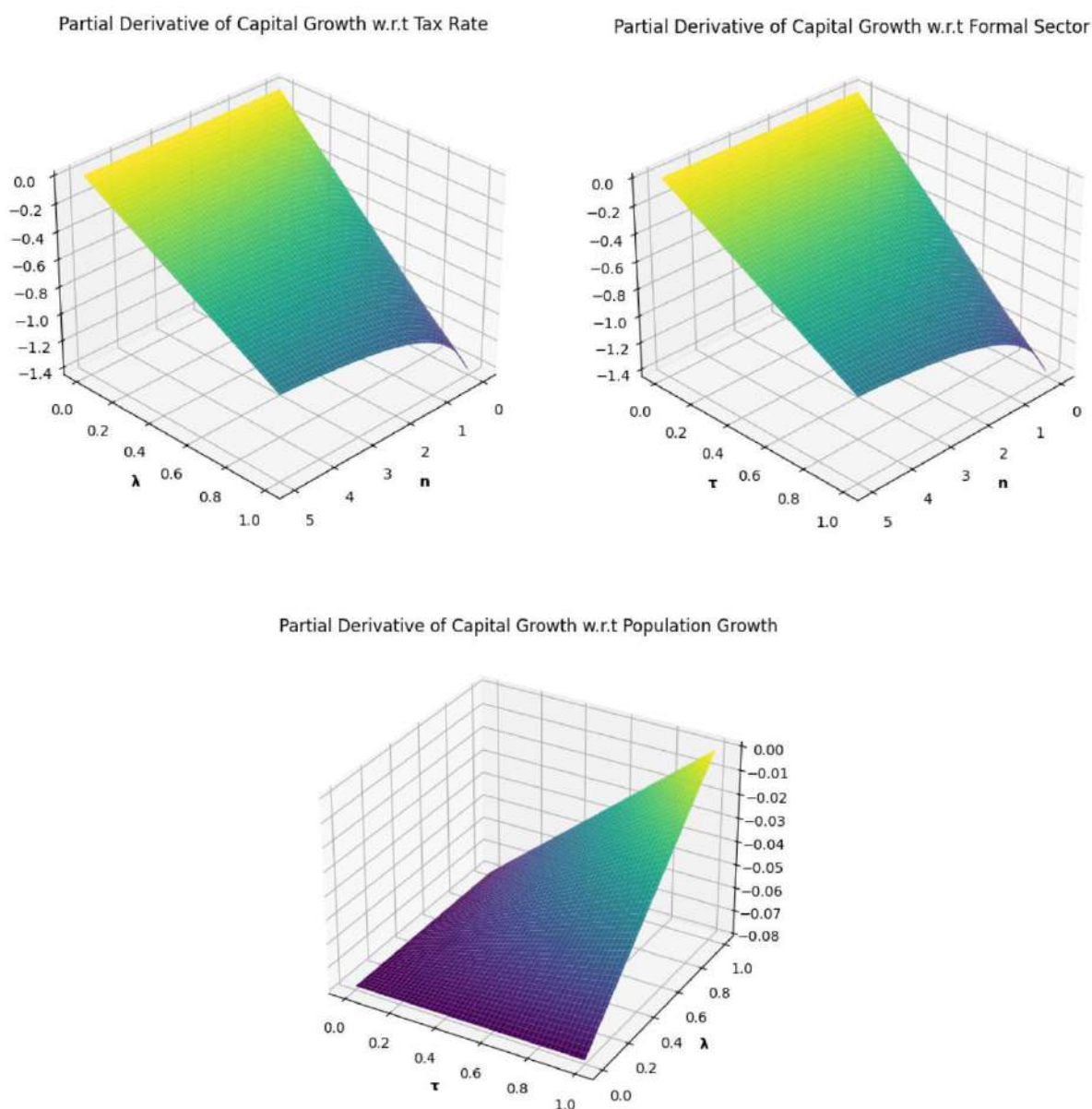
For $\lambda = 0.8$, growth increases marginally with fall in n and rapidly with fall in τ . This situation is not realistic since India's formal sector is currently not 80% of the total population. Nevertheless, this can help drive policy decisions in the scenario that the proportion of the formal sector rises in the near future due to technological advancements. For $\lambda = 0.2$, growth rate is comparatively larger for the case of $\alpha = 0.3$ rather than 0.5 or 0.7.

Fig 2: Capital growth surfaces for different parametersCapital Growth Surface ($\lambda = 0.2, \alpha = 0.3$)Capital Growth Surface ($\lambda = 0.8, \alpha = 0.3$)Capital Growth Surface ($\lambda = 0.2, \alpha = 0.5$)Capital Growth Surface ($\lambda = 0.8, \alpha = 0.5$)Capital Growth Surface ($\lambda = 0.2, \alpha = 0.7$)Capital Growth Surface ($\lambda = 0.8, \alpha = 0.7$)

The partial derivatives of the growth rate with respect to the tax rate, proportion of formal sector and rate of population growth are plotted to study the sensitivity of growth rate with respect to each of these parameters. The results can be summarized as follows:

- $\frac{\partial g(t)}{\partial \tau}$ is steeper for lower levels of n and gradually flattens out. This implies that the growth rate is more sensitive w.r.t tax rate for lower levels of population growth.
- $\frac{\partial g(t)}{\partial \lambda}$ is steeper for lower levels of n and gradually flattens out. This implies that the growth rate is more sensitive w.r.t the proportion of the formal sector for lower levels of population growth.
- $\frac{\partial g(t)}{\partial n}$ is relatively insensitive with respect to τ but the change w.r.t λ is more or less constant.

Fig 3: Partial derivatives of growth surfaces



Policy Recommendations

Integrating PAYG along with other modifications can balance economic growth with equity and welfare. Some policy recommendations for incorporating the PAYG scheme into the current administrative framework are as follows:

- 1. Sector and Industry Specific Tax Rates:** The majority of the population is in the informal sector and earn lower income while a smaller proportion works in the formal sector. Different tax rates can be imposed for funding the PAYG scheme for the working population in different sectors and industries. This can aid in raising the overall tax rate and increasing capital growth rate, without imposing a burden on the marginalized population.
- 2. Hybrid Pension Scheme:** A hybrid pension scheme comprising the PAYG model used to provide assured income post retirement can be integrated with a partial NPS scheme to encourage savings and provide higher returns. This will effectively hedge market risk while also ensuring more equitable income distribution.

These policy recommendations would help in accelerating capital growth upto the steady state beyond which capital will grow at a constant rate. The most optimistic simulation depicts that the growth rate can potentially reach 8-12% under the proposed hybrid scheme, assuming the Indian economy is yet to reach steady state. Additionally, since n is low for India, the partial derivative surfaces are steeper and hence careful policy implementation is required in order to avoid destabilizing the economy.

Conclusion

The current economic scenario of declining population growth, rising proportion of the informal sector and demographic shift reinforces the need for re-implementation of the PAYG scheme to sustainably accelerate capital growth and ensure equitable income distribution. The scheme can be made sustainable in the long run by further modifications, which will ultimately be guided by the demographic dynamics of the country in the future. One should note that the quantitative analysis undertaken in the above sections does not imply complete discarding of the NPS scheme, rather it portrays the benefits of a lagged PAYG scheme over the former. The perfect solution lies in the intersection of the lagged PAYG scheme with the partial NPS so as to introduce a hybrid pension scheme, with an optimistic approach towards attaining an equitable and sustainable future.

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ASSET PRICES, CAPITAL FLOW AND OUTPUT: SOME ANALYTICAL AND POLICY PERSPECTIVES

Anushka Dutta and Pramit Banerjee
3rd Year, UG

Abstract

The long-run relation between financial development and economic growth has been extensively studied in the literature. What is missing in the literature is a short-run analysis of relation between stock-market valuation, effective demand and macroeconomic performance. To fill this gap in the literature, we extend the Blanchard paper (1981) in several directions. Firstly, we introduce an explicit monetary policy rule namely leaning against the wind. Secondly, we introduce openness. In particular, we make the economy open to both trade in commodities and capital flow. The standard text book analysis says that capital inflow is contractionary under flexible exchange rate. We will show that capital flow may well turn out to be expansionary by boosting private investment.

JEL Classification

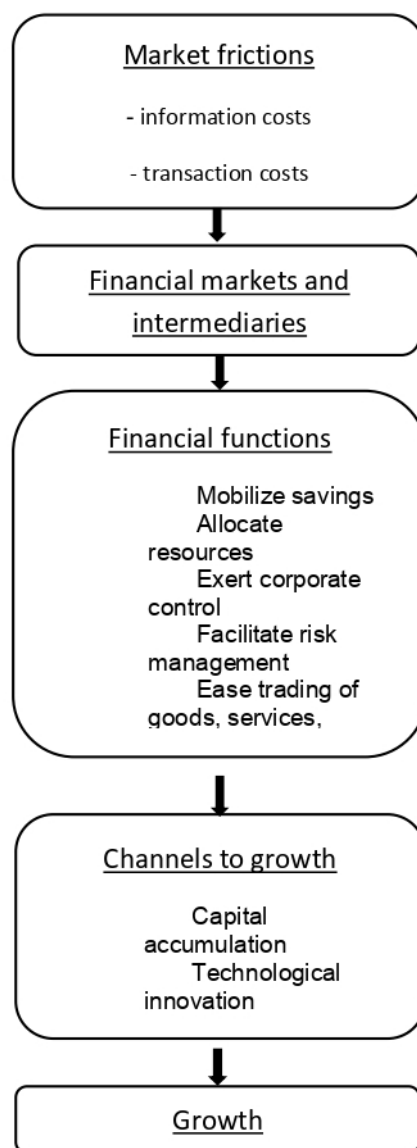
E44, E52, F41, O16, G10

Keywords

Tobin's Q, exchange rate, capital market liberalization

Introduction

There are two alternative approaches to the study of the relation between financial development and growth. One is a bank-based approach and the other one is a market-based approach. First, we examine how these approaches explain a role of banks and stock market development in shaping macroeconomic developments. Banks are the largest type of financial intermediaries. They provide a wide array of financial services and specialize in providing these services to households and firms, which are the most dependent on external finance. Capital markets ensure the efficient and sustainable funding of governments, corporations and banks. They facilitate the mobilization and allocation of medium and long-term funds and they increase the diversity and competition in the financial systems.



Source: Ross Levine (1997)

The present paper will focus on integration between the real sector and the financial sector in time of globalisation. In particular, we have capital account liberalisation which influences the macroeconomic system in a variety of ways. In the Indian context, Foreign Direct Investment (FDI), Foreign Portfolio Investment (FPI), and stock market development are integral to macroeconomic growth. Both FDI and FPI are major sources of capital inflow for an economy and serve as important channels to invest in an overseas economy. Stock market development can be analysed by tracking dimensions like stock market turnover, market capitalisation, various indices, segments, classes of financial assets and markets. In our analysis and stylised facts, we consider stock market turnover as an indicator of stock market growth, where a steady increase in the amount of stock market turnover implies a growth of the stock market.

The rest of the paper is organised as follows. Section II is a review of the existing literature, in section III we present certain stylised facts, section IV builds up the model, in section V we carry out some comparative static exercises, and section VI concludes the paper.

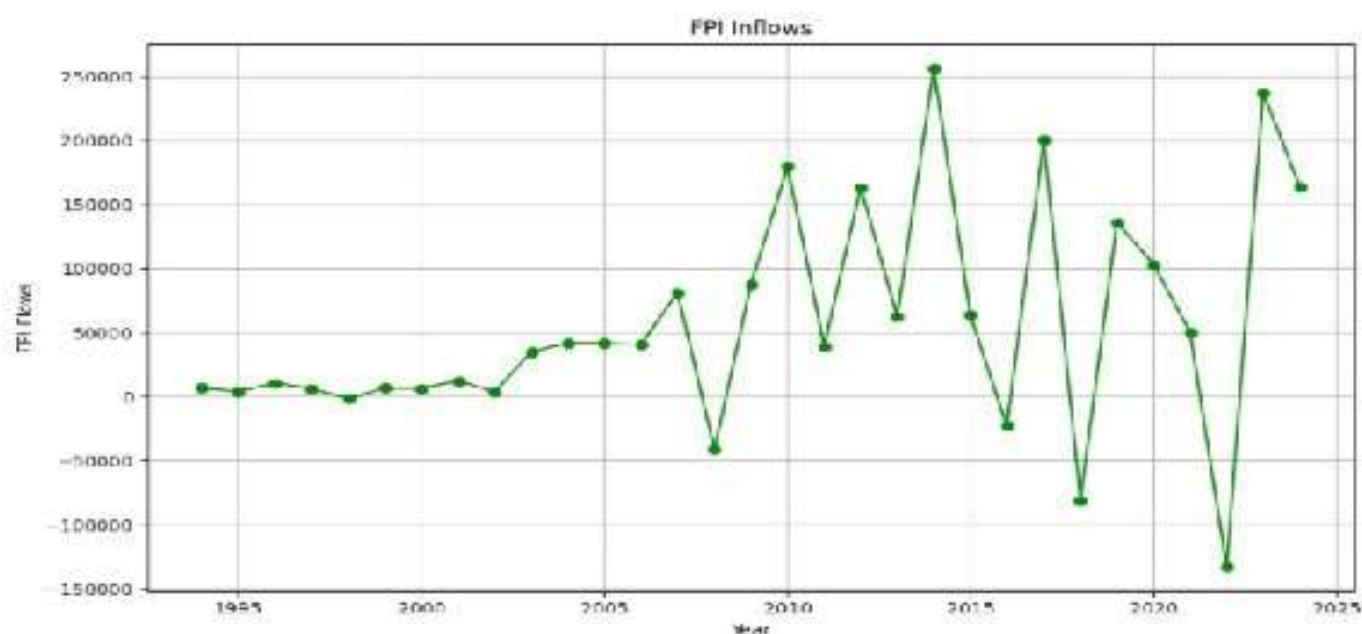
Section III: Stylised Facts

Figure 1: Foreign Direct Investment in India



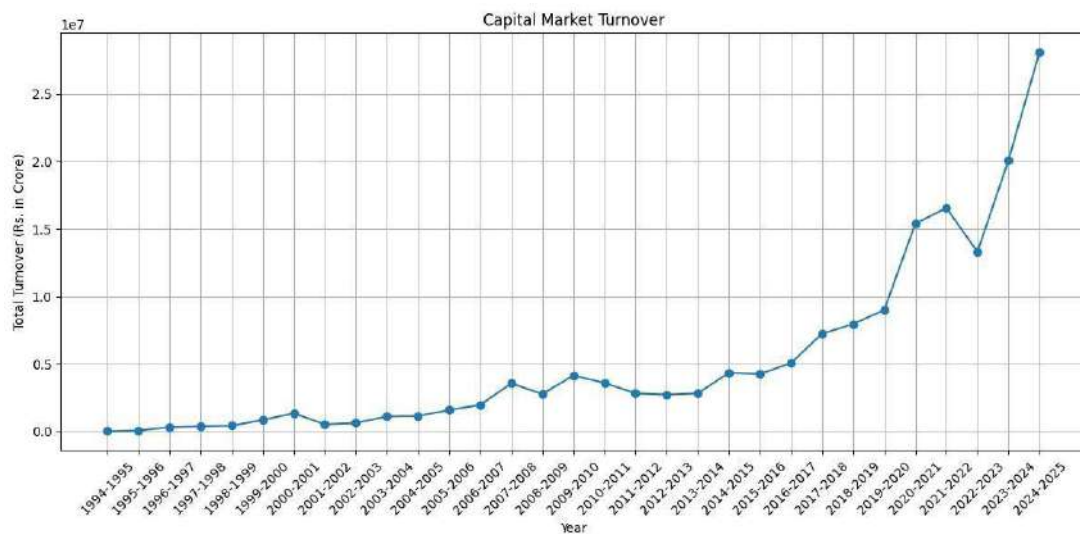
Source: CEIC (Central European International Cup) Data

Figure 2: Foreign Portfolio Investment in India



Source: World Bank

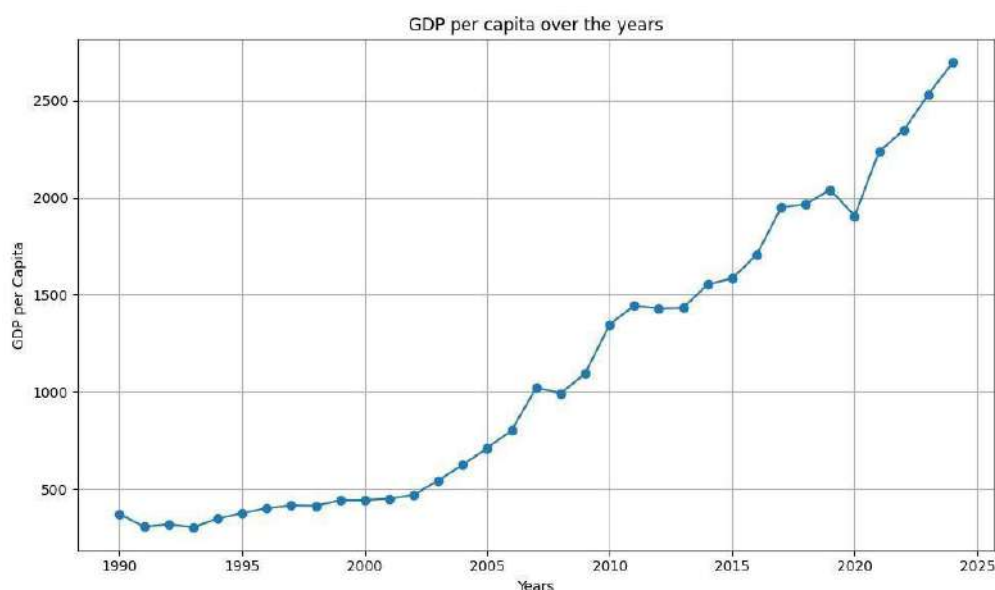
The data above presents the quarterly inflows of Foreign Direct Investment (FDI) in India from 1991 to 2024, measured in millions (USD). The trajectory reveals a significant rise in FDI post 2005, reflecting increased investor confidence, policy liberalisation and deeper integration of India into the global economy. Peaks in FDI inflow correspond to periods of strong economic performance and key sectoral reforms. A notable spike is observed around 2020, followed by a sharp drop signalling the impact of the COVID-19 pandemic and related global uncertainties. Despite this volatility, FDI inflows have shown resilience and a pattern of recovery, indicating renewed investor optimism and macroeconomic stability in the post-pandemic period.

Figure 3: Capital Market Turnover in India (1994- present)

Source: NSE, India

The above data represents Total Capital Market turnover (Rs. In crore) in India from November, 1994 to June, 2025. The steady increase in the Capital Market turnover can be attributed to a series of structural reforms, technological advancements, and changing behaviour investments. A sharp dip can be observed from 2020 to 2022, which depicts the unanticipated crash during the Covid-19 pandemic. However, the Indian stock market showed recovery with increased macroeconomic optimism and is showing steady growth in recent times.

The data above represents the GDP Per Capita (in USD) in India from 1900 to 2024. It shows the long-term positive trend in GDP per capita, depicting a slow growth rate of GDP per capita from 1900 to 2003, with an average GDP Per capita of \$399.78, a period of acceleration from 2004 to 2010 with an average GDP per capita of \$941.9, a strong and steady growth rate till 2019 with an average GDP per capita of \$1678.98, with a dip in 2020 due to the Covid-19 pandemic, and post-pandemic recovery from 2021 to 2025 with an average GDP per capita of \$2344,18.

Figure 4: GDP Per Capita in India

Source: World Bank

Section IV: The Model

Our model is a Short Run Keynesian Open Economy model based on monetary policy known as leaning against the wind. We assume a flexible exchange rate, import of capital goods, and static expectations. Next, we consider the Monetary policy rule. The Central Bank fixes the interest rate to stabilise fluctuations in exchange rate. This is known as 'leaning against the wind'. If exchange rate goes up Central Bank increases the interest rate i.e. re denotes 'leaning against the wind' and $r' > 0$.

λ denotes proportion of investment expenditure on domestically produced capital goods and $(1 - \lambda)$ is a proportion of investment expenditure on imported capital goods. The β is a dividend payout ratio. The model is given by the following equations:

$$Y = C(Y - T) + I(q) + G + X\left(\frac{eP^*}{P}\right) - (1 - \lambda) I(q), \quad 0 < \lambda < 1$$

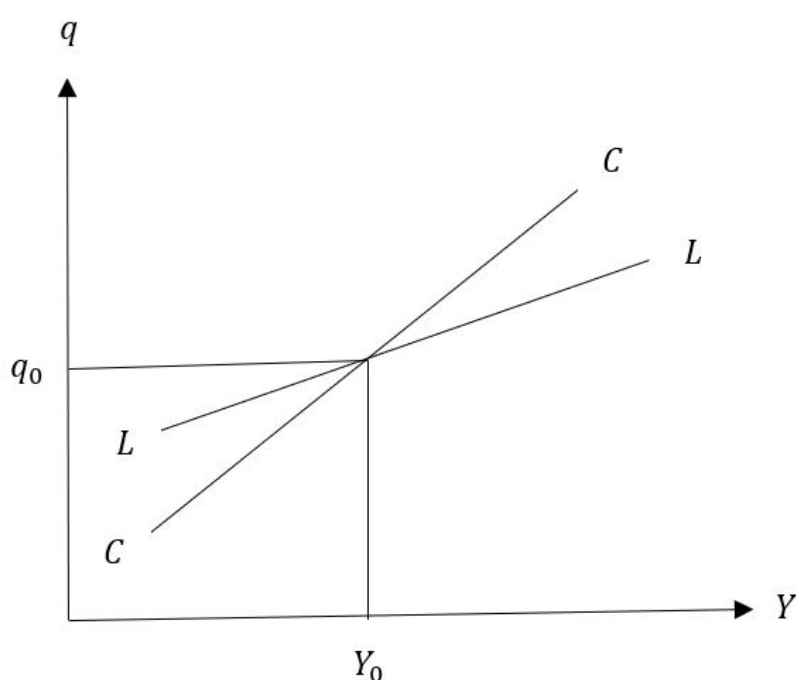
$$= C(Y - T) + \lambda I(q) + G + X\left(\frac{eP^*}{P}\right) \quad | \quad \text{-----}(1)$$

$$r(e) = \frac{\pi(Y)}{q} + \left(\frac{q^e}{q} - 1\right) \quad \text{-----}(2)$$

$$X\left(\frac{eP^*}{P}\right) - (1 - \lambda) I(q) + F(r(e) - r^*) = 0 \quad \text{-----}(3)$$

In the goods market equilibrium in equation 1, we see that as Tobin's q rises, the output (Y) also increases. This is indicated by the upward sloping CC curve. Now, since Y increases, $\pi(Y)$ also rises. Thus, to maintain the parity condition, Tobin's q increases, exchange rate (e) increases and simultaneously r increases. This gives rise to the upward sloping LL curve

Fig 5: The Model



Source: Self Derived by Author

Equation 1 gives the commodity market equilibrium. We assume perfect substitutability between government bonds and equities and hence, return on these two assets are equal. Accordingly, Equation 2 is an arbitrage condition. Equation 3 represents the balance of payments equilibrium

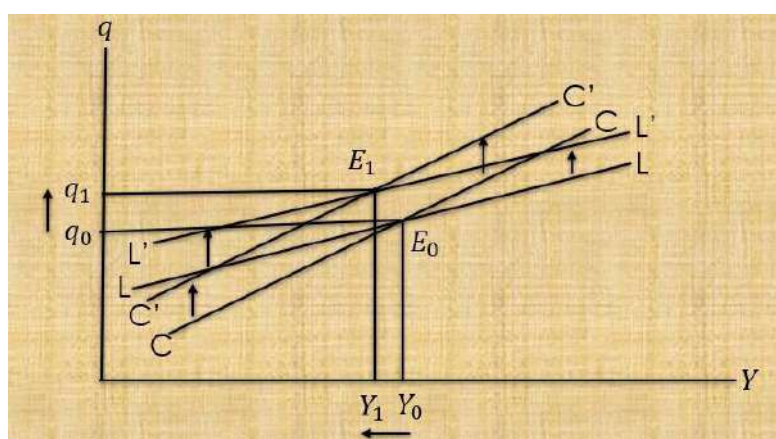
Section V: Comparative Statics

i) Increase in foreign capital inflow

An increase in foreign capital inflow (F) causes the exchange rate (e) to fall. From equation 1 output (Y) falls as exports (X) fall. This causes the leftward shift of the CC curve. From equation 2 as e falls, r falls and Tobin's q rises. This causes a leftward or an upward shift of the LL curve. Thus, there is an ambiguous effect on output (Y) and value of stock market (q) as both CC and LL curves shift leftwards. Since, two opposite forces are in action it is leading to falling exports and rising investments. Net effect on the real sector depends on the strength of the opposite forces. Hence, capital account liberalization may not be contractionary.

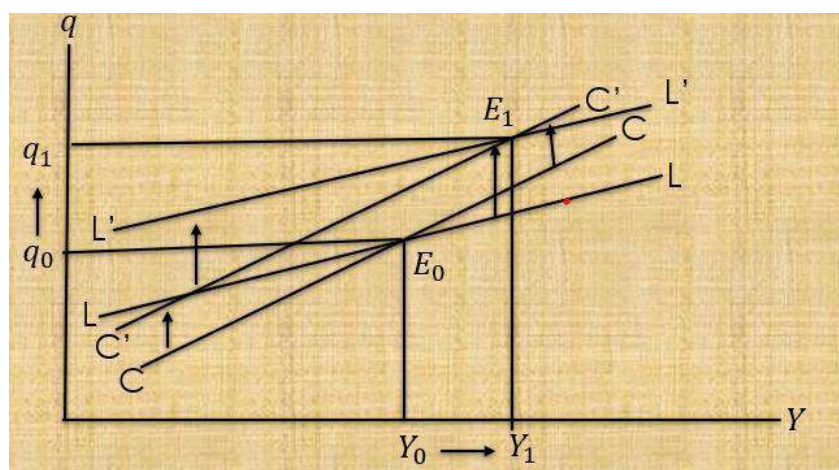
Case 1:

Fig 6: Contractionary Effect on Output due to Capital Account Liberalization



Case 2:

Fig 7: Expansionary Capital Account Liberalisation



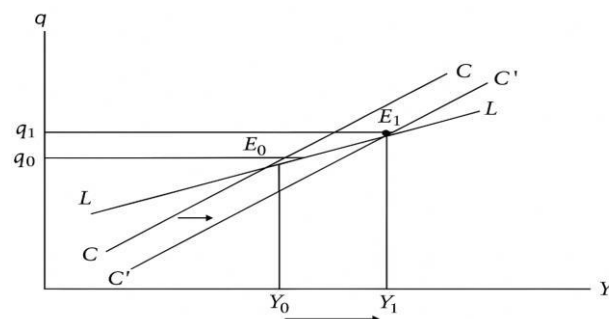
Source: Self Derived by Author

In case 1, the effect of fall in export dominates rise in investment and output falls. In case 2, the effect of rise in investment dominates fall in export and output rises. Thus, capital account liberalisation may not be contractionary and it may generate a positive macroeconomic outcome.

i) Expansionary fiscal policy

An expansionary fiscal policy i.e. a rise in the government expenditure (G) causes output Y to rise from equation 1. Hence, from equation 2 q rises leading to a rise in imports, which causes BOP deficit and hence, e increases which causes exports (X) to increase. So, an increase in output (Y) and in Tobin's q shifts the CC curve rightwards. Thus, we see that an increase in government expenditure (G) leads to crowding in of private investments along with rising exports.

Fig 8: Effect of Expansionary Fiscal Policy

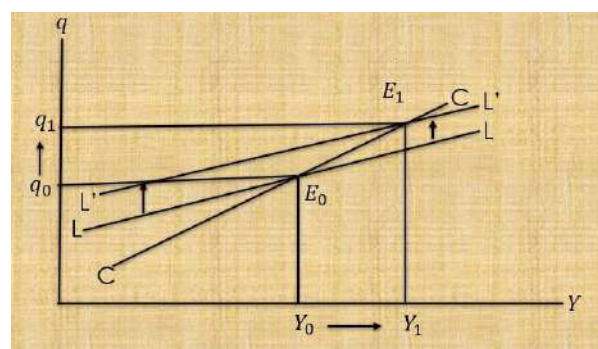


Source: Self Derived by Author

ii) Increase in dividend payout ratio

If the dividend payout ratio i.e. β goes up, from equation 2 Tobin's q rises. This causes the LL curve to shift upward. Rise in Tobin's q causes investment to rise and output goes up. So, both Tobin's q and output rise.

Fig 9: Increase in β



Source: Self Derived by Author

Section VI: Concluding Remarks

Our paper explores how financial markets interact with the real economy in a globalized world, where capital account liberalisation and stock market dynamics play a significant role in shaping macroeconomic performance. By extending Blanchard's (1981) framework, we incorporated key features such as openness to trade and capital flows, and a monetary policy rule commonly referred to as "leaning against the wind" where the central bank responds to fluctuations in the exchange rate. This helped us examine how short-run changes in financial conditions, including variations in investment and expansionary fiscal or monetary policy, influence output and the value of assets, particularly through Tobin's q . In summary, this paper highlights the growing integration between the financial and real sectors in the era of globalisation. As economies become more interconnected, it becomes crucial for policymakers to design frameworks that recognise and balance the dynamic interplay between financial openness and macroeconomic stability ensuring that investment incentives align with sustainable and inclusive growth.

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DOUGHNUT ECONOMICS IN RESHAPING GLOBAL CAPITALISM: A GUIDE TOWARDS SUSTAINABLE FUTURE

Tisha Ghosh
3rd Year, UG

Abstract

This article is concerned about the idea of Doughnut economics as a transformative framework for reshaping global capitalism. It criticizes the traditional economic growth model and examines the viability of a system that is more concerned about the well being of people within ecological limits. Unlike typical economic models that are focused on GDP, the Doughnut Economics ensures that no one falls short of life's essentials. The paper critiques the shortcomings of global capitalism, including rising inequality and environmental degradation. The analysis highlights the policy reforms, alternative metrics and cultural shifts necessary for systematic change. With the real-world examples and data, this article evaluates *whether the doughnut economy model can actually guide the economy towards a sustainable future within planetary boundaries, or is it just better as an idea.*

JEL Classification

B52, E61, F64, I31, O44, Q01

www

Introduction

“Humanity’s 21-st century challenge is to meet the needs of all within the means of the planet.”

– Kate Raworth

In an economy defined by deepening inequality and ecological collapse, gaps caused due to cracks in global capitalism are widening day by day. As glaciers melt and billionaires earn more than millions in a day, an important question arises: *Can our economy be organized in a better way?*

The Doughnut economy or Doughnut economics is a visual and hypothetical model, first proposed by economist Kate Raworth. Offering a bold alternative, can it really reshape one’s lifestyle on a global scale? And if so, then how?

The Doughnut Shape: Two Rings

The inner ring represents a social foundation which includes minimum living standards every person should have (food, water, healthcare, education, housing, etc). Falling below this ring indicates a state of deprivation. (Sen, 1999)

The outer ring represents an ecological ceiling which includes planetary boundaries that must not be exceeded (climate change, biodiversity loss, pollution, etc.). Going beyond the outer ring indicates environmental degradation. (Rockstrom et al., 2009)

The area between these two rings refers to a “safe and just space” for humanity. Unlike traditional economics, the doughnut ensures well being for all within planetary boundaries, instead of maximizing GDP.

The Flaws In Global Capitalism

Capitalism has always considered growth in GDP as the ultimate marker of progress. But it has few drawbacks-

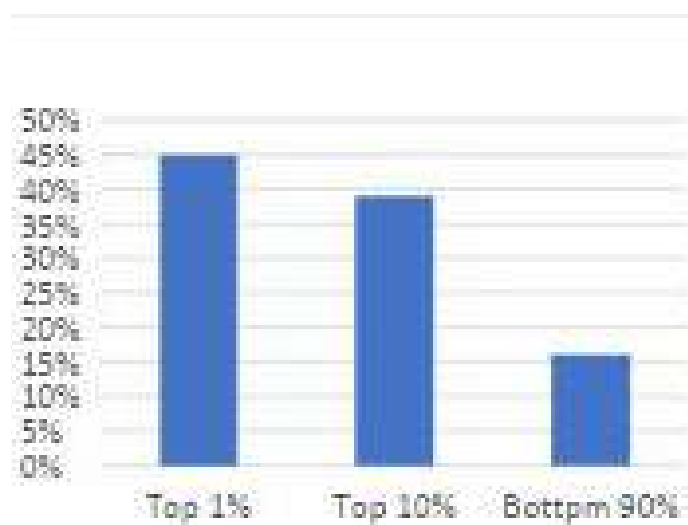
- ***Rise in Inequality-*** The richest 1% owns about half of the wealth in this world while billions struggle for basic needs. Capital increasingly rewards capital but leaves labor and nature exploited.

Table:Global Wealth Distribution Table

Wealth Group	Share of global wealth
Top 1%	45%
Top 10%	39%
Bottom 90%	16%

Source:Credit Suisse, 2023

Fig 1: Graphical Representation Of Global Wealth Share



Environmental Exploitation- Environmental degradation often affects economic growth, ranging from fossil fuel extraction to deforestation. Earth consumes faster than ecosystems can regenerate. Earth Overshoot Day is the date when humanity has exhausted its annual resource budget. Given below is a table that shows the estimated biocapacity ratio of the last year 2024 and the present year 2025. It indicates that planetary resources are used at 1.7-1.8 times sustainable rates.

Years	Earth Overshoot Day	Estimated Biocapacity Ratio
2024	August 1	1.7 (approx.)
2025	July 24	1.8 (approx.)

Source: Global Footprint Network, 2025

- **The Growth Fetish-** Nation tends to ignore well-being, sustainability and justice despite knowing the fact that more GDP doesn't indicate more happiness. Clearly a new paradigm is overdue.

The Doughnut Framework: Challenging The Status Quo

Doughnut Economics challenges the orthodox economic thinking in several ways:

Reframing the goal: Shifting the focus from growth to thriving, this model conveys the idea that economies should deliver well being and not infinite expansion.

Valuing the unseen: This model gives attention to the unpaid care work, ecological services and community resilience, which are often overlooked in the traditional model.

Encouraging systems thinking: Economies are seen as deeply rooted in the society, which in turn is deeply rooted in the living Earth- not external to it.

Favoring regeneration and redistribution: This model promotes the idea of circularity, equity and renewal instead of extraction and concentration.

Thus this framework states ‘Wealth creation must be aligned with social and economic repair’.

Global Ripples: Real World Applications

Doughnut Economics has been put into practice in many places. Amsterdam became the first city to adopt the doughnut framework as a guiding principle for its post Covid recovery plan. It aimed to reduce the use of primary raw materials by 50% in construction and infrastructure by the year 2030. Although precise figures are yet to be published, the target is to examine the real-world potential of the model.

TABLE:Amsterdam’s Doughnut Economics Implementation (2020-2024)

CATEGORY	INITIATIVE	RESULTS
Circular economy	Reduce primary raw materials use by 50% by 2030	26% reduction achieved in key sectors (2020-2023)
Housing	Retrofit social housing to be energy-efficient and affordable	5000+ units retrofitted with green upgrades
Public Procurement	100% circular procurement in city projects by 2025	53% of procurement circular by 2023
Local Food Systems	Strengthen local food production and access	37 urban farms and 15 food hubs created or supported
Mobility	Prioritize bike, walk and electric transit infrastructure	70% of city trips now made by bike or public transit
Emissions Reduction	Carbon neutral city by 2050	33% reduction in CO2 emissions since 1990
Social Inclusion	Integrate marginalized communities into green job sectors	1200+ new jobs circular and sustainable sectors (2020-2023)

Source: City of Amsterdam, 2024 and Ellen MacArthur Foundation, 2024

(Real time tracking is going on and thus more accurate data will be available in annual reports and city-level sustainability audits. The above figures are just estimates.)

Cities like Brussels, Copenhagen and Nanaimo are also exploring similar shifts. The model has potential to support sufficiency economies in the Global South focusing on equitable resilience and climate justice.

Criticisms

- The governments, corporations and financial institutions often get benefits from the status quo and may resist change in the system.
- Doubt exists if city level initiatives can cope up with national or global policies and if international trade rules align with the doughnut model.
- Some argue that doughnut economics is not suitable as a long term idea as it softens capitalism without dismantling it. It retains markets and private enterprise but doesn't replace them.

Reshaping Capitalism

To reshape global capitalism, few points can be taken into consideration-

- Policy reforms like enacting progressive taxation, supporting universal basic services and strengthening labor rights, should be enlightened.
- GDP should be replaced with indicators that measure human well being and ecological health.
- The economy should consider moving from consumerism to stewardship, from competition to cooperation. The economy should serve the people and planet, not the other way round.

Conclusion

Doughnut economics may not be an answer to all aspects of the economy but it offers a powerful question “What if economics cared about humanity and nature, not profit and power?” As climate intensifies and inequality deepens, reforming capitalism is no longer optional, it's existential. The doughnut economics points towards an equitable and sustainable future. It is still an unsure thing whether it can fully reshape global capitalism, but in this economy, it might be the best place to start.

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LABOR MARKET IN THE ERA OF PLATFORM ECONOMY, OF WHICH, VANISHING SECTOR IS ONE CONSEQUENCE: A MICRO-THEORETIC GENERAL EQUILIBRIUM MODEL

Noyonika Bhattacharya and Anushka Dutta
3rd year, UG

Abstract

The rapid advancement of technology has indeed transformed how we interact with the world, making everyday tasks simpler. The labor market has revolutionized the prospect of labor as a productive factor and has widened its scope to online platforms. The question of whether a technology in its modern form, that is, artificial intelligence (AI) can spur development depends on the nature of employment created and on whether labour can move to higher productivity sectors, raising incomes and ensuring social protection (Acs et.al.,2021). The objectives of our paper are to develop a micro-theoretical model addressing the effects in the labour market with AI automation and how it leads to the consequence of the vanishing sector. The methodology used is an otherwise multi sector- multi factor general equilibrium model. Further as a consequence of the emergence of the AI based sector, leading to turmoil in the skilled labour market, we examine the role of labour market protectionist policies in mitigating this shock. Interestingly, our findings reveal that symmetric protectionist policies further aggravates the incidence of vanishing sectors, while asymmetric protectionist policies improve the situation. However, the latter approach is more politically contentious than the former.

JEL Classification

D50, E24, J21, O33

1.Introduction

With the advent of artificial intelligence, more and more people desire to be technologically skilled. Thus, in many ways the revolutionization and digitization has been the unseen governor and streamlined our lives. AI's impact remains debated. It critically depends on whether modern technology is a substitute for labour or a productivity augmenting technological progress. The objective of our paper is to analytically demonstrate the consequence of the emergence of an AI based sector on the labour market and incidences of the vanishing sector in terms of a micro-theoretical multi sector multi factor general equilibrium model. The emergence of the online platform-based sector makes the initially stable system unstable. This necessitates "vanishing" of at least one other sector to restore stability. Further as a consequence of the emergence of the AI based sector, leading to turmoil in the skilled labour market, we examine the role of labour market protectionist policies in mitigating these shocks.

The structure of our article is organized as follows:

- Section 1 : The Introduction
- Section 2 : The Model,
 - Sub-Section 2.1 : Description of the Economy,
 - Sub-Section 2.2 : Economy with AI,
 - Sub-Section 2.3 : Protection of skilled labour in the AI sector
 - Sub-section 2.4 : Protection of skilled labour in all sectors of the economy
- Section 3 : The Concluding Remarks and Policy Recommendation

2.The Model

In this section, we construct a three-sector General Equilibrium model that is in line with the seminal works

based on Jones(1965) and Jones(1971).The stylized economy is assumed to be small open developing economy with three sectors of production, first is the unskilled specific sector, the next is the skilled specific sector both operating in the conventional economy while the third sector is modernized ,comprising skilled personnel using AI.

2.1. Description of the Economy

Taking the traditional sector(without AI) into consideration which is sector 1 and sector 2, the former is unskilled -specific and the latter using skilled-specific labor. Here we take the production function of both the sectors as X_1 and X_2 ,taking Cobb Douglas functions that has unskilled labor (L_1) and machinery (M_1) in sector 1. The production function in sector 2 is defined in a similar way, taking skilled labor(S_2) and machinery (M_2) in the functional form.

$$X_1 = L_1^\alpha M_1^{(1-\alpha)} \quad (2)$$

$$X_2 = S_2^\beta M_2^{(1-\beta)}$$

The firm's objective is to minimize the cost subject to the output constraint in sector 1. Here total cost is defined as the sum of the product of wage of unskilled labor (W)and (L_1) with rate of interest on machinery(R) and machinery M_1 .We perform the exercise of cost minimization taking the Lagrangian .

$$\text{Min } C_1 = W L_1 + R M_1 \quad (3)$$

$$\text{Subject to. } X_1 = L_1^\alpha M_1^{(1-\alpha)}$$

The Lagrangian equation is given by:

$$Z = W L_1 + R M_1 + \lambda [X_1 - L_1^\alpha M_1^{(1-\alpha)}] \quad (4)$$

Solving, we get the following conditional factor demand functions:

$$L_1 (R, W, X_1) = k^{(1-\alpha)} R^{(1-\alpha)} W^{-(1-\alpha)} X_1 \quad (5)$$

$$M_1 (R, W, X_1) = k^{-\alpha} W^\alpha R^{-\alpha} X_1 \quad (6)$$

Substituting (5) & (6) in C_1 , we get:

$$C_1 (W, R, X_1) = W^\alpha R^{(1-\alpha)} (k^{(1-\alpha)} + k^{-\alpha}) X_1 \quad (7)$$

Similarly, the cost-minimizing problem in sector 2 can be stated as the sum of the product of wage of skilled labor (W_s)and skilled labor(S_2) with rate of interest on machinery(R) and machinery M_2 . Performing the above exercise of taking the lagrangian we get the following optimal conditional factor demand functions :

$$S_2 (W_s, R, X_2) = g^{(1-\beta)} R^{(1-\beta)} W_s^{(1-\beta)} X_2 \quad (8)$$

$$M_2 (W_s, R, X_2) = g^{-\beta} W_s^\beta R^{(-\beta)} X_2 \quad (9)$$

Substituting the values of S_2 and M_2 respectively from equation (9) and (10) we get the cost function in sector 2 as:

$$C_2 (W_s, R, X_2) = W_s^\beta R^{(1-\beta)} X_2 (g^{(1-\beta)} + g^{-\beta}) \quad (10)$$

The general equilibrium analogue is represented using the sets of price-system and endowment-system, respectively:

Profit-maximising conditions are as follows: Here we get the average cost of sector 1 and 2 as the exogenously set prices of the respective sectors boil down to the perfectly competitive market structure.

$$AC_1(W, R) = P_1 \quad (11)$$

$$AC_2(W_s, R) = P_2 \quad (12)$$

Factor-endowment conditions are as follows:

$$M_1(W, R, X_1) + M_2(W_s, R, X_2) = \bar{M} \quad (13)$$

$$L_1(W, R, X_1) = \bar{L} \quad (14)$$

$$S_2(W_s, R, X_2) = \bar{S} \quad (15)$$

The main unknown variables are W, R, W_s, X_1 and X_2 . From equation (12) we get W in terms of R , (13) gives us W_s in terms of R, X_1 and X_2 in terms of R is obtained in equation (15) and (16) thus we get the final value of R in (14). This completes the determination of equilibrium values in the model.

Lemma 1: *The 5×5 system without AI is stable given consistent determination of all equilibrium values.*

2.2 Economy with AI

Now consider the emergence of sector 3 that produces output X_3 which is a close substitute of X_2 but using AI as an input. The production function is given by:

$$X_3 = X_3(S_3, A_3, M_3) \text{ where } A_3 \text{ is the AI input} \quad (16)$$

Cost is minimized when skilled wage (W_s), price of AI (ρ^*) and rate of interest of machines (M_3) is least.

Taking the Lagrangian and performing the cost minimization subject to the total output constraint in Sector 3 (X_3), we obtain:

$$\text{Min } C_3 = W_s S_3 + \rho^* A_3 + R M_3$$

$$\text{Subject to: } X_3 = S_3^{\gamma_1} A_3^{\gamma_2} M_3^{(1-\gamma_1-\gamma_2)} \quad (17)$$

Solving yields the conditional demand functions of skilled labor in Sector 3 (S_3^*), AI (A_3^*) and machinery (M_3^*) as follows:

$$S_3^*(W_s, \rho^*, R) = W_s^{-(1-\gamma_1)} \rho^{*\gamma_2} R^{(1-\gamma_1-\gamma_2)} e_1 X_3 \quad (18)$$

$$A_3^*(W_s, \rho^*, R) = \rho^{*(1-\gamma_2)} W_s^{\gamma_1} R^{(1-\gamma_1-\gamma_2)} e_2 X_3 \quad (19)$$

$$M_3^*(W_s, \rho^*, R) = R^{-(\gamma_1+\gamma_2)} W_s^{\gamma_1} \rho^{*\gamma_2} e_3 X_3 \quad (20)$$

$$AC_2(W_s, R) = P_2$$

$$AC_3(W_s, \rho^*, R) = P_3$$

A decline in the price of AI input (ρ^*) given exogenously makes AI relatively cheaper, prompting Sector 3 to increase its AI usage and expand output. To maintain the price level P_3 , the costs of skilled labor (W_s) and machinery (R) rise. As a result, average cost (AC_2) in Sector 2 also increases due to higher W_s and R , surpassing P_2 . Since $AC_2 > P_2$, the traditional skilled-specific sector shuts down. In Sector 1, the rise in R raises production costs, leading to a decline in unskilled wages (W) to maintain balance, which subsequently reduces the demand for unskilled labor. Meanwhile, in Sector 2, the increase in average costs causes the sector to disappear entirely as there is negative profit. Ultimately, AI adoption leads to the vanishing of the modern sector. The vanishing sector, sector 2, releases all S_2 and M_2 which is absorbed in sector 1 and sector 3 causing

X1 and X3 to rise. The vanishing sector, sector 2, releases all S2 and M2 which is absorbed in sector 1 and sector 3 causing X1 and X3 to rise.

Corollary 1: *The unstable 6×6 GE system necessitates the vanishing of at least one sector (Sector 2) such that the reduced 5×5 form stability gets restored.*

2.3. Protection to skilled labor in the AI sector

Here we consider fixing the skilled wage rate in the AI automated Sector 3 while keeping it flexible in Sector 2.

Proposition 2: *Fixed skilled wages in AI automated sectors preserve the incidence of vanishing sector 2, thus keeping the 6×6 system stable. Sector 2 survives although skill wage rate deteriorates.*

$$AC_1(W, R) = P_1$$

$$AC_2(W_s, R) = P_2$$

$$AC_3(W_s, \rho^*, R) = P_3$$

When ρ^* falls, R must rise as P_3 and W_s is fixed. In AC_1 , W has to fall. In AC_2 , W_s has to fall. So, Sector 2 survives although the skilled wage rate deteriorates. However, this is politically conflicting as when the government secures the wages for skilled labor in one particular sector with AI automation the traditional sector that has equally skill specific labor bears the brunt of being neglected and is excluded from social security. Though this scenario is the economically best alternative, its political implications are controversial.

2.4. Protection of skilled labor in all sectors of the economy

Finally, consider the case where all skilled wages are fixed such that:

$$AC_2(\overline{W_s}, R) = P_2$$

$$AC_3(\overline{W_s}, \rho^*, R) = P_3$$

Proposition 4: *Symmetric skilled wage fixation causes vanishing of sector 2, but also unemployment of skilled labor as they are released from the vanishing sector.*

When ρ^* falls, R must rise as P_3 and $\overline{W_s}$ is fixed. In AC_2 , R rises but both P_2 and $\overline{W_s}$ are fixed. So, this gives rise to unstable equilibrium. Thus, Sector 2 vanishes. The skilled labour released from Sector 2 are unemployed as they cannot be absorbed in Sector 1 that requires unskilled labour and Sector 3 has already expanded but skilled wages are fixed so it cannot accommodate the surplus labour released from Sector 2. This situation is politically inclusive however economically undesired. Thus, this could lead to hampering economic development by aggravating unemployment.

Comment 1: *Asymmetric wage fixation in terms of fixed W_s in sector 3 only prevents vanishing sector incidence, while complete or no imperfection leads to vanishing sector & unemployment in the former.*

Comment 2: *Partial imperfection is politically inefficient as the group is devoid of fixed wage rate despite the same skill level. While the economically worse symmetric wage fixation is politically efficient strategy*

3. Conclusion

The outcome of our analysis was to emphasise on how advancement of AI in the economy leads to a vanishing sector in the labour market. The skilled specific sector that falls under the traditional setup (without AI automation) is the sufferer either in a way of contraction of the sector, complete inexistence and unemployment raising income inequality and social security concerns in a developing economy.

However some policy recommendations have been formulated to make the situation less adverse by fixing a price floor or minimum support wage for skilled labor in the modern sector consisting of AI automation. This is a politically conflicting policy as the same skill specific sector under traditional setup is neglected and not provided with wage security by the government. We also focus on the symmetric protection from

skilled laborers' wage fluctuations in the traditional and modern economy. Though it is politically inclusive to the specific skilled labor across Sector 2 and Sector 3, it is not economically the best alternative. This is due to the fact that minimum wage support in both the sectors cause vanishing of the traditional sector without AI together with unemployment of the labor resource, worsening the economical development. The future prospects of the study conducted could be empirical and statistical analysis on AI automation in small economies and the effect caused in the economy due to the vanishing sector.

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WORK PAUSED, INTERNET ON: COMPARATIVE LEISURE TRENDS IN RURAL AND URBAN LABOUR FORCE

Rounak Biswas
3rd Year, UG

Abstract

This article examines the role of the internet as a primary channel for entertainment and its influence on leisure time within the Indian labour force, with a particular focus on rural–urban differences. Drawing on Time Use Survey (TUS) 2019 data, it explores how increased access to internet-based entertainment such as social media, streaming platforms, and online games has redefined leisure in both rural and urban contexts. The analysis employs a simple time allocation model to show how online leisure supplements or even replaces offline leisure, thereby expanding total leisure time. Findings indicate that for every additional 10 minutes spent online for entertainment, rural workers experience an average of 8 extra minutes of total leisure, compared to 6 minutes for their urban counterparts. This differential effect stems from limited alternative leisure channels in rural areas and greater work flexibility in informal sectors. The article further discusses economic interpretations, policy implications, and the broader significance of digital inclusion as a driver of well-being. It concludes that the internet's role in reshaping leisure is not merely technological but also socio-economic, influencing time-use patterns and potentially altering labour productivity and quality of life.

JEL Classification

J22, O18, L86, D12

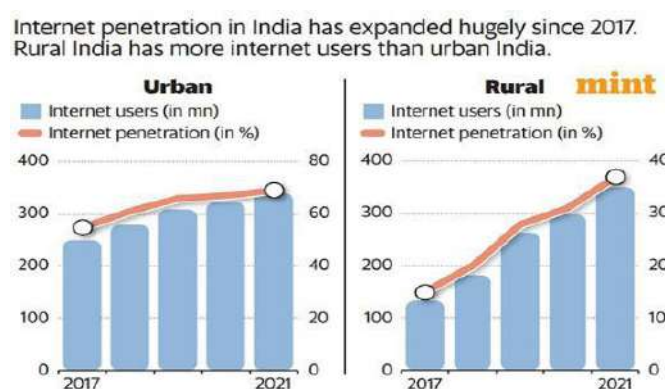
Keywords

Internet use, Leisure, Rural–urban labour, Time allocation, Digital entertainment, Work–leisure trade-off, India

Introduction

Over the past decade, India's digital landscape has undergone a remarkable transformation. The fall in mobile data costs, expansion of 4G and now 5G networks, and widespread smartphone penetration have created an environment where internet access is no longer a luxury but a daily necessity. This technological shift has particularly influenced the allocation of time between work and leisure among the labour force. In microeconomic terms, labourers face a constant trade-off: hours spent working generate income, while hours of leisure offer utility through rest, recreation, and personal activities. The internet, especially in the form of video streaming, social media, and gaming, has emerged as a new and highly attractive leisure channel. This has subtly but significantly altered time-use patterns, as workers across India both rural and urban integrate digital entertainment into their daily routines. The story, however, differs between rural and urban areas. Rural workers often engage in seasonal, less rigid work schedules, making it easier to insert leisure periods during the day. Urban workers, while often facing stricter time constraints, are finding ways to reclaim leisure by multitasking or compressing work hours, sometimes aided by work-from-home arrangements. Understanding this phenomenon requires combining empirical data with economic reasoning is the very aim of this article.

Fig 1: Internet Penetration in India



Source: Internet in India 2021 report by IAMAI & Kantar

Theoretical Framework: A Simple Time Allocation Model

Let:

- T = Total available time per day (1440 minutes)
- H = Hours worked
- L = Leisure time
- I = Internet entertainment time (subset of leisure)

By definition:

$$T = H + L$$

and Leisure itself can be divided into offline leisure (L_0) and online leisure (I)

$$L = L_0 + I$$

Where L_0 is non-internet leisure (e.g., physical rest, offline recreation) and online leisure is almost entirely driven by Internet based entertainment like Youtube videos, Instagram scrolling, OTT platforms, Online games and video calls with friends.

The "Scroll or Earn" Trade-off:

If you work: Earn ₹ X (the wage)

If you scroll: Get ₹ Y worth of enjoyment

For example, Construction worker: $X = ₹50$, $Y = ₹30$ & Office worker: $X = ₹200$, $Y = ₹30$

So the, labour whether an IT professional or a factory worker, will spend time on the internet if their enjoyment value(Y) is greater than the loss in wage(X)

Empirical Relationship

We estimate a straightforward relationship:

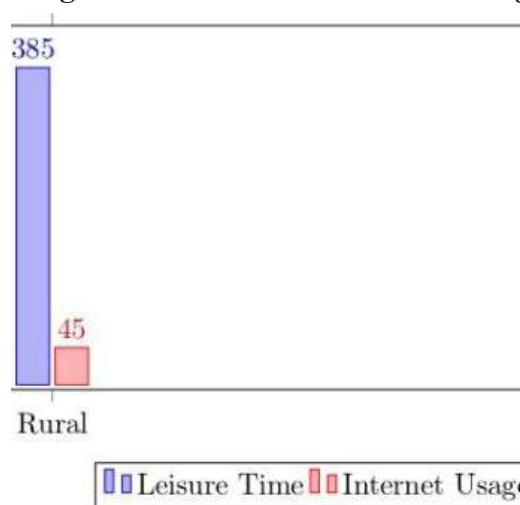
$$L_i = \alpha + \beta \cdot I_i + \varepsilon_i$$

- L_i is total leisure minutes for person i
- I_i is spend in Internet by person i
- Assumed β coefficients reflect plausible elasticities based on rural-urban digital divide literature. β measures corresponding increase in leisure due to per additional minute surfing in internet
- α is the baseline leisure when no internet is used
- ε_i is the error term

Group	Average Leisure (Min/day)	Average Internet (min/day)	β (approx.)
Urban	385	45	0.8
Rural	360	60	0.6

Using individual-level secondary data enables the model to capture differences between rural and urban workers. The estimates, derived from the NSO Time-Use Survey (2020), are broadly consistent with supplementary telecom usage reports. The marginal effects (β) represent illustrative estimates intended to reflect plausible behavioural differences in internet usage and leisure time across rural and urban contexts.

Fig 2: Leisure Time vs Internet Usage



Economic Interpretation

Rural ($\beta = 0.8$): For every additional 10 minutes spent on internet entertainment, rural workers experience an 8-minute increase in total leisure time. This suggests a high elasticity of leisure substitution rural individuals may be substituting traditional leisure activities (e.g., socializing, radio etc.) with online entertainment, leading to a net increase in leisure.

Urban ($\beta = 0.6$): A 10-minute increase in internet usage corresponds to only a 6-minute rise in total leisure. Urban workers exhibit lower responsiveness, likely due to the following factors:

Saturation effects— the urban population already has diverse leisure options (theatres, cafes, gyms etc.)and hence internet usage does not displace other activities as such.

Multitasking: Urban users may integrate internet usage with work or chores, reducing its net leisure impact.

Why Are Rural Gains Bigger?

Leisure increases as more time is spent on internet entertainment. This effect is stronger among rural workers because of high marginal utility of leisure.

From a microeconomic standpoint:

$$\partial I / \partial L = \beta > 0$$

where,

$$\beta_{\text{rural}} > \beta_{\text{urban}}$$

This is mainly due to the following factors:

Limited offline leisure options: The Internet adds a major new channel which has not been experienced by the rural labour force before.

Cultural norms: Online leisure may be more acceptable when going out is not always a feasible option.

Flexible work patterns: Informal rural work arrangements may allow more micro-breaks, enabling online leisure without cutting out on work hours drastically.

Policy Recommendations

- **Skill-tainment:** Integrating short, engaging learning modules (farming tips, finance basics) into entertainment streams so as to improve labour skills.
- **Micro-Shifts:** Designing of rural work schedules around peak internet hours to balance productivity with personal leisure preferences.
- **Leisure Credits:** Offering free data vouchers for hours spent on verified skill-based or educational platforms, making leisure more productive.
- **Seasonal Off-Peak Push:** Usage of telecom incentives and low-data entertainment during harvest or peak work periods to minimise productivity loss.

Conclusion

The Internet's growing presence in the Indian labour market has redefined the delicate balance between work and leisure, especially in rural areas where its influence on free time is more profound. Rather than viewing this shift as a threat to productivity, it is better understood as an opportunity to reshape how leisure is valued and utilised. As Amartya Sen reminds us, "Development is freedom"—and in today's context, digital access can expand that freedom by offering both entertainment and avenues for skill growth. If guided by smart policies, the leisure created by internet use can evolve from passive consumption to active capability-building, fostering well-being and economic resilience. The real policy challenge, therefore, is not in limiting internet-induced leisure but in steering it toward outcomes that strengthen both the individual and the economy, ensuring that the digital revolution becomes a bridge between leisure and labour rather than a divide.

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GLOBALISATION WITH A CONSCIENCE: INDIA'S APPROACH TO A SUSTAINABLE AND EQUITABLE GROWTH

*Navya Reshamwala, Srreshtha Sureka and Vishakha Sikaria
3rd Year, UG*

Abstract

The purpose of this article is to highlight the policies and initiatives that the Indian government has put in place to promote economic growth in tandem with social justice and environmental preservation. The findings are supported by case studies, industry-specific statistics, and public impact reports. They enable the nation to grow closer to reaching its sustainable development goals by being dispersed over multiple key sectors that contribute to sustainable development, such as smart cities, green energy, financial inclusion, and climate-resilient agriculture.

Our study presents a novel paradigm that combines cutting-edge technology, inclusive governance, and local innovation. In addition to providing a successful story, the Indian precedent offers a useful and dynamic blueprint to help build a more just and sustainable society.

JEL Classification

F63, I38, Q01, O13

Introduction

Sustainable development can be regarded as a blueprint for a nation to attain economic growth without endangering its resources and environment for subsequent generations. India has been attempting to strike a balance between the need to preserve its natural resources and its rapid economic growth. A new report released by the Reserve Bank of India (RBI) points out that up to 4.5% of the country's GDP could be at stake by 2030 due to lost labour hours caused by climate change issues, extreme humidity and heat. Surprisingly, 50% of India's GDP comes from sectors that work in excess heat. The drain on economic productivity would be far larger when taking into account the annual cycle of pollution produced by such sectors.

The nation has implemented a number of programs and laws to support green infrastructure, sustainable agriculture, and renewable energy. To guarantee that future generations inherit a healthy and prosperous environment, efforts are being continuously made to lower poverty and raise living standards.

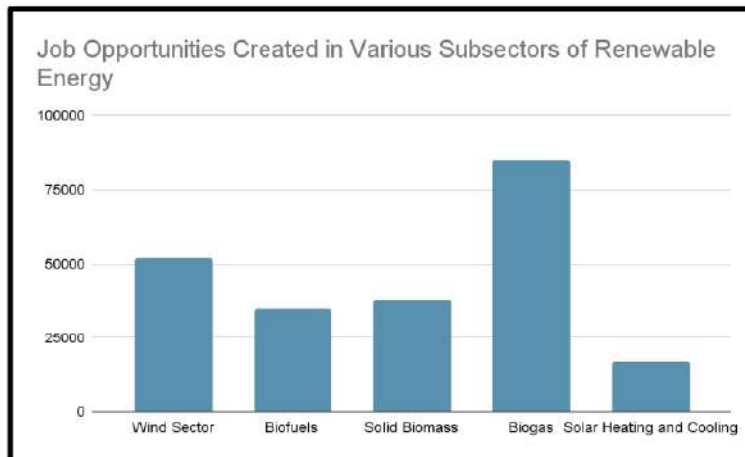
The Leap to Green Energy: Economic Implications

India is attempting to tackle a dual problem at hand - navigating sustainable development alongside equitable growth. Green energy is like hitting the bull's eye when it comes to sustainable development, which is one of the key pillars of this movement. Being the most populous country in the world and a fast paced economy, achieving net zero emissions by 2070 calls for urgent action via the medium of policy, and technological reforms. With a current installed capacity of 462 GW (as of December 2024), out of which 45% stems from renewables; and a potential capacity of 500 GW by 2030, energy strengthening is the key to building a strong economic foundation. [1][3]

Steered by initiatives like PM KUSUM and PM Surya Ghar-Muft Bijli Yojana, India's Solar energy is growing at a CAGR of 36.5%. The energy storage sector is destined for a steady and robust growth, supported by the rising demands for renewable energy. The energy storage infrastructure is constantly evolving, and

promises a bright future for this industry. Renewable energy subsectors have contributed to job creation and the following graph highlights this data. [2]

Fig: Job Opportunities Created in Various Subsectors of Renewable Energy



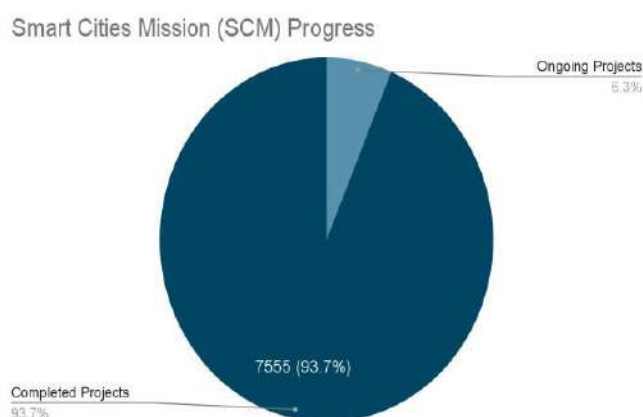
By keeping renewable energy development on a pedestal in India's sustained economic growth, we will be able to address UN SDGs like affordable and clean energy, climate action, decent work and good health & wellbeing. The green energy transition has attracted FDI and its benefits have trickled down to grassroots problems like skill development and unemployment.

Smart Cities: An Economic Goldmine

Requirement for Smart Cities: Cities provide efficient companies, better-paying jobs, quality of life, and hence can be regarded as the epicentre of economic development and innovation. Despite occupying just 3.0% of India's land, Indian cities generate a huge 60.0% of the country's gross domestic product (GDP). [4]

Launched on 25th June, 2015, the Smart Cities Mission is a milestone urban development project that seeks to multidimensionally enhance the quality of life and deliver urban infrastructure, using 'smart solutions'. Envisioned as a Centrally Sponsored Scheme, the mission is supported by Rs. 48,000 crores (US\$ 5.76 billion) of government money. With 100 cities coverage since its launch, the Smart Cities Mission has taken notable steps in its initial decade. Till May 9, 2025, there are 7,555 projects 94% of the total 8,067 projects completed with a value of ₹1,51,361 crore. Also, 512 projects with a value of ₹13,043 crore are in the advanced stage of implementation. This is the total of 8,067 multi-sectoral projects worth ₹1.64 lakh crore. [7]

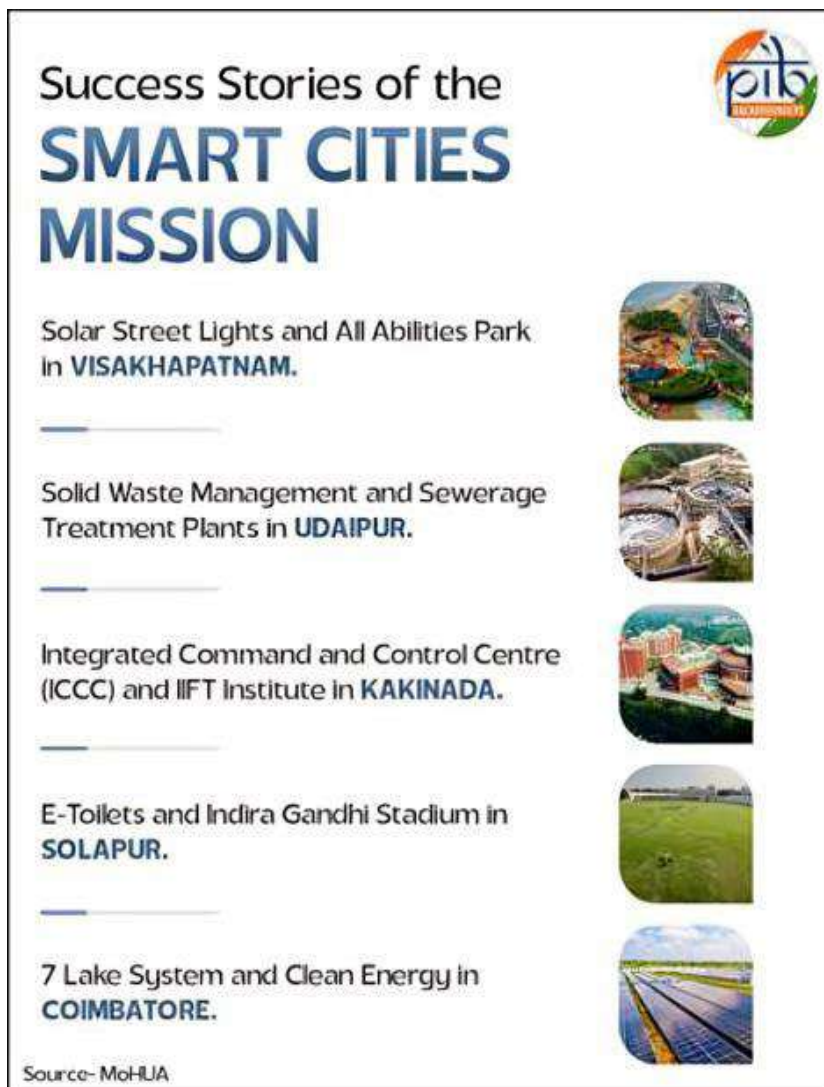
Fig: Smart Cities Mission Progress



Source: smartcities.gov.in (as of 9.05.2025)

This project has addressed issues such as public safety and security, water supply, employment generation, solid waste management. It has also helped improve health and education, with e-health centres and smart classroom technology burgeoning in the country-wide scene.

Fig 3: Success Stories



Source: Ministry of Housing and Urban Affairs (MoUHA)

PMJDY and Equitable Growth through Financial Inclusion

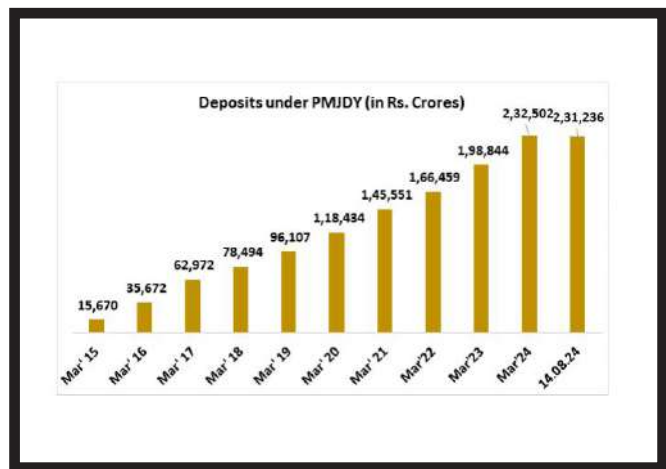
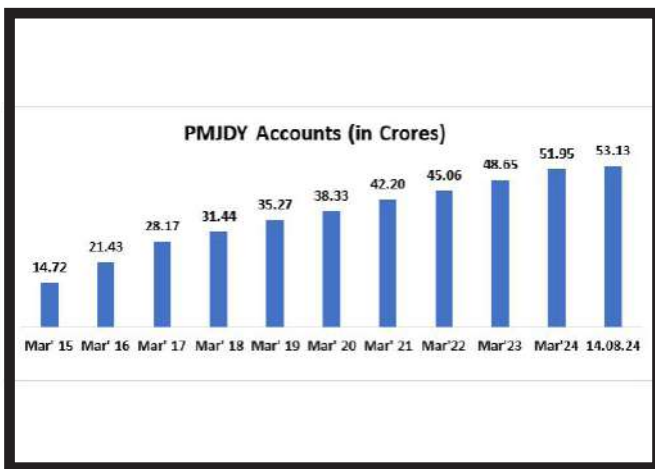
In India, the discussions on economic development necessitate the government policy interventions to be guided by broader frameworks that reflect global perspectives. Building on this, Amartya Sen's "Capability Approach," emphasis is laid on economic growth as a means to achieve wider social goals – such as the UN SDGs – rather than being confined to *GDP metrics*.

Time and again, we have seen that India's pathway to a sustainable and equitable economy in a globalized landscape depends heavily on large-scale social inclusion schemes. Despite most of these schemes having generated significant, and quantifiable socio-economic gains, questions have been raised about their efficiency, leakages and long-term sustainability.

By critically assessing Pradhan Mantri Jan Dhan Yojna (PMJDY), we evaluate its role in alleviating poverty and sustaining growth in globalized India.

Within ten years of its inception, PMJDY has established itself as India's largest financial inclusion program. With fascinating figures showing women holding 56% of the 53.13 crore accounts overall, and 67% of these accounts belonging to rural and semi-urban residents, the scheme has not only bridged gender disparities in financial access, but also addressed the regional gaps. It has been a major step forward in empowering women and taking them a step closer to financial independence. [8][9][10]

The scheme's JAM Trinity (Jan Dhan, Aadhar, Mobile) has been revolutionary in spreading financial literacy and improving governance for the direct bank transfers. PMJDY has been a key enabler of India's transformed and well-developed digital landscape. [9]



Source: Press Information Bureau, Government of India; Press Release: August 28, 2024

Even though PMJDY has been successful in raising deposits and thereby formal savings, statements cannot be made on its role in reducing poverty. Statistically, about 17% of these Jan-Dhan accounts remain inactive, putting light on the lack of sufficient financial literacy. Several financial instruments remain underutilised due to the same reason. Moreover, its long-term sustainability is often questioned due to low involvement of private sector institutions. [9]

Thus, we deduce that, to remain a catalyst for equitable and sustainable growth, PMJDY must align its social impact with the economic realities of globalization, creating a financial ecosystem that empowers every citizen.

Sustainable Agriculture and Climate Resilience

India, being an Agrarian economy, is vulnerable to climate change, due to which extreme weather conditions are a threat to the economy. Approximately 60% of India's net sown area is still used for rainfed agriculture, which produces 40% of the nation's food. The results of the climate change impact assessment indicate that without adaptation measures, rainfed rice yields are projected to decline by 20% by 2050. Meanwhile, yields from irrigated rice fields are estimated to decline by 3.5% in 2050. By encouraging conservation and sustainable use of these limited natural resources through suitable methods, agricultural expansion can be maintained. India has been actively working towards this since 2008, after the launch of the **National Action Plan on Climate Change (NAPCC)**. [13]

Key measures adopted since the launch of the NAPCC:

1. **National Mission for Sustainable Agriculture (NMSA):** NMSA uses a three-pronged approach to improve agronomic practices. Its components include Rain-fed Area Development (RAD), Soil Health Management (SHM) and On-Farm Water Management (OFWM). Using precision farming tools like GIS-based soil mapping, sensor-guided irrigation systems and more climate-resilient crops, farmers have been able to adapt to unpredictable rainfall patterns, droughts and thermal stress. [11]
2. **Paramparagat Krishi Vikas Yojana (PKVY):** Since its inception, the program has formed 37,364 clusters of organic farming covering 15 lakh hectares of cultivable land. This scheme has allowed farmers to avoid expensive third-party certification since it operates under the Participatory Guarantee Scheme for India. [12]
3. **The Mission Organic Value Chain Development for the North-Eastern Region:** This is a pivotal initiative in transforming traditional farming practices into high-value, sustainable enterprises. It will enable the North East regions to tap into the national and international organic produce markets and emerge as a prominent supplier. The program has formed 100 Farmer Producer Companies (FPCs) that have empowered over 40,000 farmers to create a commercial organic farming model. [14]

However, merely 0.8% of the Ministry of Agriculture and Farmers Welfare (MoAFW) budget is allocated to NMSA. Beyond the INR 142,000 crore budget of MoAFW, the Central government also spends about INR 71,309 crore annually on fertiliser subsidies. So, while the Indian government recognises the importance of promoting sustainable agriculture, the focus remains heavily skewed towards green revolution-led farming.[15]

Conclusion

In the changing world of globalization, India's growth story is not just about rising GDP or foreign investment. The true indicator of growth lies in how inclusive, resilient and sustainable it is. Programs like PMJDY, rural electrification, renewable energy expansion, and targeted welfare schemes highlight a shift towards including equity in the economic narrative. Growth is not restricted to numbers; it propels social change when rural enterprises integrate into global value chains, underserved communities obtain access to clean energy, and women establish their first bank accounts.

Rethinking growth means linking the benefits of globalization with caring for the environment, promoting gender equality, and reducing poverty. India can lead the way for globalization to create shared prosperity by investing in people, strengthening social safety nets, and ensuring that economic connections with the world do not worsen domestic inequality. This approach prioritizes sustainability and equity as essential components of enduring and inclusive growth.

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FDI, SKILLED-UNSKILLED WAGE GAP AND EMPLOYMENT: A GENERAL EQUILIBRIUM ANALYSIS

Srijit Kumar Mondal
3rd Year, UG

Surosmitta Biswas
2nd Year, UG

Abstract

The role of foreign capital inflow has been a driving force in the era of openness marked by liberalisation, privatisation, and globalisation. Developing countries alongside their developed counterparts are no exception. Usefulness of foreign capital inflow in a developing economy has been long contested. Analysing how FDI affects skilled-unskilled wage gap in a general equilibrium framework with a non-traded sector is not unexplored (Chaudhuri and Yabuuchi, 2007 and others). However, our treatment of foreign capital in respect to its returns alongside domestic capital makes our model interesting. Our stylized economy comprises agriculture, manufacturing, and service sectors. Agriculture alongside manufacturing uses unskilled labour and domestic capital whereas skilled labour and foreign capital finds place in the tertiary (or service) sector. Capital earns different rates of return based on its source whether domestic or foreign. The wage of skilled labour depends on the unemployment rate whereas the wage of unskilled labour is flexible. Our research question is whether FDI led service growth is an enclaved pattern of growth or generates adequate linkage effects for the rest of the economy. The paper shows that the result critically depends on the presence of the non-traded sector. We will show that if a non-traded sector exists FDI increases employment of skilled labour. Both skilled wage and unskilled wage rises. Critics of FDI argue that FDI has a minimal linkage effect with the rest of the economy. Whether FDI contributes to the overall economic development of the host country depends on the structure of the economy. The presence of a non-traded sector plays an important role in shaping linkage effects which has wide implications for the labour market. Our 3-sector general equilibrium model shows that in presence of a non-traded good FDI not only causes employment of skilled labour to rise and may improve the wage gap. It should however be noted that the effect on wage gap is conditional. Domestic capital owners are worse off. An effort is also made to understand the reaction of domestic capital owners to FDI i.e. whether domestic capital owners lobby against inflow of foreign capital or they act as comparators.

JEL Classification

D58, F16, J31, F66.

Keywords

FDI, skilled-unskilled wage-inequality, employment, labour market.

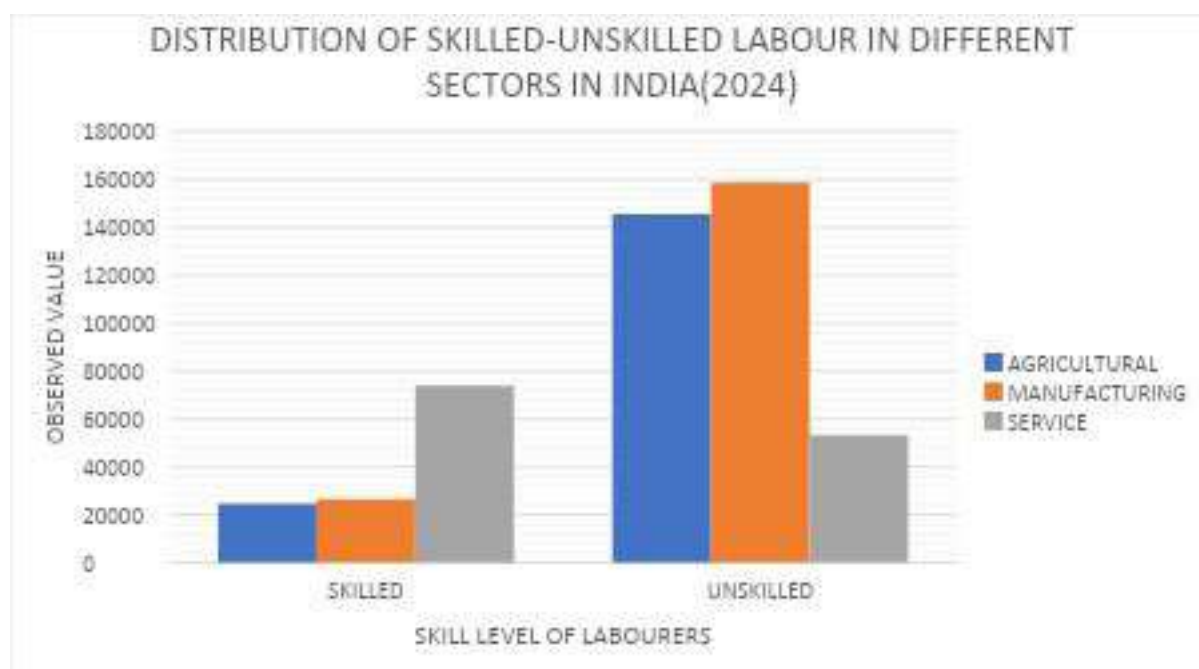
Introduction

Explanation of growing income inequality is one of the important recent research areas in Development Economics. The conventional belief is that globalization leads to an improvement in welfare both from the aggregative and distributive perspectives. However, with regard to its distributive effect, many empirical works point out that skilled-unskilled wage income inequality has grown up in various developed and developing countries. Different studies offer different explanations for this phenomenon; and trade liberalization and technological progress are the main two controversial reasons for this phenomenon.

According to Conventional Trade Theory, such as Heckscher-Ohlin (H-O) model and Stolper-Samuelson (S-S) theorem, decline in wage disparity in skilled and unskilled workforce in labour-abundant developing countries such as India by increasing relative returns to unskilled labour. However, empirical analyses complicate this theoretical proposition by also including evidence for divergence in wage levels. Institutional structure, direction of trade, sectoral compositions, foreign investment, and technology flow etc. influence the wage differential between skilled and unskilled labour.

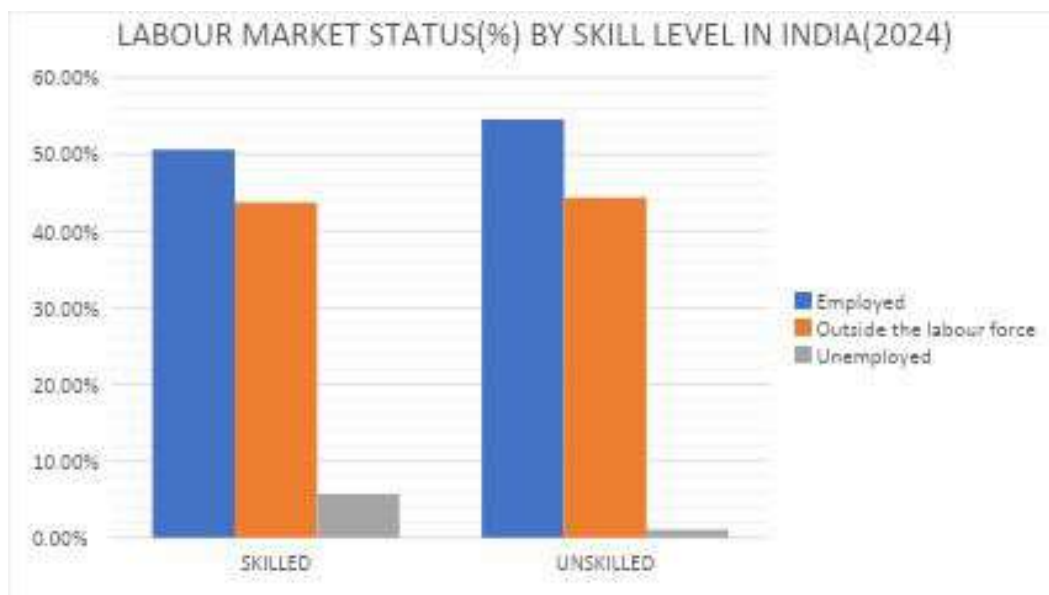
SECTION II: Descriptive Statistics

Fig 1: Distribution of Skilled-Unskilled Labour Sector-wise



Source: ILO, PLFS

The bar graph titled “Distribution of Skilled-Unskilled Labour in Different Sectors in India (2024)” indicates the disparity in employment of skilled and unskilled labour in the three sectors of the economy which are the agricultural sector, manufacturing sector and the service sector. It is clear from the graph that skilled labour is predominantly employed in the service sector and the employment of skilled labour is comparatively very low in the agricultural and manufacturing sector. In contrast we find that unskilled labourers are heavily employed in the agricultural and manufacturing sector with both employing nearly the same and substantial number of labourers but are negligible in the service sector compared to the other two sectors.

Fig 2: Labour Market Status

Source: ILO, PLFS

The bar graph titled “Labour Market Status (%) by Skill Level in India (2024)” shows a comparative analysis of the employment of the Indian population categorized as skilled and unskilled labour. It categorizes the population into three parts- employed, outside the labour force and unemployed.

From the graph it is evident that the employment level of unskilled labour (around 55%) is slightly higher than that of skilled labour (around 50%). This could be attributed to the high demand for unskilled labour in the agricultural and manufacturing sector which tend to absorb large numbers of unskilled labour whereas the demand for skilled labour is service sector specific. It is interesting to note that nearly around the same percentage of labourers (around 44%-45%) both skilled and unskilled are outside the labour force indicating that a substantial proportion of the Indian work force are not participating in the work force regardless of their skill levels.

However, the most important difference lies in the unemployment rate of the laborers. It is evident from the bar graph that the unemployment rate is much higher in the skilled laborers (around 5%) whereas the unemployment rate is nearly negligible in the unskilled labour. This suggests that the skilled labour faces more unemployment instead of having higher skill sets possibly due to the reason of wage rigidity where the skilled workers don't work at lower wages than their expectation whereas the unemployment in unskilled labour is much lower as they operate in flexible labour market and hence unskilled workers find it easier to get absorbed into low-skill, low-wage employment despite the lack of job security or advancement opportunities. Thus, the graph shows a paradox in the Indian Labour market where unskilled labour are more readily employed whereas skilled labour face unemployment despite their higher qualification.

Fig 3: Average Monthly Earnings of Labour by Skill

Source: ILO, PLFS

The line graph titled “Average Monthly Earnings by Skill Level Over Time” is a time series data graph that shows the wage gap between skilled and unskilled labour in India from 2010 to 2024. Over the years both skilled and unskilled labourers have experienced a steady growth in their monthly wages however skilled workers have significantly earned more than their unskilled counterparts. Though there is a visible wage gap between skilled and unskilled workers, over time we have seen the wage gap have not widened but if possible have decreased over the period indicating slow narrowing of the wage disparity. The line graph overall reflects the value of skill development in earning a higher wage rate and the need for policies to upskill workers to reduce wage inequality.

SECTION III: The Model

In this section we build up a three-sector general equilibrium model for a small open economy. The three sectors are the service sector (X), import competing manufacturing sector (Y) and the traded agricultural sector (Z). The X sector produces exportable goods; the Y sector produces imports and the Z sector produces traded agricultural goods. Skilled labour and foreign capital are used in fixed proportion in the service sectors, and they are specific only to this sector. On the other hand, the Y and Z sectors use domestic capital and unskilled labour, where domestic capital and unskilled labour are mobile between these two sectors. We also assume there is substitutability between domestic capital and unskilled labour in the Y and Z sector.

We have a CRS (Constant Returns to Scale) production function. We assume perfect competition in all markets and thus product price is equal to the unit cost of production in each sector. The assumption of a small open economy gives constant product prices, determined in the world market for sector X, Y and Z. We consider sector X is purely export oriented. Now we consider returns to factors. Foreign capital earns a return (r_f) in the host country. Domestic capital earns a different interest rate (r_d). The reason why foreign capital and domestic capital earn different interest rates in the host country is that they are two different types of capital and the marginal product of capital is different for these two types of capital. The wage paid to skilled workers is w_s which is a function of unemployment of skilled labour. This unemployment may be termed as

“Luxury Unemployment.” The lower the unemployment rate the greater the skilled wage. However, wages of unskilled labour are flexible and hence there is no unemployment of unskilled labour. The following symbols are represented in the representation of the model.

- a_{lsx} : Factor coefficient of skilled labour per unit of output in the X sector.
 a_{ly} : Factor coefficient of unskilled labour per unit of output in the Y sector.
 a_{lz} : Factor coefficient of unskilled labour per unit of output in the Z sector.
 a_{kfx} : Factor coefficient of foreign capital per unit of output in the X sector.
 a_{kdy} : Factor coefficient of domestic capital per unit of output in the Y sector.
 a_{kdz} : Factor coefficient of domestic capital per unit of output in the Z sector.
 w_s : Wage rate of skilled labour.
 w_u : Wage rate of unskilled labour.
 r_f : Return of foreign capital in the host country.
 r_d : Return of domestic capital.
 P_i^* : Price of the food in the i th sector, $i=X, Y, Z$.
 L_s^- : Total supply of skilled labour.
 L_s : Skilled labour employed.
 L_u : Given supply of unskilled labour.
 K_f : Stock of foreign capital.
 K_d : Stock of domestic capital.
 u : Unemployment Rate.

Let wage of skilled labour be a function of effort and unemployment as follows.

$$w_s = w_s(u) \quad \text{-----}(1)$$

$$u = \frac{L_s^- - a_{lsx} X}{L_s^-} = 1 - \frac{a_{lsx} X}{L_s^-} \quad \text{-----}(2)$$

The general equilibrium structure of the model is as follows:

$$P_x^* = w_s a_{lsx} + r_f a_{kfx} \quad \text{-----}(3)$$

$$P_y^* = w_u a_{ly} + r_d a_{kdy} \quad \text{-----}(4)$$

$$P_z^* = w_u a_{lz} + r_d a_{kdz} \quad \text{-----}(5)$$

The endowment equations are given by:

$$L_s = a_{lsx} X, \quad L_s < L_s^- \quad \text{-----}(6)$$

$$K_f = a_{kfx} X \quad \text{-----}(7)$$

$$K_d = a_{kdy} Y + a_{kdz} Z \quad \text{-----}(8)$$

$$L_u = \alpha_{ly} Y + \alpha_{lz} Z \quad \text{-----}(9)$$

Here we note that L_s is the actual employment of skilled labour while L_s^* is its endowment. Unemployment of skilled workers can be explained in terms of efficiency wage theory.

Next, we define factor intensity ranking. We assume that sector Z is labour intensive compared to Y sector and accordingly $\frac{\alpha_{lz}}{\alpha_{kdz}} > \frac{\alpha_{ly}}{\alpha_{kdy}}$ for any common value of ratio of wage of unskilled labour to return to domestic capital.

The working of the model is as follows. Equation (7) determines X. From equation (2) we get the unemployment rate, u. From equation (1) we get wage of skilled labour, w_s . Equation (4) and (5) solve for wage of unskilled labour, w_u and return on domestic capital, r_d . From equation (3) we get return on foreign capital, r_f . Equation (8) and (9) solves for Y and Z.

SECTION IV: Comparative Statistics Under The Basic Model

Rise in foreign capital (K_f)

Let us consider the increase in the flow of foreign capital. Rise in K_f leads to rise in X from equation (7) as K_f is specific to X. As X increases, employment of skilled labour L_s increases from equation (6). Thus, due to rise in foreign capital unemployment of skilled labour decreases and skilled wage increases. However, there is no change in other factor prices, hence skilled-unskilled wage gap increases. Thus, we conclude that foreign capital inflow led growth of the service sector has limited impact on the economy.

SECTION V: Concluding Remarks

This paper investigates the persistent wage gap between skilled and unskilled labour in the context of a small open economy, using a series of 3 sector general equilibrium models. The findings show that development implications of FDI depend on the structure of the economy. If all sectors are traded FDI benefits only the skilled labour by increasing both wage and employment of skilled labour.

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GLOBALIZATION , GENDER PAY GAP AND LABOUR MARKET OUTCOMES: A GENERAL EQUILIBRIUM ANALYSIS

Srijit Kumar Mondal and Pramit Banerjee
3rd Year, UG

Abstract

This paper attempts to explain how different factors pertaining to the process of globalization affect the Gender Pay Gap in developing countries. In doing so we construct a set of general equilibrium models of a small open economy and these models may apply to a large class of emerging market economies. Gender disparity has many dimensions. This paper will consider certain types of gender inequality commonly observed in developing countries and in the Indian labour market as well. We will consider male-female wage gap and male-female labour force participation. Female Labour Force Participation Rate in India is much below the Global average. The nature of female participation varies from sector to sector. Female Participation in the labour force in rural areas is significantly higher as compared to urban areas and the manufacturing sector. It is instructive to note that globalization unleashes forces with myriad implications for both product market and labour market. We will examine how male-female wage gap and female participation in the labour market are related to globalization. We consider two traded sectors of production, prices of which are given in the international market. In the model female labour is a specific factor of production which is attributed to gender stereotyping. Particularly, female labour is used in the export oriented agricultural sector. On the other hand, male labour and capital are mobile between two sectors of production. We will show that capital account liberalization, i.e. perfect international mobility of capital has an ambiguous effect on wage gap. On the other hand, unfavourable price movement of exportable commodities accentuates the wage gap provided female labour is a specific factor of production in the export-oriented, agricultural sector. These results are independent of factor intensity ranking.

JEL Classification

J01, J16, F16, C52, J31

Keywords

Male-Female Wage Disparity, Labour Market, Globalization, vanishing sector.

Introduction

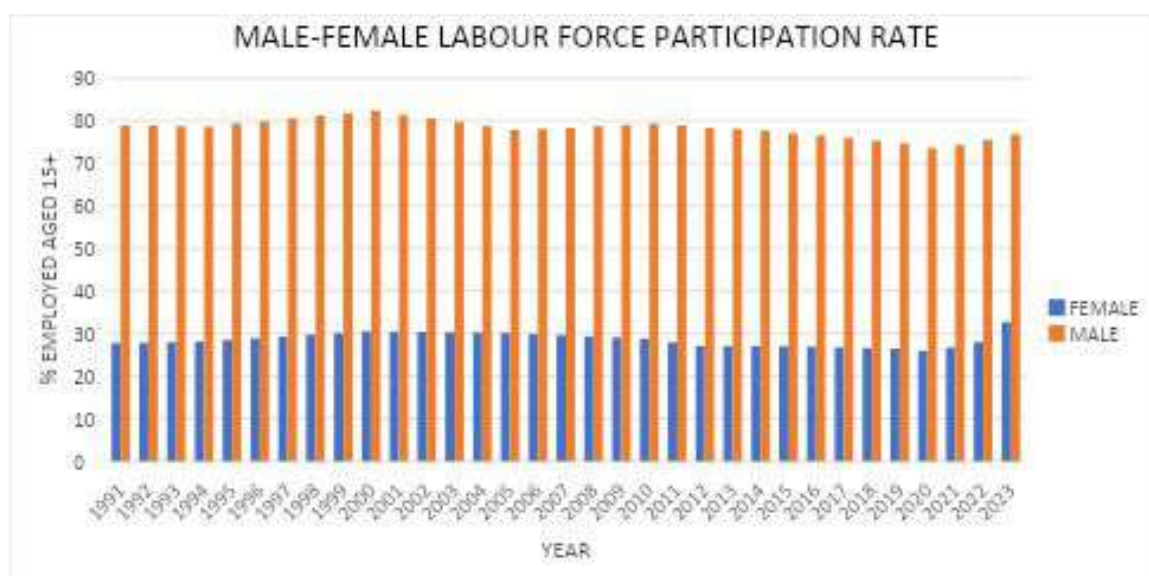
In this paper we address several dimensions of gender disparity. In particular, we will focus on male-female wage gap. What we will examine is how this wage gap is contingent on the process of globalization. ‘The Many faces of Gender Inequality’ addresses gender inequality as a collection of disparate and inter-linked problems and introduces us to several forms of gender inequality, namely, Mortality inequality, Natality inequality, Basic-facility inequality, Special-opportunity inequality, Professional inequality, Ownership inequality, and Household inequality (Sen, 2001). Likewise, in this paper we take into account several dimensions of gender disparity. This paper aims to establish the exploitative nature of globalization on both the product market and labour market and how it influences the wage disparity between male and female. The expansive nature of globalization serves as a source of economic growth, providing access to new markets, knowledge, and technology with enhanced global cooperation. However, it also lures in increased competition affecting the vulnerable product and labour markets, let alone its severe impacts of imbalanced trade and domestic job loss. This exploitation of labour and resources, particularly, further worsens the state of gender inequality and widens the prevailing male-female wage gap in developing countries.

The rest of the paper is organised as follows. In section II we present some stylised facts, in section III we construct the basic two sector general equilibrium model, in section IV we carry out some comparative static exercises of the basic model and Section 5 concludes the paper.

SECTION II: Some Stylised Facts

In this section we consider some statistical evidence on labour force participation of male and female workers along with gender wage gap in the post liberalization period.

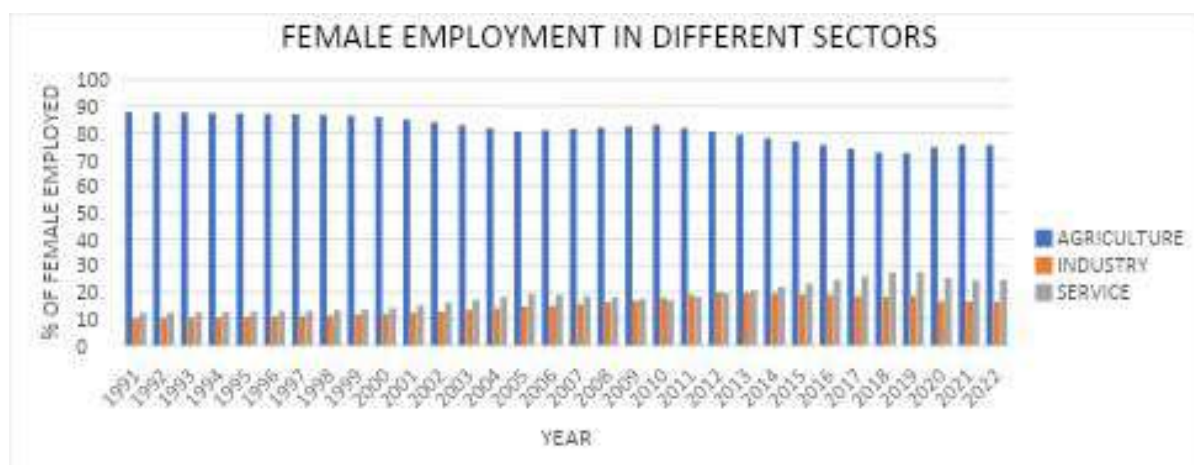
Figure 1: Male-Female Labour Force Participation Rate in India



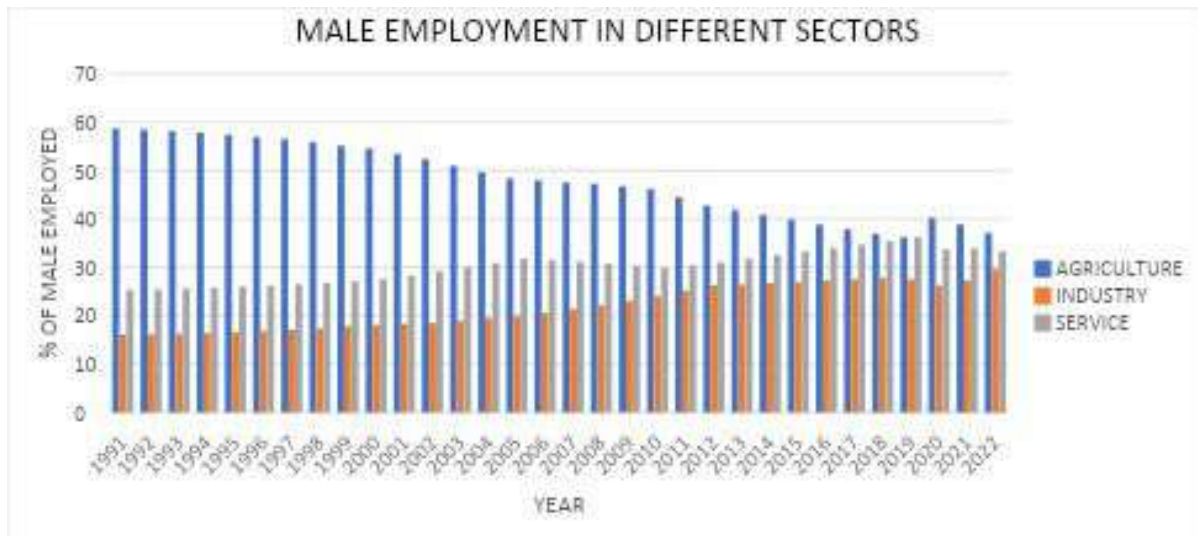
Source: World Bank, ILO.

The above data shows female participation in the labour force has remained remarkably stagnant. While in 1991 male labour force participation was around 79 percent, and female labour force participation being only around 28 percent. Over the years in 2023 male labour force participation accounts for nearly 77 percent while female labour force participation remains around 33 percent only. Thus, it has been observed that male labour force participation is always around 50 percent higher than that of female labour force participation.

Figure 2: Female Employment in different sectors in India



Source: World Bank, ILO.

Figure 3: Male Employment in different sectors in India

Source: World Bank, ILO.

From the above data, even though we see a high proportion of male labour employment in the agricultural sector in 1991 followed by 16 percent in industry and 25 percent in service sector, it has been observed that the male work force has nearly been equally distributed among all the three sectors in 2022.

Figure 4: Male-Female Wage Gap in India

Source: World Bank, ILO.

From the above data it can be inferred that post globalisation although there has been an increase in the wage rate the male-female wage gap has widened as well. While in 2005 the gap between male-female average monthly earnings of employees was around 1649 units of local currency it has expanded to account for around 6455 units of local currency.

SECTION III: The Model

We consider a small open economy consisting of two traded sectors. Sector X is the Export oriented agricultural sector while Sector Y is the Import competing manufacturing sector. Sector X uses female labour, male labour, and capital while sector Y uses male labour and capital only. In a developing country, agricultural commodities constitute the exportable sector. Thus, female labour is a specific factor in the production of agricultural commodities. It is instructive to note that male labour is mobile between two sectors of production. In the context of financial globalisation, capital is perfectly mobile and is used in both the sectors of production. We assume a competitive market and CRS. Accordingly, the zero-profit condition holds for both the sectors. We also assume perfect capital mobility such that domestic interest rate is equal to foreign interest rate.

Now the price system is given by the following equations:

$$P_x^* = \omega_m a_{mx} + \omega_f a_{fx} + r^* a_{kx} \quad \text{-----}(1)$$

$$P_y^* = \omega_m a_{my} + r^* a_{ky} \quad \text{-----}(2)$$

Where P_x^* the price of X, ω_m is the male wage, ω_f is the female wage, r^* the foreign interest rate, a_{mx} is factor coefficient of male labour per unit of output in the X sector, a_{fx} is factor coefficient of female labour per unit of output in the X sector and a_{kx} is the factor coefficient of capital per unit of output in the X sector. P_y^* the price of Y, a_{my} factor coefficient of male labour per unit of output in the Y sector, a_{ky} is the factor coefficient of capital per unit of output in the Y sector.

The quantity system gives full employment and is given by the following equations:

$$L_f^- = a_{fx} X \quad \text{-----}(3)$$

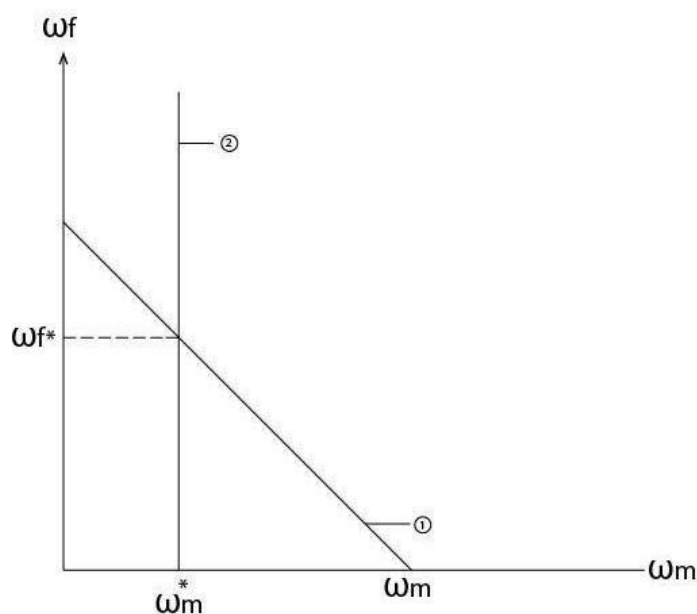
$$L_m^- = a_{mx} X + a_{my} Y \quad \text{-----}(4)$$

Where L_f^- is the endowment of female labour, L_m^- is the endowment of male labour, X is output in X sector, and Y is output in Y sector.

Next, we consider working on the model. From equation (2) we get male wage rate, from equation (1) we get female wage rate, from equation (3) we get quantity of X, from equation (4) we get quantity of Y. This completes the working of the model.

Next, we consider graphical representation of the model. Plotting this model in ω_f and ω_m plane we get a downward sloping line for equation (1) and a vertical straight line to the ω_m axis for equation (2).

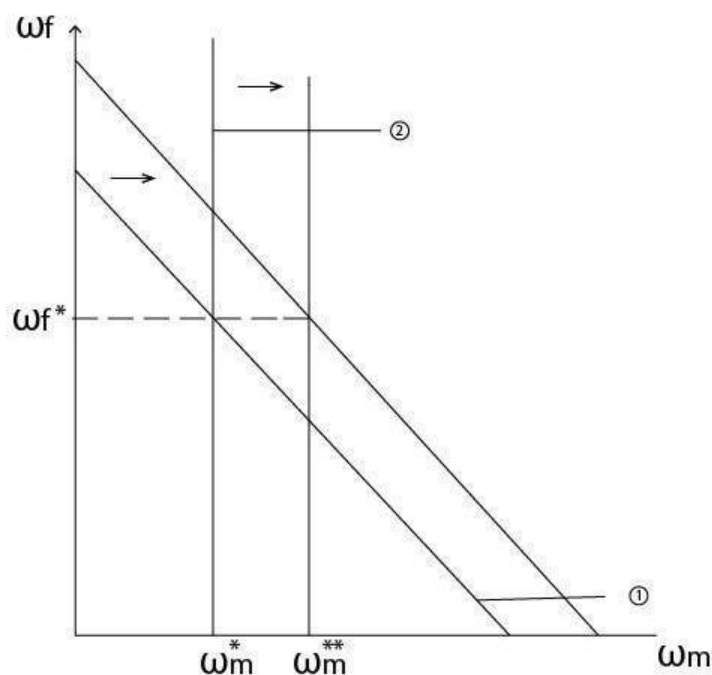
Fig 5: The Model



Source: Self Derived by Author

SECTION IV: Comparative Statistic**i) Fall in r^***

This may be conceptualised as an outcome of capital account liberalisation. From equation (2) we get rise in ω_m . There are two opposite effects on ω_f . Fall in r^* tends to increase ω_f while rise in ω_m tends to decrease ω_f . The final effect is uncertain. Accordingly, the male female wage gap may increase, decrease or remain the same.

*Fig 6: ω_f remaining same due to fall in r^** 

Source: Self Derived by Author

Fig 7: ω_f increases due to fall in r^*

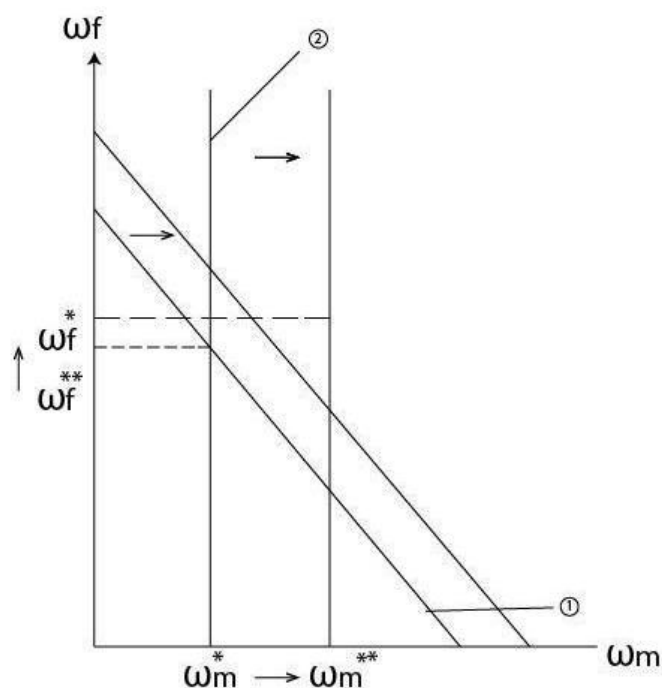
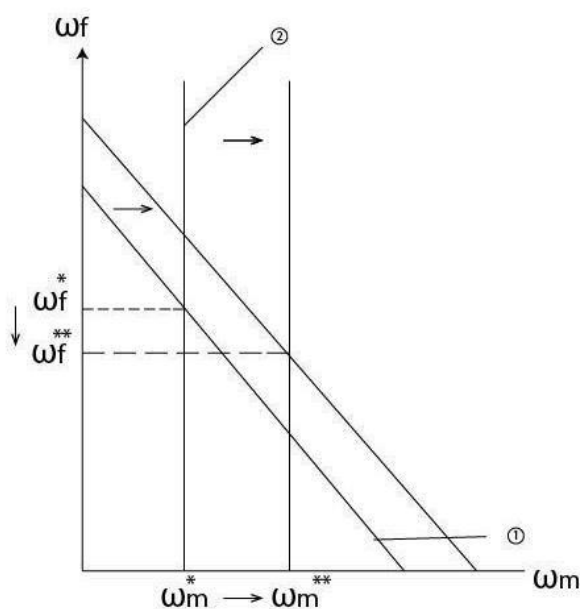


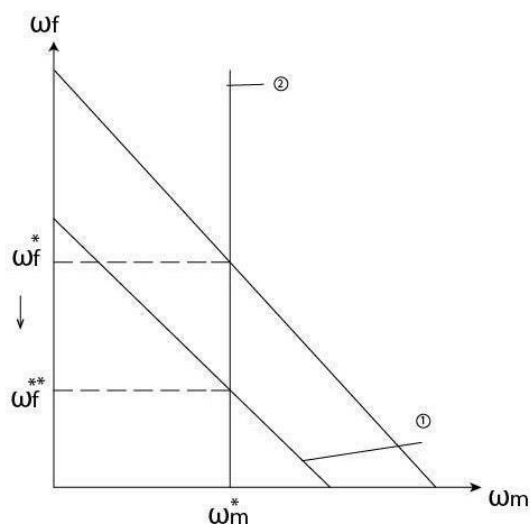
Fig 8: ω_f decreases due to fall in r^*



Source: Self Derived by Author

ii) Fall in P_x^*

Typically, less developed countries export agricultural goods. The world market for the product of agricultural goods is volatile. Let us consider fall in P_x^* . It follows from equation (1) that ω_f falls, while ω_m remains unchanged. Thus male-female wage inequality worsens.

Fig 9: Effect of fall in P_x^* 

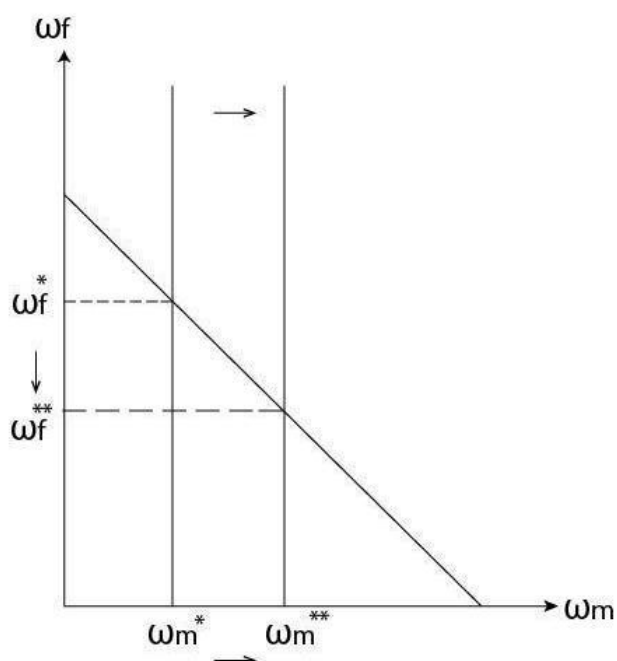
Source: Self Derived by Author

iii) Deglobalisation and Increase in Tariff

Equation (2) will be rewritten as:

$$P_y^*(1 + t) = \omega_m a_{my} + r^* a_{ky} \quad \text{-----}(2.1)$$

Consider increase in tariff rate, from equation (2.1) ω_m increases as t increases and from equation (1) ω_f decreases. Hence male female wage inequality worsens.

Fig 10: Effect of increase in tariff

Source: Self Derived by Author

SECTION V: Concluding Remarks

Gender inequality is socially nurtured and is a global phenomenon. This has multiple dimensions including gender wage gap and female labour participation. Forms of gender disparity vary across time and space. Societies in developing countries are heavily gendered; this is not simply biologically determined. This is essentially a social construct. In this paper we specifically concentrate on the gender wage gap as an outcome of globalization. Now we sum up the basic findings of our paper. Fall in the world interest rate unambiguously raises male wage but its effect on female wage is ambiguous. Accordingly, a fall in the world interest rate may not worsen male-female wage gap. Fall in price of agricultural export reduces female wage without producing any effect on male wage, hence, male-female wage gap worsens. Increase in the tariff rate raises male wage and reduces female wage. Thus, it accentuates the wage gap. The paper can be further extended to examine implications of imperfect factor mobility and unemployment.

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IS GLOBALIZATION BIASED? UNMASKING ITS EXPLOITATION OF THE THIRD-WORLD COUNTRIES

Ayush Narayan Ghosh and Soupayan Roychowdhury
3rd Year, UG

Abstract

This paper critically examines globalization's role in preserving economic inequality, arguing that it benefits wealthy nations in a disproportionate manner, while exploiting the poorer ones. Through the lens of Dependency Theory and the Stolper-Samuelson Model, the paper explores how structural trade relationships, global market dynamics, and concentration of market power enable core nations to capture unrestricted gains. Empirical evidence from various global indices for third-world countries reveals parallel trends in globalization and inequality. A focused case study in the latter half of the article demonstrates how European countries (primarily Switzerland) earn more from chocolate exports than West African producers who supply the majority of global cocoa. The findings suggest that globalization, while promising inclusive growth, often reinforces dependency, limits value capture in poor countries, and hinders the possibility of equitable growth. The paper concludes with few policy recommendations that we believe will keep the poor countries insulated from the disproportionate impacts of globalization. It is high time that we start rethinking what globalization actually stands for, thus redefining the concepts of growth and development in a world where globalization has become the primary driver of modernization.

JEL Classification

D63, F13, F63, O57

Introduction

Globalization has been associated by many with economic growth, access to new technology and cultural exchange. But as we delve deep into the topic, we can see the effects of globalization depends merely on the perspectives of different countries. For some, it has been the ray of opportunities while for others it is the curse of exploitation. In the end, it is the rich countries who set the terms of globalization whereas the poor and developing countries are forced to participate. Their participation may be driven by global pressure from institutions like the IMF, World Bank, WTO or by the idea of short-term gains ignoring the long-term costs.

The motive of this article is to 'rethink' globalization from the point of view of the relatively poorer nations and assess whether there has been a net positive effect from it. Globalization talks about shared prosperity, but is it the reality? Once the trade gates are opened, more often than not, the local industries struggle to survive against the foreign corporations. The profits of trade rarely stay in the economies that produce them – instead, they flow overseas to the already prosperous economies. The following sections in our article aim to expose the reality behind the facade of globalization, revealing globalisation for what it truly is - a powerful tool often exploited by the rich to maintain their dominance.

Enforcer of the Dependency Theory Ft. Globalization

In the International Economy, there are competing theoretical arguments regarding the question of global inequalities. One such theory is the Dependency Theory, which emerged in the 1950s. It was primarily witnessed in the case of Latin American countries but is relevant for explaining the global inequality prevailing between countries in the 21st Century.

In order to understand the Dependency Theory, we need to define the concepts of "Core" and "Periphery" countries. Core nations are usually "more economically developed, technologically advanced", while periphery nations are "less developed, often relying on the core nations for economic stability, and growth". This distinction plays a crucial role in understanding the dynamics of trade relationships between nations. The theory states that in a capitalist system, resources tend to flow from the periphery to the core nations (regressive transfer). This is because the poor countries tend to provide cheap labour for the businesses in rich countries. Therefore, this integration into the global system happens on uneven terms that benefit core nations more than the periphery nations.

Here we claim that **Globalization works as an enforcer of the dependency theory**. Contrary to many economists who believe globalization is the best means for bringing prosperity to the largest number of people, let us take up a few cases where it has only benefitted the core and exploited the periphery.

1. **Pharmaceutical Patents:** Core pharmaceutical firms often develop drugs using biological resources from the periphery nations, and patent them globally. As a result, these countries earn billions in IP royalties and control market access and dynamics, while production is often outsourced to poor or third world countries to reduce costs. Companies like *GlaxoSmithKline (UK)*, *Pfizer (US)*, and *Merck (US)* held patents on life-saving antiretroviral drugs (ARVs), and sold these drugs in the West for prices as high as \$10,000+ per patient per annum.
2. **Structural Adjustment Programs (SAPs):** During the 1980-1990s debt crises, many countries had to implement a set of reforms in exchange for loans and debt relief from the International Monetary Fund (IMF) and World Bank. These reforms emphasized *free markets, trade liberalization, and fiscal restraints*. The rich countries took advantage of these reforms to gain access to new markets and untapped sectors, so as to acquire cheap assets and expand their global footprint. The periphery nations, on the other hand, had to suffer from *deindustrialization, unemployment, inequality and loss of economic sovereignty*. Zambia, Jamaica and Bolivia are some of the few countries that got negatively affected by the implementation of SAPs.
3. **Agricultural Exports from the Global South:** Core countries control demand via supermarkets, food conglomerates, and commodity traders (such as Nestlé & Unilever). Global South farmers seldom sell directly to consumers abroad. Instead, they sell to intermediaries who dictate the prices. This makes farmers vulnerable to **global price fluctuations**. Eg: Coffee in Ethiopia, Cocoa in Ghana.

In the following section, we have established a correlation between globalization and inequality in developing countries by comparing their KOF Globalization index with their Gini coefficient.

Empirical Evidence : The Inequality Connection

The *KOF Globalization Index* is a composite index that measures the degree of globalization across various countries in the world (*KOF Swiss Economic Institute, ETH Zurich, 2024*). The calculation of the globalization scores is done on the basis of three parameters: the **economic, social and political** dimensions of globalization. The turning point in KOF Globalization scores occurred during the 1990s, owing to the wave of liberalisation policies, privatisation and de-regulation norms, that were established on a global scale to improve feasibility. Despite such high figures, the effect of globalization on income inequality has been an issue of crucial interest in most third-world economies.

Globalization & Third-World Countries: The Economics Behind Discrimination

Table 1: Table representing percentage changes in KOF scores & Gini Index

Country	Year	KOF Score	Change(%)	Gini	Change(%)
China	1990	34.09	81%	32.43	30%
	2015	62.02		42.16	
Sri Lanka	1990	49.22	5%	32.48	20%
	2015	51.81		39.16	
Bangladesh	1990	21.55	89%	28.85	11%
	2015	40.82		32.13	
India	1990	31.26	67%	31.88	10%
	2015	52.38		35.15	
South Africa	1990	39.06	70%	59.33	7%
	2015	66.72		63.38	

The table in the image above shows the percentage change in the KOF globalization scores as well as the *Gini Co-efficient* scores for various countries, especially third-world countries. The Gini Co-efficient is a measure of the inequality, whether it be regional, wealth, economic, prevailing in a country. A higher score reflects a higher level of inequality.

It is hypothesised that increased globalization deteriorates income distribution in developing countries. As is evident from the above table, for most third-world countries, income inequality has shown a positive trend with rising globalization. Some of the few conclusions that can be derived from the table are: -

1. Globalization Index (KOF) in China increased by 81% between 1990 and 2015 accompanied by a 30% increase in Income Inequality Index (*Gini*) during the same period. Integration of China into global value chains helped the country boost its GDP, but at the same time it widened the inequality gap between rural and urban sections. The rapid accumulation and rise in the price of capital favoured the skilled sectors, while the unskilled or informal sectors(which rely mostly on labour-intensive techniques) recorded stagnant growth.
2. Sri Lanka has been witnessing higher income inequality compared to the globalization scores. The country recorded a 20% increase in the Gini Index, whereas the Globalization index merely went up by 5%. Sri Lanka's integration into export markets increased openness, but the benefits were concentrated in export-oriented sectors. The country's dependence on global circuits for tourism favoured the accumulation of gains in the internationally connected sectors.
3. Bangladesh, despite having a booming garment industry, has recorded an 11% increase in inequality, despite a massive spike in globalization score by 89%. This is due to the presence of global supply bottlenecks prevailing in the market. Due to availability of cheap labour, the international brands have captured a higher proportion of the valuations. Bangladesh, being the assembly of garments, witnesses much less growth. The value-added is highest in *R&D* and *branding*.
4. Despite high KOF globalization scores in South Africa, the Gini-coefficient values are already high enough(>63.38), suggesting inequality to a much larger extent. Trade liberalization and foreign investment have boosted certain sectors, particularly finance and mining, yet the benefits have been concentrated among a small portion of elites.

In all these cases globalization only amplified the existing inequalities. As global trades benefit skilled workers and capital owners, the shift from agriculture to industry and service sectors widened the wage gap in the third-world countries since the majority of the labour force is unskilled.

Who really wins and loses from global trade?

In this section, we introduce the *Stolper-Samuelson Model* to explain the real-world effects of globalization and international trade on developed and developing/under-developed countries. Presented in 1941 by Walter Stolper and Paul Samuelson, the theorem postulates that “*an ad valorem import tariff (in a two-commodity, two-factor country) will bring about a more than proportionate rise in the price of the corresponding “intensive” factor in that industry*”(Cambridge University Press, 2014).

Most globally renowned companies have flourished owing to globalization. They have achieved such economic growth by bringing manufacturing and production to factories that are based in Third World countries. These countries lack capital and focus mainly on cheap labour and labour intensive techniques. In theory, wages for unskilled labor in third-world countries should rise due to increased demand. But in practice, due to global supply chains, wage suppression, labor surplus, and weak institutions, these gains are limited. Thus, the only winners from globalization, according to the SS theory, are the already developed countries with capital intensive production mechanisms.

Does the Stolper-Samuelson Theory hold up in the real world as well?

Donald R. Davis and Prachi Mishra(2007) explores the shortcomings of the SS theory, especially for small economies, as follows.

In the classic SS Model, let us consider the case of a small country(when it comes to global markets). It is assumed that the poor country is unskilled-labour-abundant.

The country produces two goods, namely X(skilled-labour intensive) and Y(unskilled-labour intensive). The only factors of production used are skilled labour(S) and unskilled labour(U).

For both goods, price must equal unit cost.

$$P_X = w_S S_X + w_U U_X \text{ \&}$$

$$P_Y = w_S S_Y + w_U U_Y$$

where S_X & S_Y are the amount of skilled labour required in the production process of X and Y respectively.

If we consider that the poor country is an importer of X and exporter of Y, then we get

$$P_X = (1+t)P_X^* = w_S S_X + w_U U_X \text{ \&}$$

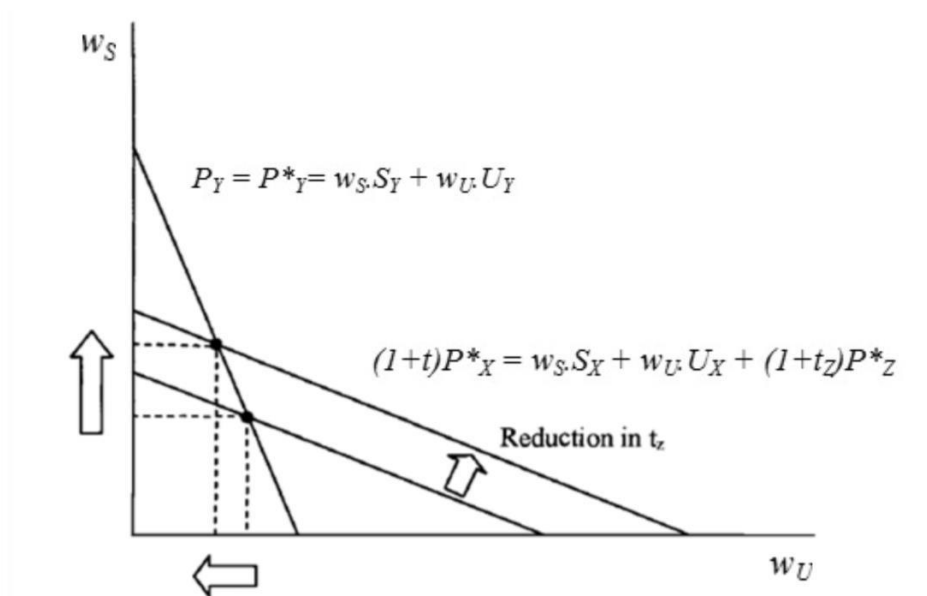
$$P_Y = P_Y^* = w_S S_Y + w_U U_Y$$

where t is the tariff applied on imported goods

A reduction in tariff will reduce the domestic price of skilled-labour intensive good X, leading to a fall in w_S , and a rise in w_U .

Thus, the “trade theory” holds here, in the sense that liberalization will raise the wages of the unskilled labour in unskilled abundant countries.

Fig 1: Impact of trade flow on wages in case of non-competing good



**Image Source: Donald R. Davis and Prachi Mishra(2007),
National Bureau of Economic Research**

The above diagram displays the effect of international trade when a non-competing(imported) intermediate good Z is introduced in the production process of X.

Let the tariff on Z be t_Z .

According to zero-profit maximisation rule, we have

$$P_Y = P_Y^* = w_S S_Y + w_U U_Y, \text{ \&}$$

$$(1+t)P_X^* = w_S S_X + w_U U_X + (1+t_Z)P_Z^*$$

The left hand side shows the net revenue earned from the import of good X.

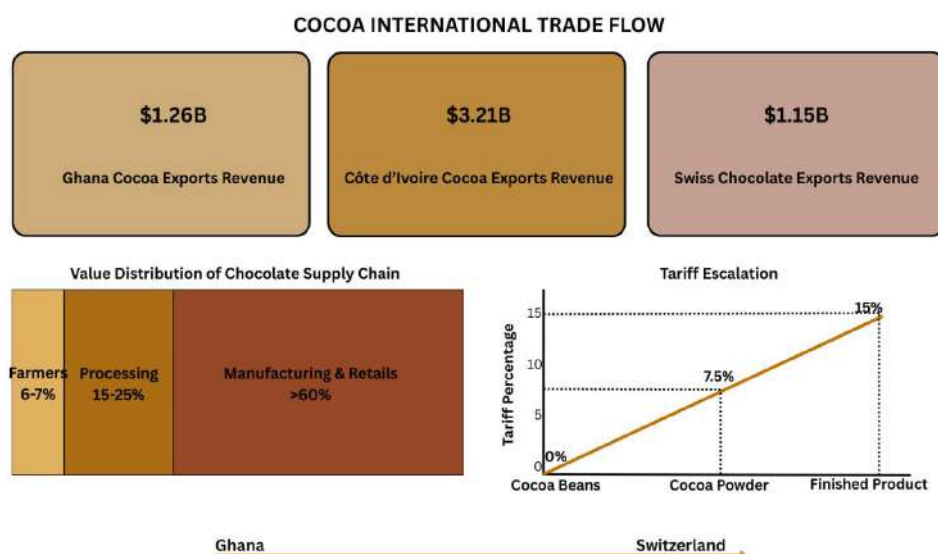
In this case, if t_Z is reduced, the revenue earned on good X will rise. This will lead to a rise in the wages of skilled-labour (w_S). On the other hand, the new intersection will force the wage of unskilled-labour to fall (w_U).

Thus, the trade theory fails to hold in case of small countries due to the presence of intermediate imported goods used in the production process. Non-competing goods are usually goods that are imported and consumed. A small country will be dependent on a larger share of imported goods, leading to a larger presence of intermediaries.

The real-winners are the already developed countries as the presence of such non-competing goods is limited in case of core nations. Thus, the theory holds perfectly for them, and as a result they are able to earn billions from unrestricted globalization.

“From Beans to Bars: How Value Chains Favour Europe over Africa” - A Case Study

Fig 2: Dashboard representing international trade flow of global coca



Data Sources : WITS, World Bank, 2022; Chocosuisse, 2023; Cocoa Barometer, 2020; FAO, 2025

In this section, we will be exploring a significant case study of the trade flows occurring between West-African countries, primarily Ghana and Cote d'Ivoire, and European countries, namely Switzerland, to understand how the dynamics of market power and globalization actually unfold in the real world. Ghana and Cote d'Ivoire earned a combined revenue of \$4.47B from cocoa exports in the year 2022 (*WITS, World Bank, 2022*). Yet Switzerland (producing less than 1% of global cocoa) captured a higher revenue per kilogram than the entire West African cocoa sector. The main objective of this case study is to break down the role of various factors such as global market dynamics, economic conditions, and tariffs in order to analyse the concentration of wealth and capital accumulation in the higher value chains.

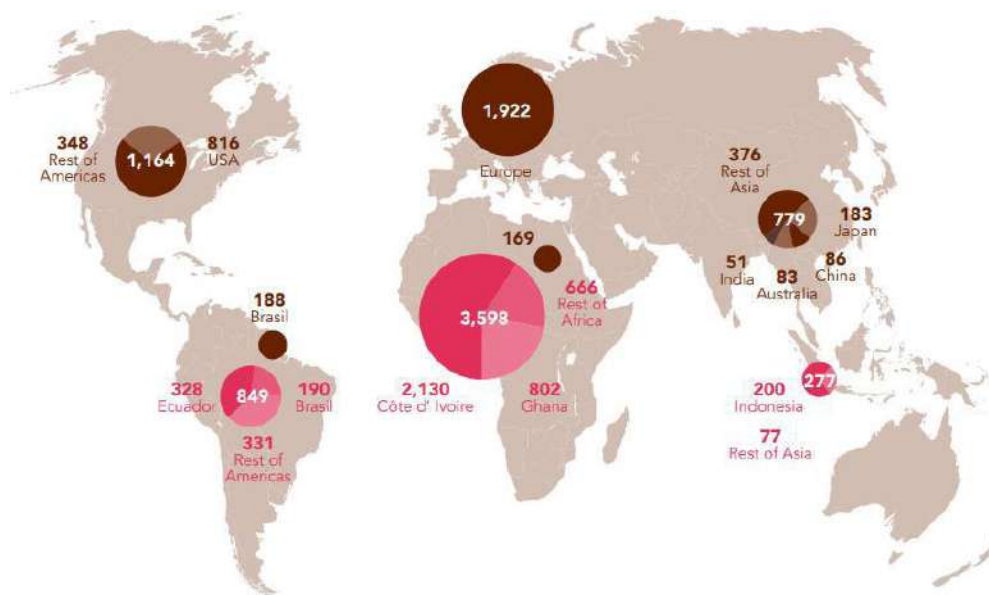
Fig 3: Global Cocoa Production & Export Values by Region

Image Source: Cocoa Barometer, 2020

1. The three most important cocoa-producing countries, the Ivory Coast, Ghana and Ecuador, are responsible for around 66 % of the global harvest. The Swiss chocolate industry imported 74 % of its cocoa bean requirements. It was responsible for processing around 2.0 % of the worldwide consumption of cocoa beans. In quantitative terms, Switzerland is therefore a minor player. (*Chocosuisse, 2023*)
2. In 2022, 73.1% of Swiss chocolate was exported. The export revenue amounted to \$1.15B. Thus, Switzerland turns imported beans into over a billion dollars of exported chocolates annually. (*Chocosuisse, 2023*)
3. While Ghana and Côte d'Ivoire supply more than 60% of global cocoa, yet most farmers live below the minimum standard of living. A third of Ivory Coast's cocoa farmers were paid less than the Living Income Differential(LID) of \$400 per ton (*Aboa & Angel, 2023*).
4. Farmers in West-Africa capture a mere 6-7% of the total value chain, while the manufacturing and retailers capture almost 70% of the total valuations (*Cocoa Barometer, 2020*).
5. Tariffs as high as 15% are imposed on finished chocolate products (FAO, 2025) , thus making it almost impossible for the West to export chocolate. This favours processing and branding in European countries. As a result, most of the values from the export earnings are concentrated in the European countries (Smile Framework).
6. The West is unable to cope with the volatile world market prices due to their weak-bargaining power, thus resulting in a higher income gap.

The structure of global trade—rules, market power, and branding—thus helps rich countries capture most value, while producer countries remain trapped at the bottom of the value chain.

Conclusion

A common trend in all the economies that are adversely affected by globalization, is over-dependence on a single trade commodity. This makes these countries vulnerable to price fluctuations. By diversifying their exports across various industries, they can minimize the damage of global market volatility.

Another problem, mostly prevalent in Latin American countries, is the over-reliance on foreign aid and loans by the IMF or World Bank. These loans prioritise the lenders over borrowers and lead them into a dependency trap. The only way out is to strengthen the domestic revenue system or get funding from similar developing countries.

Again if we observe the above case study, we can see, while Ghana and Côte d'Ivoire supply more than 60% of global cocoa, Switzerland alone generates more revenue by exporting a small fraction of processed chocolate. Adding value to the raw product increases the price of the export more than proportionately. Hence the developing countries should invest in manufacturing plants and encourage the businesses to export finished goods.

Moreover the periphery countries need to be self-reliant. By investing in human capital, strengthening labour laws, and encouraging more domestic consumption, they can mitigate the negative impacts of globalization, and in the process insulate themselves from its wrath.

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THE GLOBALISATION OF ARMS TRADE AND THE CONSEQUENCES OF WAR

*Avik Pradhan
3rd Year, UG*

Abstract

Globalisation has shown its reverberations in the arms trade, which has transformed the industry into a strategic instrument of geopolitical dominance and financial benefits. This paper outlines the origin of arms trade from the 16th century till the current trade where it contributes to over 2.3% of the global GDP. It examines the consequences of war in terms of human lives, gender-based violence, climatic repercussions and economic disruption. Case studies of Ukraine Gaza elaborate the stark comparison between the profits extracted by major arms manufacturers and its humanitarian cost in reference to infrastructure destruction, pollution and long term resource depletion. Results emphasise on the urgency of transparent arms transfer, strict export prohibitions and reallocation of resources towards development of human lives and a more sustainable development, criticizing the current disbalance between monetary profits and moral and humanitarian obligations.

JEL Classification

F51, F52, H56, O19, Q54

Introduction

The globalization of the arms trade and the creation of the “war industry” has tremendously increased the chances of global armed conflicts based on the motive of financial benefits and geopolitical power. Nations with developed arms industries enjoy economic and strategic benefits while the importers often get involved in prolonged conflicts causing mass destruction. This paper examines their economic analysis for both exporting as well as war affected nations with case studies based on Ukraine and Gaza. The study also focuses on the social as well as the climatic repercussion of these conflicts.

Origin and the Globalization of Arms Trade

The origin of the international arm’s trade finds its way back to the 16th and the 17th century where France, Britain, Netherlands and Portugal supplied arms and ammunition to other nations. Firearms then soon became a means of influence as well as a commodity as there was a steady demand for it in Africa, Asia and Americas. (United Nations Office on Drugs and Crime [UNODC], 2020). As the industrial revolution took place in the late 18th and the 19th century, it had its effect on the arms trade as well. Mechanisation and large-scale manufacturing of firearms led it to arms being traded globally. By the 19th century, it had become a formal sector and an international market. (Sampson, 1977) The early 20th century observed some backlash against the arms industry as people alleged them to propagate wars for monetary profit. World War I and the Cold War transformed the arms industry into a large-scale strategic instrument. The United States and the Soviet Union dominated the arms trade where they strategically supplied arms to allies and proxy states to advance their geopolitical objectives. (Akerman & Larsson Seim, 2014). Post Cold War globalization grew the market access of weapons and manufacturing companies sought out purchasers in developing nations and conflict zones.

The Economic of Arms Trade

In the current period arms trade has transformed into a multibillion-dollar industry which contributes significantly to the economies of several nations. As recorded in 2023, the worldwide expenditure on military equipment and ammunition reached around \$2.44 trillion which translated to approximately 2.3% of the World GDP (Stockholm International Peace Research Institute (SIPRI), 2024).

The ten leading arms exporting nations as of 2024

Rank	Exporter	Share of global arms exports (%)		Per cent change from 2015–19 to 2020–24 ^a	Main recipients and their share of exporter's total exports (%), 2020–24					
		2020–24	2015–19		1st	2nd	3rd			
1	United States	43	35	21	Saudi Arabia	12	Ukraine	9.3	Japan	8.8
2	France	9.6	8.6	11	India	28	Qatar	9.7	Greece	8.3
3	Russia	7.8	21	-64	India	38	China	17	Kazakhstan	11
4	China	5.9	6.2	-5.4	Pakistan	63	Serbia	6.8	Thailand	4.6
5	Germany	5.6	5.7	-2.6	Ukraine	19	Egypt	19	Israel	11
6	Italy	4.8	2.0	138	Qatar	28	Egypt	18	Kuwait	18
7	United Kingdom	3.6	3.6	-1.4	Qatar	28	USA	16	Ukraine	10
8	Israel	3.1	3.2	-2.0	India	34	USA	13	Philippines	8.1
9	Spain	3.0	2.3	29	Saudi Arabia	24	Australia	18	Türkiye	13
10	South Korea	2.2	2.1	4.9	Poland	46	Philippines	14	India	7.0

Source: SIPRI, 2024

The table shows the ten leading arm exporters. The United States accounted for 43% of global arms exports within the period of 2020- 2024, followed by France (9.6%). Russia (7.8%), China (5.9%) and Germany (5.6%). Major shifts can be observed in the export patterns of arms exports. Some countries saw an increase (such as the case of Italy) whereas some countries saw a decrease (such as the case of Russia).

For nations with a well-established arms industry employment is provided to many through manufacturing units, research and development is propagated and international relations and also improved due to defense cooperation agreements. GDP of such nations is also improved due to increased government expenditure on military expenses. Nations with a considerable share of military expenses on their GDP include Saudi Arabia (7.4%), Israel (4.5%), Russia (4%), and USA (3.5%) (SIPRI, 2024)

Consequences of War

Several attempts have been made to measure the consequences in quantifiable or figurative terms but all these attempts have faced setbacks in one way or the other. In many cases dummy variables have been used which are based on assumption of absence of feedback mechanism among the variables in the system (such as effect of war and economic growth) and thus they might not hold accurate. The number of military casualties might also not be an accurate measure as they are often manipulated by those involved in the conflict. For a similar reason, the annual percentage of military expenditure cannot also be considered as an absolute measure along with the unavailability of annual figures especially for small war-torn countries. (Ganegodage, Rambaldi, 2014)

So, for the analysis we take certain social benchmarks and certain related figures for measuring the “cost of war”.

1. Gender based struggles- Even in war times women are not exempted from the responsibility of taking care of the household as well as the injured. Scarcity of resources and massive price hikes often drive women, especially those belonging to the more vulnerable sections to begging or even prostitution. Pregnant women are unable to get access to proper infrastructure or resources resulting in still birth or infant deaths. Physical or sexual violence against women is a common occurrence in refugee sites which mostly go unaddressed. (Ashford and Huet-Vaughn, 2003)

2. Environmental Cost- “Ecocide refers to unlawful or wanton acts committed with the knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment caused by those acts.” (Wirtu & Abdela, 2025, para. 3) Setting up of military bases with extensive infrastructure for habitation as well as military deployment results in soil degradation and depletion of natural resources. Modernisation of warfare, especially the inclusion of drones results in much more energy consumption especially if they draw their power from non- renewable sources. Lead from bullets, fuels from vehicles and other chemical effluents leave a trace on the terrestrial and the aquatic environment of the war-torn areas which in turn affect the vegetative life and the wildlife surrounding it. Wars also increase the potential of transgression of invasive species which may disrupt the existing species of a region and might uproot ecosystems as a whole. (Wirtu & Abdela, 2025)

3. War and economic downfall- War has severe ripples in economic systems including production, investment and in both goods and factor markets. Destruction of manufacturing and service infrastructures bring all kinds of economic activities to a halt. War also affects foreign investments and international trade as a whole. Armed conflicts also result in massive inflation due to disruption of supply, resource shortages and increased government borrowing for military expenses (Ganegodage & Rambaldi, 2014).

Recent Conflict Zones

UKRAINE (2022- Present)

Russia’s invasion of Ukraine in 2022 has resulted in a GDP fall of approximately 29% in 2022 and reconstruction expenses are predicted to be around \$486 billion. (World Bank, 2023). The ongoing conflict has given rise to 6.3 million refugees and 17.6 million people in need of humanitarian aid (UNHCR, 2024).

GAZA (2023- Present)

Israel’s invasion of Palestine, precisely that of the Gaza strip, has caused a GDP decrease of 80% and resulted in a predicted reconstruction cost of \$18.5 billion (World Bank, 2024). Over 30,000 civilian deaths (70% of the population) have been reported till date and more than 80% of the population has been displaced (UNOCHA, 2024). It was reported by CEOBS in 2024 that over 281,000 tonnes of CO₂ was emitted in just the first 60 days due to Israel’s bombardment and airstrikes.

Conclusion

The globalization of the arms trade has resulted in an oppressive cycle in which nations with established arms industries not only aid in war but also propagate them for their personal benefits and dominance. The war affected countries on the other side face the consequence of this in terms of entire economic downfall, destroyed infrastructure, displaced population, gender-based oppression and environmental degradation. The after effects from which prolong way after conflict resolution. It is of great importance to break this destructive cycle by imposing stricter restrictions, trade regulations and diversion of capital and resources towards military expenditure to greater causes such as food security, better healthcare systems and a more sustainable future. Economic profits simply cannot and should not come at the cost of humanitarian loss.

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GENDERED IMPACTS OF CLIMATE CHANGE AND GLOBALISATION IN SOUTH ASIA: FROM AN ECONOMIC LENS

Oishee Roy
3rd Year, UG

Abstract

This article explores the gendered economic impacts of climate change and globalisation in South Asia, focusing on how these structural forces intersect to reinforce inequalities. Women, especially from marginalised caste, class and rural groups, bear disproportionate burdens due to their concentration in informal labor, lack of land rights, exclusion from climate finance and global trade benefits. Increasing climate shocks corrode agricultural livelihoods and informal urban incomes. Global value chains, on the other hand, perpetuate precarious, low-paid work for women. This article highlights the inadequacy of gender-blind economic policies. It argues for intersectional, gender-responsive economic planning, emphasising reforms in labor regulation, care infrastructure, digital access, and climate finance to advance inclusive development. Addressing these gendered inequalities is not only a justice imperative but critical for sustainable economic resilience in South Asia.

JEL Classification

J16, F63, F66, Q54, Q56

Introduction

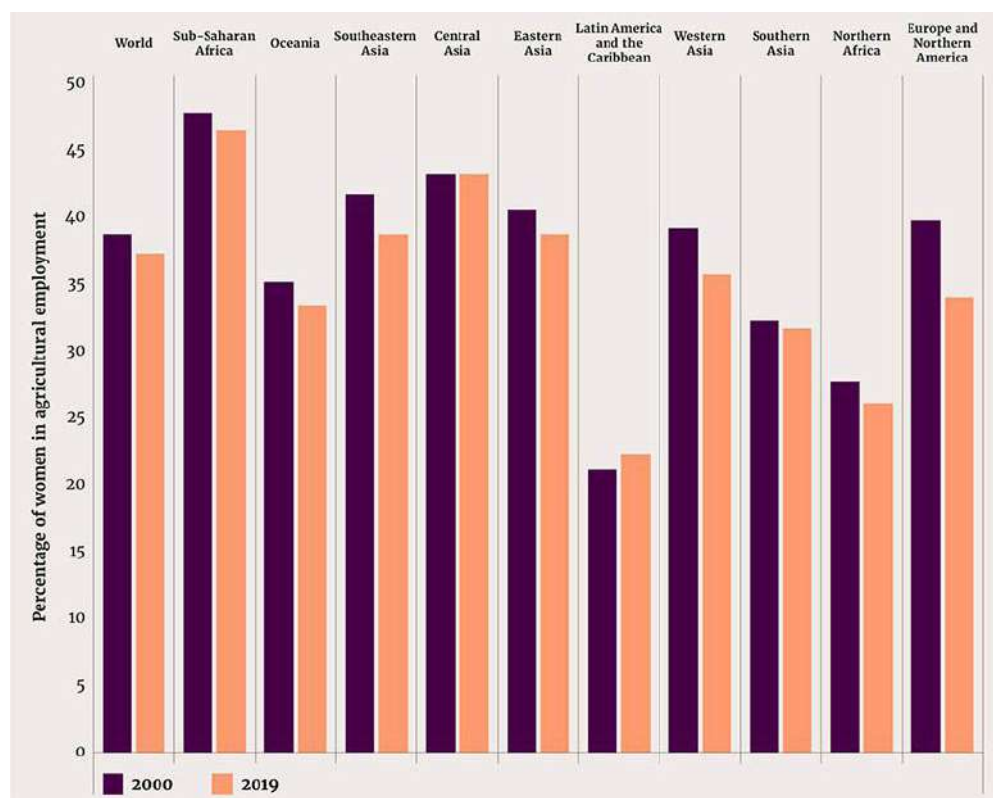
South Asia, comprising countries like India, Bangladesh, Nepal, Pakistan, and Sri Lanka, is one of the most climate-vulnerable regions globally, even as it becomes increasingly integrated into the circuits of global capitalism. Intersections of climate change and globalisation have reshaped economic realities by transforming labour markets, production systems, migration patterns and social welfare. Women, especially from poor and marginalised communities, face disproportionately higher economic risks and fewer opportunities due to entrenched inequalities in labor access, asset ownership, and policy representation.

Investigating such dynamics from an economic perspective unfolds how climatic shocks and global capital flows reinforce gendered labor segmentation, exploitative work conditions, and unequal access to adaptation finance. To mitigate these disparities, policy interventions must be centered on structural gender inequality within economic institutions and macroeconomic policy frameworks.

Gender and Climate-Induced Economic Vulnerabilities

a) Agricultural Livelihood Losses - Women constitute over 60% of the agricultural workforce in countries like India, Nepal, and Bangladesh (FAO, 2023). Rising temperatures, erratic rainfall, and increased frequency of extreme weather events have reduced crop yields, especially in rain-fed farming zones (Patel et al., 2020). This decline disproportionately impacts women, whose economic roles are often unpaid or underpaid. A computable general equilibrium (CGE) model study by Abeysekera et al., (2024) found South Asia's GDP could decline by up to 3.6% by 2050 due to climate-induced agricultural losses, with female-led households experiencing 8% more income loss due to vulnerability in subsistence farming. Fig. 1 illustrates that women do not constitute the majority of agricultural workers globally, nor is their share in agriculture increasing in most regions, pointing to little evidence of 'feminization of agriculture' at the global or regional level.

Fig. 1: Decline in the share of women out of all workers employed in agriculture in the last 20 years



Source: FAO (2023)

b) Urban Heat and Informal Work - Urban informal women workers, including home-based producers, street vendors, and waste pickers, are highly exposed to heatwaves and urban flooding. Over 65% of women reported reduced work hours and productivity during extreme heat, which directly reduced their earnings by up to 30% (Gul, 2025). Without access to cooling systems, safe housing, or paid sick leave, these workers cannot mitigate the health and income shocks of climate change. The gendered nature of urban economic vulnerability highlights a blind spot in municipal climate action plans, which rarely address intersections of gender, informality, and environmental risks.

Globalization via Gendered Production Structures

a) Precarious Global Value Chains (GVCs) - Economic globalization has restructured South Asian economies toward export-led growth, particularly in textiles, garments, electronics, and services. Such shifts have induced large-scale employment for women in Special Economic Zones (SEZs) and Export Processing Zones (EPZs). For example, Bangladesh's garment sector, which exports over \$40 billion annually, employs 80% women. In this sector, women earn 25–40% less than men for similar work due to role differentiation and lack of union representation (Kabeer & Mahmud, 2004). The global demand for flexible cheap labour reinforces gender-based occupational segregation, posing women in vulnerable positions. Women face short-term contracts, wage theft, hazardous working conditions, and a disproportionate number of low-skill, repetitive jobs. According to feminist economics, this is an instance of 'feminized labor exploitation', in which patriarchal labor hierarchies are exploited by globalization to obtain inexpensive labour.

b) Labour Deregulation in Special Economic Zones (SEZs) - To attract foreign investment, South Asian governments have relaxed labor protections in SEZs and EPZs—areas often employing contract-based female labor without social security, maternity leave, or safety regulations. In India's SEZs, 85% of women surveyed reported working without written contracts (Rai & Waylen, 2014). Deregulation of labour markets has resulted in job insecurity, stagnant wages, and gender-based occupational segregation. This contradicts the promises of empowerment and poverty alleviation that globalization claims to deliver. Feminist economists argue this is a structural consequence of capitalist globalization prioritizing profit over labor rights (Elson, 1999).

Care Economics and Gendered Costs of Trade Reforms

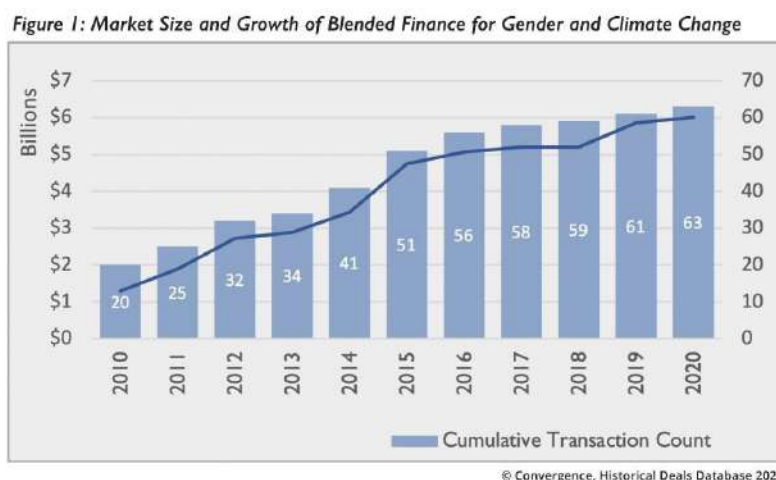
a) Retrenchment of Public Services - Trade liberalisation reduces public revenues through tariff cuts, which in turn constrains government spending on social services. In South Asia, this has manifested in declining investment in sectors that are both heavily used and staffed by women, such as healthcare, children and public employment. In India, women spend 299 minutes per day on unpaid domestic and care work, compared to 97 minutes for men (Nagaraj, 2022). The burden of filling these gaps falls on women, especially in rural areas, where they substitute for declining public services by providing unpaid care work. This limits their participation in formal labor markets and leads to 'time poverty'.

b) Feminised Migration for Care Work - Global demand for care labour has resulted in feminised migration from South Asia, especially to the Gulf and South-East Asia. Women migrate as domestic workers and caregivers under temporary labour schemes that offer low wages and limited protections. However, these women often face labor exploitation, withheld wages, and lack of legal protection due to the informal nature of care work and restrictive visa regimes. This global care chain sustains middle-class households in wealthier countries at the cost of increased economic vulnerability for South Asian women, who often remit earnings to families while receiving little long-term economic security themselves.

Gendered Financial Exclusion and Credit Access

a) Microfinance and Debt Traps - Despite being hailed as a tool for women's empowerment, microfinance has produced contradictory results. Women in Bangladesh and India frequently take out loans on behalf of male family members and are nonetheless responsible for paying them back. Microcredit can increase stress and lengthen debt cycles if it is not accompanied by improvements in asset ownership, market access, and financial literacy (Bateman & Chang, 2012). Fig. 2 represents how blended finance can address the gendered impacts of climate change, taking market size and growth into consideration.

Fig 2: Market Size and Growth of Blended Finance in Gender and Climate Change



Source: Apampa, A. (2020)

b) *Gender Gaps in Climate Finance* - According to a report published by the UNDP, 10% of global climate finance reaches women-led initiatives, and only 3% directly target women's economic empowerment. Large-scale renewable energy projects or afforestation schemes often exclude women from decision-making and employment, while displacing them from land and forests (UNDP, 2022).

c) *The Digital Divide* - Financial inclusion is increasingly linked to digital platforms. However, women have substantial obstacles in accessing mobile banking, digital credit, and e-commerce. In India, nearly half of rural women lack personal mobile phones (Sonne Vyas, 2025). This digital divide restricts their participation in emerging fintech ecosystems, which are key to credit and market access under globalisation.

Regional Case Studies - Localised Economic Impacts:

a) India: Heatwaves and Gendered Urban Labor

India's rising heatwaves have disproportionate effects on urban women working in informal sectors like vending, construction, and sanitation. Without access to health insurance or cooling infrastructure, women experience reduced work hours and income, further worsening poverty (Choudhary et al., 2025).

b) Bangladesh: Climate Migration and Female Vulnerability

In Bangladesh's coastal regions, rising sea levels displace thousands yearly (Md, et al.). Climate-induced displacement leads many women into low-paid urban domestic work or unregulated garment work, increasing risks of exploitation, trafficking, and child labour (Islam et al., 2025).

Towards Gender-Responsive Economic Policies - The Way Forward

i) *Gender-Budgeting and Climate Adaptation:* Governments must work towards mandating gender-responsive budgeting across national climate and trade policies. Investments are to be prioritized in public care infrastructure, water security, and decentralized renewable energy targeting women farmers and informal workers.

ii) *Labor Rights and Informal Sector Protections:* Governments must expand social protections to include informal workers, especially in SEZs and climate-vulnerable regions. Universal maternity benefits, minimum wages, and formal contracts are essential for gender-equitable economic resilience. Care economy investments are to be introduced in stimulus packages and industrial policies.

iii) *Climate Finance for Women:* Climate funds should mandate quotas for women-led cooperatives, self-help groups, and community-based adaptation projects. These investments support both equity and effective local resilience.

iv) *Digital Inclusion Programs:* Subsidized mobile access, rural broadband, and gender-inclusive fintech training can bridge the digital divide. Inclusive fintech ecosystems should be built to support women entrepreneurs and informal traders. This enhances women's participation in markets, services, and digital economies.

Conclusion

Climate change and globalization are dual economic challenges for South Asia, disproportionately affecting women across agricultural, informal, and care sectors. From economic data and climate-demographic modelling to case studies, it's clear that climate change and globalization in South Asia disproportionately impact women across multiple dimensions. Wage losses, income shocks, financial exclusion, and time poverty intensify existing inequalities. Without gender-responsive planning and macroeconomic reform, development policies will continue to reinforce structural inequities.

Centering women, especially marginalized and informal workers, in trade, labor, and climate finance policy is not only an ethical imperative but an economic necessity for sustainable and inclusive development. Solutions do exist: gender-responsive budgeting, inclusive labor reforms, targeted climate finance, digital access, and intersectional land rights can advance a more equitable, resilient economy. Embedding gender justice at the core of economic policy is not just socially necessary—it enhances growth, sustainability, and collective resilience in South Asia's future.

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INDIA'S FINANCIAL MARKETS IN A GLOBALIZED WORLD: RESILIENCE, REFORM, AND GROWTH

*Hanshika Sethi, Niharika Bansal, Swastika Ghosh
3rd Year, UG*

Abstract

This paper examines the dramatic shift in India's financial markets after economic liberalization in 1991. It follows the transition from a closed, fractured system to an open, technology-facilitated, and globally integrated environment. The article identifies major reforms that drew foreign capital, including the liberalization of FDI and FPI regulations, and SEBI-led institutional development. It also examines the strength of these markets against external shocks such as the 2008 crisis and the COVID-19 outbreak. It highlights the fintech revolution in liberalizing financial services. Finally, the article positions India as a fast-expanding economy with great long-term potential, supported by its present policies and market forces.

Introduction

The Financial Markets in India has undergone a significant transformation after the BOP crisis and consequent globalisation in the economy in 1991. The end of the License Raj, reduction in trade barriers, the liberalisation of foreign investments, devaluation of the Indian rupee and globalisation for true economic developments were the key changes of this era.

Since then, India's economy has grown miraculously among the developing nations and has emerged as a new major force in the global economy. The growth process, if reviewed during the 12 Five-Year Plans, has observed some notable transformations which includes gradual increase in GDP, real per capita income, agricultural and industrial production, expansion of the industrial and export sector, application of modern technology, increasing faith of multinational companies for institutional investments and rising confidence of Indian counterparts in overseas mergers and acquisitions. The economy steadily advances toward economic self-reliance with an excellent industrial and infrastructure base, despite significant population and unemployment pressures.

The financial sector, particularly the capital market arena, has also been experiencing incredible growth during the last two decades. There has been a paradigm shift in the configuration of the economy resulting in increasing importance of external trade and foreign capital inflows and supplementing further buoyancy to the capital market. Indeed, after years of spectacular growth, the economy experienced major setbacks during the 2008-09 financial crisis and COVID-19. The factors inimical to growth included global economic slowdown, tensed global equity and credit markets, and increasing commodity prices. These have also impacted the capital and current account of the BOP with extreme volatility in the stock market prices and exchange rates similar to other emerging economies.

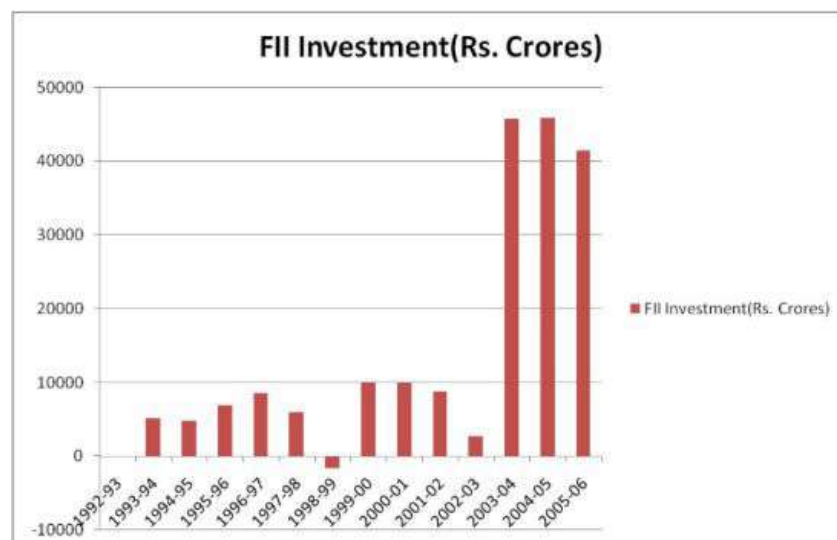
Despite these turbulent times, India's equity markets saw a sharp rebound post-COVID. The capital market returns have not only recovered but also doubled in value since 2019, surpassing those of the majority of emerging market peers, according to indexed MSCI data. Robust domestic investor participation and a resurgence in FPI flows have positioned India as a long-term investment destination. Today, India is well-positioned to maintain its lead among fast-growing economies in FY2025-26.

Evolution of Financial Markets in a globalized world

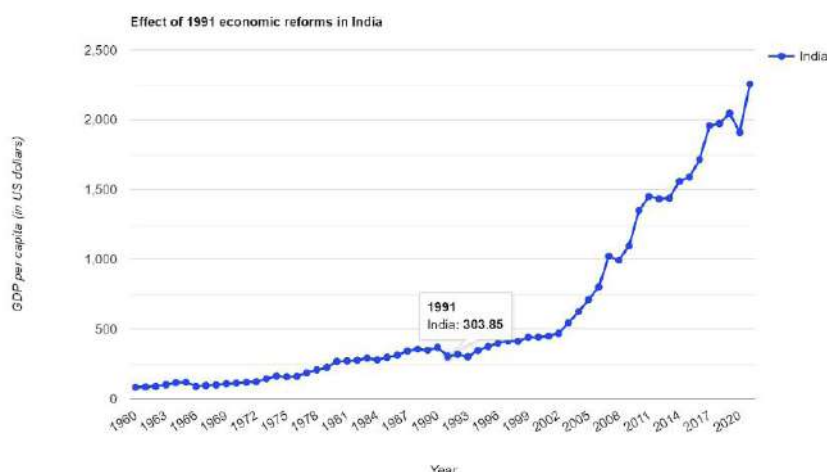
Prior to the introduction of globalization, the financial markets of India were dominated by outdated practices in terms of investment and borrowing, and considerable control over forex markets. Borrowing was facilitated largely by public sector units and moreover the lack of financial literacy left a majority of the population at the mercy of powerful moneylenders of the informal sector. Equity and bond markets were largely unorganised, fragmented and regional, whereas fixed exchange rates prevailed in the forex market.

With the advent of globalization in 1991, the scenario underwent a drastic transformation. There was an inflow of capital from developed nations of the world in the form of FII, FDI, FPI. These were investors who saw an opportunity in the underutilized resources of India and the relatively inexpensive labour force, thus, giving an impetus to the development of industries. This was further enhanced by the establishment of SEBI, a contemporary of the SEC, US, which further increased investor confidence, including among domestic investors. The IMF reforms of 1991-93, laid the foundation for this global investor access to Indian equity and debt markets. Due to technological influences, dematerialized accounts emerged along with electronic trading, marking a significant shift from traditional paper assets. Trades that required days of settlement were now executed on a near real time basis, facilitated by NSE, marking a significant shift from the initially inefficient BSE. Liquidity and transparency increased and so did diversification. People started investing in assets such as REITs, ETFs, green bonds and even riskier and completely new-derivative instruments, thus reflecting a new investor confidence. Overall, India's financial system transitioned from a closed, bank-led structure to an open, technology-driven, globally integrated market.

Fig 1: Attracting Global Capital: FDI, FPI, and India's Market Potential



Source: Goel and Gupta (2011)



https://www.reddit.com/r/india/comments/13qayyr/indias_gdp_and_effect_of_1991_economic_reforms/

The development of financial markets, driven by their integration with global capital markets, was one of the foundational milestones in rethinking the economic growth of India. The 1991 Industrial policy stimulated the sustained flow of capital, and thus proved to be a landmark in the globalization of the Indian financial markets. Two critical reforms adopted as part of this policy were the abolition of industrial licensing and relaxation of FDI cap on major industries. FDI up to 51% was automatically approved, thus streamlining the process of foreign investment while simultaneously allowing Indian firms to raise capital with lower bureaucratic hurdles. This limit was even greater in some sectors, with a 100% allowance for single brand retailers. This paradigm shift allowed multinational corporations to take controlling stakes, directly invest in production facilities, and integrate India into global value chains. Sector-specific liberalization policies included New Telecom Policy, 1999 (opened telecom to up to 49% FDI initially, later raised); Petroleum Exploration Licensing Policy, 1997 (allowed foreign participation in oil & gas exploration) and IT and BPO incentives, 1990s–2000s (tax holidays for software exports, creating IT clusters attractive to foreign capital).

Investment also came into the Indian stock market in the form of FPI, eased by the dematerialization of shares, establishment of NSE with electronic on-screen trading and introduction of derivative instruments.

Further, the adoption of BITs safeguarded foreign investors, and provided mechanisms for dispute resolution while simultaneously ensuring non-discriminatory treatment. At the same time, current account convertibility, as obligated by the IMF's article VIII, allowed free trade convertibility, profit repatriation and remittances. This made the markets more accessible, thus serving as a major precondition for FDI inflows. Moreover, the development of SEZs, provision of tax incentives and other investor protection mechanisms contributed to creating a conducive investment climate. As foreign capital influx surged, so did India's GDP, thus proving the link between globalization and domestic economic expansion. Real GDP per capita rose by approximately 360% between 1991 and 2023, accelerating from a long-term trend growth rate of 1.6% to roughly 5.2% annually.

Global Shocks and Their Impact on India's Financial Markets

A number of incidents put the resilience of the financial markets to the test as India became more integrated into the global economy. The Global Financial Crisis of 2008–2009 (GFC) and the COVID-19 pandemic (2020) are two of the major shocks that have happened in the last few decades.

2008 Global Financial Crisis: Ripple Effects on the Indian Economy

The 2008 financial crisis, whose epicentre was the U.S., had repercussions on the entire world. The world GDP declined by 1 percent. It is considered the worst financial crisis since the 1930s Great Depression. The collapse of the Lehman Brothers in September 2008 turned the turmoil into a global crisis. Even with the banking system's solid foundations and a well-regulated regulatory environment, the crisis's knock-on effects had a negative impact on the Indian economy.

In 2008–09, economic growth slowed to 6.7%. This was a fall of 2.1 percent from the five-year average growth rate of 8.8 percent during the period (2003-04 to 2007-08). Per capita GDP expansion increased by an estimated 4.6 percent during 2008-09. Although this is a sharp deceleration from the average rate of 7.3 percent each year over the last five years, it is still appreciably faster than the average 3.3 percent each year income growth between 1998-99 and 2002-03.

India's balance of payments in 2008-09 reflected the spread of the international crisis to India. The current account deficit in 2008-09 rose to 2.6 percent of GDP from 1.5 percent of GDP in 2007-08. And this is the highest level of current account deficit for India since 1990-91. The capital account surplus dropped from a record high of 9.3 percent of GDP in 2007-08 to 0.9 percent of GDP. And this is the lowest level of capital account surplus since 1981-82. Compared to a record increase of US\$ 92.2 billion in reserves for 2007–08, the year ended with decline of US\$ 20.1 billion (including valuation adjustments).

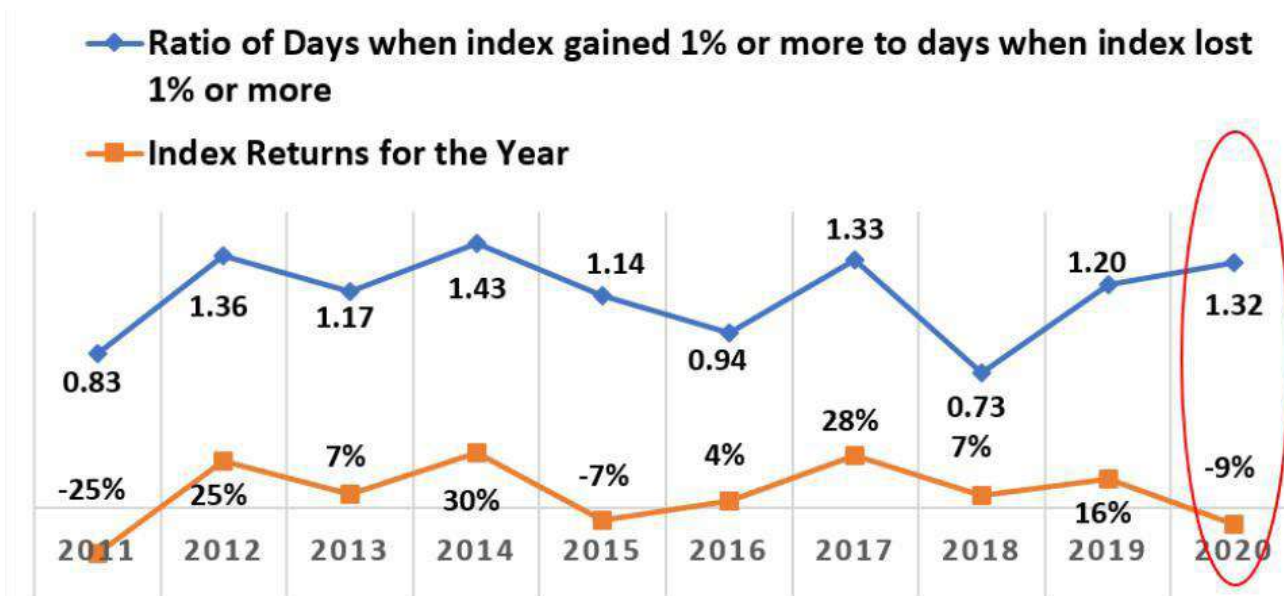
Table 1: India's Balance of Payments: 2008-09						
	US\$ Million				% Change (Y-O-Y)	
	2007-08	2008-09	1st Half 2008-09	2nd Half 2008-09	1st Half 2008-09	2nd Half 2008-09
Exports	166163	175184	98107	77077	35.1	-17.6
Imports	257789	294587	168208	126379	45.2	-11.0
Trade balance	-91626	-119403	-70101	-49302	-62.2	-1.9
% of GDP	-7.8	-10.4	-6.1	-4.3		
Invisible receipts	148604	162556	84635	77921	32.5	-84.1
Invisible payments	74012	72970	36065	36905	14.0	-12.9
Invisibles, net	74592	89586	48570	41016	50.6	-3.1
% of GDP	6.4	7.8	4.2	3.6		
Current account	-17034	-29817	-21531	-8286	-96.1	-36.8
% of GDP	-1.5	-2.6	-1.9	-0.7		
Capital account (net)	109198	9737	19032	-9295	-63.0	-116.1
% of GDP	9.3	0.9	1.7	-0.8		
-Foreign direct investment	15401	17496	13867	3629	185.1	-65.6
-Portfolio investment	29556	-14034	-5521	-8513	-129.9	-176.6
-External commercial borrowings	22633	8158	3157	5001	-71.7	-56.4
-Short-term trade credit	17183	-5795	3689	-9484	-44.0	-189.5
-External assistance	2114	2638	869	1769	22.6	25.9
-NRI deposits	179	4290	1073	3217	1475.6	1151.8
-Other banking capital	11578	-7687	3747	-11434	-35.4	-298.0
-Other flows	10554	4671	-1849	6520	-147.1	-1.7
Change in Reserves (-increase/+decline)	-92164	20080	2499	17581	106.2	134.0

Source: Reserve Bank of India (RBI)

COVID-19 Pandemic: Unprecedented Disruption and Market Volatility

India's economic growth has been greatly impacted by the COVID-19 lockdown. The government and the Reserve Bank of India (RBI) have made a number of reforms to increase liquidity. These include lowering repo rates, extending moratoriums, and focusing on the CRR and SLR instruments. Under the reverse repo window, the RBI released a surplus of Rs. 7.1 lakh crores, lowering the reverse repo rate by 0.25% while keeping the repo rate at 4.2%. The RBI has also decreased the requirement of LCR of commercial banks to 65%, which will be restored in two phases. A special refinance facility worth Rs.60,000/- crores was provided to financial institutions to boost liquidity in affected sectors.

The stock market has also experienced increased volatility, with the BSE and NSE experiencing a massive fall in daily derivative contracts. To monitor volatility and high speculation, SEBI reduced position limits and short-selling of index derivatives. The Covid-19 pandemic has pushed the Indian benchmark index to a level seen during the 2008 Global Financial Crisis. The BSE Sensex had experienced a 1% or more gain/loss every second trading day since the announcement of lockdown in 2020. The market's response to COVID-19 in March could be attributed to the integration of global supply chains and just-in-time inventory systems, which are highly vulnerable to sudden supply disruptions. The sudden lockdown imposed on 1.3 billion Indians brought uncertainty and increased uncertainty, making the odds of Sensex falling by 2.5% or more less likely.



Source: investindia.gov.in

Fintech Revolution of India- transformation of India's Financial Sector

The Indian financial market is undergoing a profound transformation fueled by a wave of technological innovations. Mobile enabled brokerage firms such as Zerodha, Groww, and Paytm Money are democratizing the stock market by giving the user easy access to the stock market through user-friendly platforms at low trading costs. As a result, investing is now accessible to a larger part of the population, regardless of their income levels and location.

The effects of financial technology or Fintech goes far beyond trading. Fintech includes a number of services such as online payments, digital lending platforms, InsureTech, investment management services. Mobile wallets and the Unified Payments Interface (UPI) have significantly reduced cash transactions, especially in rural and unbanked areas. Similarly, digital lending platforms are providing lending access to Micro, Small, and Medium Enterprises (MSMEs) and Insurtech to extend insurance to the uninsured.

The government has also been key to this growth. Government initiatives including, Jan Dhan Yojana, Aadhaar and UPI, and the end-to-end India Stack created a strong foundational ecosystem to enroll citizens into the formal banking and identity systems, provide instantaneous identity checks, and reduce costs and friction for financial services. As a result, India's investor base is growing, and portfolios have started to diversify from conventional assets like cash and bank deposits, with an increasing participation from rural and first-time investors.

Financial landscape of India- The current scenario and the road ahead

India has been actively engaged in economic diplomacy in international forums, voicing the need for more effective multilateral development banks and a more fair representation for emerging economies in organizations such as the IMF, World Bank and UN. As a result, African Union secured permanent membership in G20 along with India's strengthened presence in the Quad and bilateral ties with U.S. Furthermore, global capital diversification in response to Ukraine conflict has heightened India's attractiveness for investment, signified by the increase in production by large multi-national corporations (MNCs) such as Apple and Samsung in-country. India attracted \$81.0 billion in foreign direct investment (FDI) in fiscal year (FY) 2024-25, up 14% in investor inflow for which importantly that services and manufacturing sectors being primary contributors to this growth, especially at change rate of 18% for manufacturing which is significant given it already had strong growth rate in prior fiscal period. The inherent characteristics of India's large domestic market, incremental changes to the economy, and initiatives such as Make in India have also continued to demonstrate India's attractiveness. Nevertheless, given the uncertainty of the global and domestic economic environment, people remain sceptical to amass capital in India as the government fiscal trajectory remains volatile along uncertainties on the part of sustainable growth.

The regulations put in place by the Reserve Bank of India (RBI) and the Securities and Exchange Board of India (SEBI) to guarantee steady and stable capital inflows reflect the evolving financial environment of India. Despite the nation's impressive growth, which includes a notable rise in non-fossil or renewable energy capacity, progress cannot be stopped because the problems of balancing growth and climate change still prevails. Analysts assert that education, transparency, and innovation are crucial to maintaining India's confidence and growth. Transparency builds trust, and the means of improving corporate disclosure - gathering and publishing official documents that are simple to review - simplifies tax, land-lease, etc. disclosed, and maintaining fiscal discipline in one's own expenditures and costs. Investor education is important, such as SEBI's online Investor Awareness Test. Innovation is important (notably in terms of technology in finance) – particularly through fintech and blockchain technology that increase efficiency of financial services while achieving additional financial inclusion.

Conclusion

India's growth and strong domestic market, along with policy changes, have the long-term potential to propel the country forward. India's medium-term growth rate is forecasted at 7% through FY 2026-27. India intends to be a "\$30 trillion economy" by 2047 and will use its leverage in the G20 and BRICS forum to build its infrastructure market and create jobs, as well as shifting supply chains and green finance in the economy. Current trends and outcomes related to international engagement and funding sustainable finance will make it easier for India to achieve faster growth.

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POWERING AI'S GLOBAL RISE: ELECTRICITY CONSUMPTION, CLIMATE IMPACTS, AND SUSTAINABLE PATHWAYS

Avarna Sah
2nd Year, PG

Abstract

Concerns that AI may worsen climate change appear exaggerated, as do hopes that AI alone will resolve the crisis. Emissions resulting from the electricity used by data centres are projected to increase from 180 million tonnes (Mt) today to 300 Mt in the Base Case by 2035 and potentially reach 500 Mt in the Lift-Off Case. Although these emissions will still be less than 1.5% of total energy sector emissions during this time, data centres rank among the fastest-growing contributors to emissions.

The broad implementation of currently available AI applications could achieve emissions reductions that exceed the emissions from data centres but still fall short of what is required to combat climate change. We estimate that the emissions reductions linked to the widespread use of existing AI solutions will be around 5% of energy-related emissions by 2035. To realize these benefits, various obstacles to AI adoption must be addressed. Rebound effects—such as a shift from public transportation to autonomous vehicles—could diminish some of these advantages. While AI can be a valuable tool in emission reduction, it is not a magic solution and does not eliminate the necessity for proactive policy measures.

JEL Classification

O33, Q54, Q55, L94

DeepSeek's Impact on the Outlook for AI Electricity Demand

The Chinese firm DeepSeek launched its advanced reasoning model, DeepSeek-R1, on January 20, 2025. Markets took a week to adjust, resulting in significant drops: AI chip design companies fell by 20%, the top chip manufacturing equipment provider by 6%, and major energy firm stocks by about 20% due to uncertainty around DeepSeek's efficiencies and their impact on AI-related electricity demand projections.

DeepSeek employs a Mixture of Experts (MoE) strategy, reducing active model size by 95% while maintaining performance—akin to accessing only a fraction of a vast knowledge base for specific queries. It also innovates by processing contextual relationships, focusing on key words, and generating output words in parallel (e.g., computing “on the mat” for “the cat sat” in one step), lowering computational, financial, and energy costs for training and deployment.

However, challenges remain. Lower costs may boost usage, and reasoning models like DeepSeek-R1 and OpenAI's o1 are far more energy-intensive than traditional large language models. This “inference time scaling” demands intensive computation for reasoning or planning tasks, making them less efficient for knowledge retrieval or summarization despite delivering superior results.

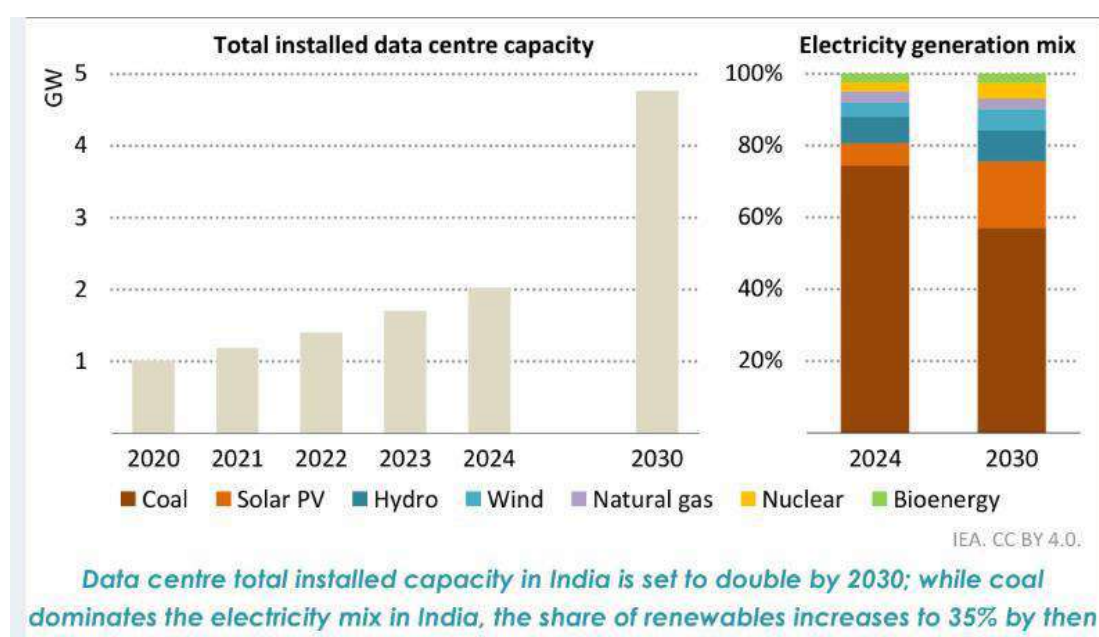
Country Focus: India

India's ICT sector is a powerhouse, with IT exports soaring to over USD 200 billion in 2024, a figure that closely rivals the USD 220 billion export revenue of the world's leading oil exporter, showcasing the country's growing economic influence in the digital realm. With approximately 950 million Internet users, India is rapidly emerging as a key market for data centres, spurred by data localisation mandates in various industries that require domestic storage of sensitive information.

As of June 2024, the nation's operational data centre capacity stands at 2 GW, consuming electricity equivalent to the needs of 6.5 million Indian households, a testament to the sector's energy demands. This capacity has doubled over the past four years, with over 2 GW of additional designed capacity set to come online within the next two years, pushing the total installed capacity to nearly 5 GW by 2030. Supporting this growth, the "India AI Mission," backed by a USD 1.2 billion budget, aims to foster an AI ecosystem with over 18,000 GPUs to empower startups and research initiatives, while state governments like Uttar Pradesh offer incentives such as a 10-year exemption from electricity duties and transmission fees for new data centres, further accelerating development. This surge in data centre electricity consumption aligns with India's position as one of the fastest-growing electricity markets globally, where coal currently accounts for 74% of generation and is projected to remain dominant beyond 2030, providing a reliable yet carbon-intensive power base. However, "open access" regulations allow tech firms to secure renewable energy through power purchase agreements (PPAs), with Bharti Airtel's data centre subsidiary committing to 140 GWh of renewable energy annually and collaborating on captive solar PV and wind projects to mitigate emissions.

Despite these advancements, significant challenges persist, particularly around grid reliability, which remains a critical concern as the risk of power supply disruptions necessitates robust backup and captive power solutions for data centres. The ongoing wave of construction requires substantial enhancements to grid infrastructure, alongside increased investments in solar, wind, battery storage, and transmission systems to meet rising energy needs. Data centres are emerging as major energy consumers, driving demand for sustainable power generation and reinforcing the need for a balanced approach to support India's AI and data centre expansion while addressing environmental impacts. This dual focus on growth and sustainability will be key to ensuring the sector's long-term success, leveraging India's digital momentum while transitioning toward a greener energy future.

Figure 1: India's total data centre capacity and electricity generation mix, 2020-2030



Source: IEA, Energy and AI, IEA, Paris

<https://www.iea.org/data-and-statistics/data-product/energy-and-ai>, Licence: Terms of Use for Non-CC Material

Outlook in the Base Case: Key Drivers and Global Results

In the Base Case, the expansion of the data centre sector is propelled by the rapid adoption of AI alongside deepening digitalization, as outlined in the International Energy Agency's (IEA) projections. Key drivers of data centre electricity consumption evolve significantly by 2030. The total server stock is expected to rise by over 60%, with about a third of this growth attributed to extended server lifetimes. Accelerated servers, critical for AI workloads, see an even sharper increase, though their share in the total server stock remains below 10%. The installed capacity of data centres, encompassing IT equipment, cooling systems, and auxiliary infrastructure, more than doubles from approximately 100 GW today to around 225 GW by 2030, as detailed in Table A.1. This surge is driven by the rising power intensity of servers, particularly accelerated ones, where the average wattage climbs due to an increasing number of accelerators per server—models with eight accelerators, boasting rated power exceeding 10 kW, become significant by decade's end, compared to under 2 kW for servers with two accelerators. Accelerated server capacity grows nearly fivefold, while conventional server capacity increases by 1.8 times.

Cooling efficiency improves, reducing the global weighted average Power Usage Effectiveness (PUE) from 1.41 in 2024 to 1.29 by 2030, saving approximately 90 TWh of electricity— a 30% reduction in cooling demand per unit of IT power. This progress stems from advanced cooling technologies and operational management, rather than a major shift from less efficient enterprise centres (whose share drops below 20% by 2030) to hyperscale or colocation facilities. Hardware efficiency continues to advance, though operational gains for accelerated servers may plateau due to high utilization and limited idle power reductions. Conventional servers, however, are poised for significant efficiency boosts, particularly in idle power savings, with ongoing improvements expected for both types.

Globally, data centre electricity consumption is projected to reach 945 TWh by 2030 in the Base Case, accounting for just under 3% of total global electricity use, up from 415 TWh in 2024 (1.5% of current demand). This represents a 15% annual growth rate from 2024 to 2030, outpacing the 3.5% growth of overall electricity demand by over fourfold. Accelerated servers, fuelled by AI adoption, drive a 30% annual increase in consumption, contributing nearly half of the net growth, while conventional servers grow at 9% annually, accounting for about 20%. Other IT equipment and infrastructure (cooling, etc.) make up 10% and 20% of the increase, respectively. All data centre types of enterprise, colocation, and hyperscale contribute to this rise, aligning with the following Table A.1's projections of capacity and consumption across scenarios.

This growth, while significant, keeps data centres' share of global electricity demand modest at 3% by 2030, though their carbon footprint could reach 320 Mt CO₂ (0.9% of energy emissions), with AI's role amplifying both challenges and mitigation potential through efficiency and renewable energy. The Base Case underscores the need for balanced policy to harness AI's benefits while managing its energy impact.

TABLE A.1

	2020	2023	2024	Base		Lift-Off		High Efficiency		Headwinds	
				2030	2035*	2030	2035*	2030	2035*	2030	2035*
Installed capacity (GW)											
Total	60	83	97	226	277	305	404	185	221	158	160
Hyperscale	20	31	36	85	103	108	139	89	103	62	64
Colocation and service provider	19	27	35	86	116	118	172	93	115	59	66
Enterprise	20	25	27	55	58	78	93	3	3	36	31
IT	38	57	68	174	228	233	330	153	196	122	132
Hyperscale	17	27	31	77	94	98	127	81	95	56	58
Colocation and service provider	11	17	23	65	96	89	142	70	100	44	54
Enterprise	10	13	14	32	38	46	61	2	2	23	20
Power usage effectiveness											
Total	1.53	1.43	1.41	1.29	1.21	1.30	1.22	1.21	1.13	1.28	1.20
Hyperscale	1.19	1.15	1.14	1.10	1.09	1.10	1.09	1.10	1.09	1.10	1.09
Colocation and service provider	1.67	1.56	1.53	1.33	1.21	1.33	1.21	1.32	1.15	1.33	1.21
Enterprise	2.05	1.95	1.92	1.71	1.54	1.72	1.54	1.67	1.46	1.71	1.53
Load factor (%)											
Total	51	49	49	48	49	47	49	49	50	48	50
Hyperscale	56	54	53	51	52	50	51	51	52	51	53
Colocation and service provider	50	48	48	47	48	47	48	47	49	48	50
Enterprise	48	46	45	45	46	44	46	45	47	45	48
Electricity consumption (TWh)											
Total	269	361	416	946	1 193	1 264	1 719	792	972	669	707
Hyperscale	100	148	166	378	466	479	626	397	472	279	293
Colocation and service provider	65	112	144	355	493	482	721	385	490	246	285
Enterprise	85	100	106	213	234	303	372	10	10	144	128
IT	176	252	295	733	985	972	1 409	657	864	522	587
Hyperscale	84	129	146	342	427	434	574	360	432	253	269
Colocation and service provider	51	72	94	266	406	361	594	291	425	185	235
Enterprise	42	51	55	124	153	176	242	6	7	84	84

*2035 numbers serve as exploratory scenarios given the high level of uncertainty around data centre demand and growth.

Source: IEA, Energy and AI, IEA, Paris

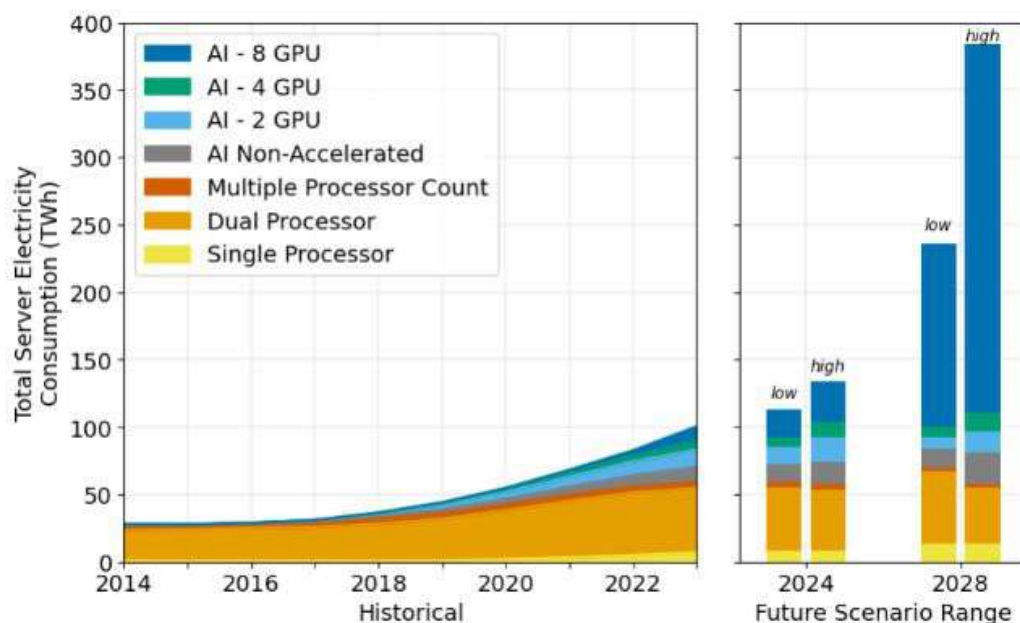
<https://www.iea.org/data-and-statistics/data-product/energy-and-ai>, Licence: Terms of Use for Non-CC Material

Table A.1 - World Data centres by case: Includes global historical and projected data by case and data centre type (hyperscale, colocation and service provider and enterprise) for the following metrics: v Total and IT installed capacity (GW) v Power usage effectiveness v Load factor (%) v Total and IT electricity consumption (TWh)

Resource Intensity of AI Model Training

AI model training demands significant resources due to the adjustment of billions of parameters through complex computations, necessitating high-performance computing (HPC) with thousands of GPUs, TPUs, and CPUs operating in parallel. Training sessions can last weeks or months, consuming vast amounts of electricity. Only major players like Google, Microsoft, and Amazon can manage the costs of hardware, cooling, and maintenance, while smaller entities face prolonged timelines and higher energy use. Frequent retraining, infrastructure failures, software inefficiencies, and increasing model complexity further escalate the demand, establishing it as a leading resource-heavy task. Refer to Figure 2 given below:

Figure 2



The total annual server energy use from 2014 to 2023 along with a future scenario range of server energy use through 2028. Server energy use more than tripled from 2014 to 2023. A large portion of this increase came from GPU-accelerated AI servers, which grew in energy usage from less than 2 TWh in 2017 to more than 40 TWh in 2023. Source: [2024 United States Data Center Energy Usage Report](#)

Source: IEA, Energy and AI, IEA, Paris

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Environmental Impacts of AI Development

AI's environmental footprint extends beyond its substantial electricity consumption, often reliant on fossil fuels, which significantly boosts greenhouse gas emissions. Cooling systems in data centres require excessive water, posing challenges in water-scarce areas. The short lifespan of GPUs and HPC components contributes to growing electronic waste, while their manufacturing depletes rare earth minerals, leading to environmental degradation. The storage and transfer of massive datasets add to the energy burden. Without sustainable practices, AI's expansion risks accelerating climate change.

Role of Research Institutions in AI Sustainability

Research institutions are key to advancing AI sustainability by conducting carbon footprint assessments of workloads, embedding green strategies into research plans, and shaping policy. Funding from agencies like NSF, DOE, and DARPA supports energy-efficient innovations. Interdisciplinary collaboration among scientists, environmentalists, and policymakers can develop balanced solutions. Educational programs and workshops can raise awareness, promoting eco-friendly practices and steering AI toward a sustainable future.

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THE TARIFF REALITY: WHY UNDERSTANDING TRADE POLICY MATTERS MORE THAN EVER

*Ahona Roy, Srijita Bhattacharjee, Sikta Bhowmick
2nd Year, PG*

Abstract

This article examines the resurgence of protectionist trade policy, with US tariff levels at historic highs. Using the India-US trade relationship as a focal point, we analyse the economics of contemporary tariff policy and their distributional implications. Analysis reveals tariffs have substantial costs for domestic consumers, contrary to prevailing myths about who pays the economic cost. Although there are immediate shocks to global trade relationships, the evidence indicates that strong economies such as India exhibit adaptive capacity through diversification of markets, use of domestic demand, and sectoral resilience. The study highlights the importance of understanding tariff mechanisms for effective policy responses in today's evolving economic landscape.

JEL Classification

F13, F14, F17, E17

Introduction

"Protectionism is a misnomer. The only people protected by tariffs, quotas and trade restrictions are those engaged in uneconomical and wasteful activity."

- Milton Friedman.

The current escalation of trade tension is reshaping the global economy and challenging India's growth trajectory. The world is at a crossroads where the concepts of free trade and globalization are facing their greatest test since World War II. The comprehensive tariff scheme of the United States is fundamentally changing the arrangements in global trade and forcing countries to rethink their economic plans.

The New Tariff Reality: By the Numbers

The ongoing escalation of trade tensions is reshaping the global economy and challenging India's growth trajectory. The world is at a crossroads where the concepts of free trade and globalization are facing their greatest test since World War II. The comprehensive tariff scheme of the United States is fundamentally changing the arrangements in global trade and forcing countries to rethink their economic plans.

From January to April 2025, the average applied US tariff rate increased from 2.5% to an estimated 27% -the highest level in over a century since the Smoot-Hawley Tariff Act (1930s). After revisions and negotiations, the rate was estimated at 18.6% as of August 2025 (Economic Times 2025). This global transition toward protectionism has very serious implications for many of the United States' key trading partners, with India being one of the most impacted economies.

The price impact is direct and significant: all 2025 tariffs are estimated to raise the overall price level by 2.3% in the short run, equivalent to an average per-household consumer loss of \$3,800 annually. For lower-income families \$1,700 annually – contradicting dogmatic rhetoric about “protection”.

India-US Trade: A Critical Partnership Under Pressure

The India-US bilateral trade relationship – once a \$118 billion success story – now stands at a **dangerous crossroads**.

The bilateral trade relationship between them has grown substantially in recent decades. Total bilateral trade (goods and services) increased from \$20 billion in 2000 to \$118 billion in 2024, with the US emerging as India's biggest trading partner in 2022-23. More recent data shows India's exports to the United States reached \$79.44 billion in 2024, while US imports from India totalled \$91.23 billion.

Key sectors—precious stones, metals, electronics, pharmaceuticals, and textiles—are especially vulnerable to the new wave of tariffs.

Understanding Tariffs: The Economic Reality

A tariff is a government-imposed tax on imported goods and services, which is meant to protect domestic industries by making foreign products more expensive. For example, if country A imposes a 25% tariff on steel from country B, then country B's steel becomes more expensive, making domestic steel more competitive.

While traditionally serving three functions—revenue generation, domestic industry protection, and diplomatic leverage—modern economic theory largely views tariffs as economically inefficient.

The key insight that many miss is that **tariffs are ultimately paid by domestic consumers and businesses, not by foreign exporters**. When the US imposes a 25% tariff on Indian steel, American importers pay that tax, typically passing the cost along through higher prices to consumers.

The Great Tariff Deception

Laymen often think the exporters, or the foreign countries, pay the tariff cost. However, tariffs are ultimately paid by domestic consumers and firms, as importers pass these costs along in the supply chain through higher prices.

Some assume the government or importers carry the burden. The reality is the economic burden falls on consumers through increased prices and reduced industry competitiveness.

There is a misconception that tariffs provide quick benefits by boosting domestic industries and bringing jobs back. While there might be short term gains for certain sectors, tariffs generally cause long term economic inefficiencies and disrupt global supply chains.

India's Resilience: Why Long-term Optimism May Be Justified

Despite the immediate challenges posed by increased US tariffs, several factors suggest India's economy may prove more resilient than initial impacts suggest:

Diversification: India's export base extends well beyond the United States. Growing trade relationships with Europe, Southeast Asia, and Africa provide alternative markets for Indian goods.

Domestic Demand: With a large and growing domestic market, India is less dependent on exports than many smaller economies. Domestic consumption can partially offset export losses.

Adaption: India's diverse industrial base and established manufacturing capabilities allow for relatively rapid adaptation to changing trade conditions.

Services Exports: India's dominant services exports - particularly in technology and business services - are less susceptible to traditional goods tariffs.

United States: Navigating the Economic Costs of Protectionism

The tariffs are being targeted to protect US industries, reduce trade deficit (India having \$45 billion trade surplus with the US). However, general perception suggests tariffs will harm the US economy by raising consumer prices, reducing purchasing power and slowing down economic growth.

Studies estimate a possible 6 % long run reduction in US GDP and a 5% reduction in wages attributable to tariffs, which is a larger economic cost than would come from a similar revenue increase through corporate tax hikes.

Tariffs will tend to disrupt supply chains, increase production costs and reduce investments due to heightened economic uncertainty. Though tariffs raise government revenue (projected trillions over a decade), the economic inefficiencies and lost output exceed the benefits of this revenue.

Tariffs act like a regressive tax mostly borne by consumers and businesses, making the economy less efficient overall.

Looking Forward: Policy Implications

The current upsurge in tariffs represents a considerable test of global economic collaboration since the war. The initial disruptions are evident, but the consequences for the long-term view are largely subject to countries' shifts in economic focus. For India, the central imperative is to diversify its markets and enhance its domestic competitiveness while capitalizing on its advantages in services and new technologies. India's large domestic market and growing middle class provide insulation from trade shocks originating from changes to external markets, a luxury smaller, export-dependent countries do not possess.

Conclusion

The question isn't whether this economic warfare will end - it's who will emerge victorious when the smoke clears.

The stakes have never been higher. The battle has never been more intense.

What the U.S. is doing with tariffs now is arguably, although not literally or in all respects, the most significant change in trade policy since the 1930s and at a concrete expense to American consumers and foreign trading partners. While this will be harder for countries like India in the short run, they can take some solace from history which suggests that resilient economies can cope with and prosper in a changing global trading architecture over time. Understanding these economic facts better than some tariffs myths risks misleading the public to wrong policy prescriptions. Protectionism undeniably has costs, yet it is also true that creative economies can invent themselves out of the swamp. History has repeatedly shown that while tariffs may be an effective short-term political tool, they rarely result in long-term economic growth. This era is poised to follow

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THE IMPACT OF CLIMATE CHANGE ON WOMEN IN AGRICULTURE IN INDIA

Akancha Kharkia and Saijal Bajaj
2nd Year, PG

Abstract

Climate change is reshaping Indian agriculture, and women—who form a large part of its workforce—are among the most affected. This article looks at three decades of data, from 1991 to 2022, linking shifts in climate and society to changes in women's roles on the farm. The numbers tell a clear story: female participation in agriculture has fallen from nearly 78% to under 60%, while greenhouse gas emissions have surged, and average temperatures have crept upward. Rainfall and cyclones have become more unpredictable, adding to the challenges of farming. At the same time, more women are getting an education and moving into other types of work, while mechanization and industrial farming have reduced the demand for manual labor. These changes bring new opportunities but also risk eroding the traditional agricultural knowledge women have carried for generations. The findings point to an urgent need for policies that give women equal access to land, tools, credit, and training—so they can adapt, lead, and help secure the future of farming in a changing climate.

JEL Classification

J16, Q12, Q15, O15, R23

Introduction

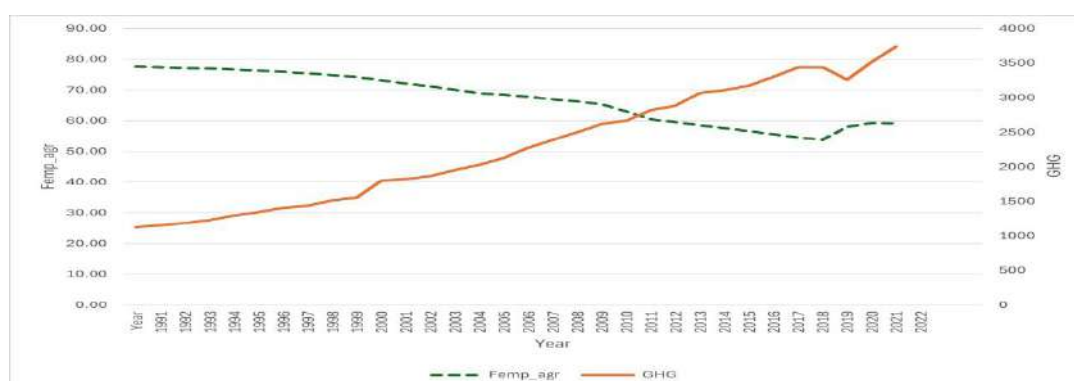
Climate change has become one of the biggest challenges we face today. It disrupts ecosystems, livelihoods, and economies around the world. In agriculture, especially in developing countries, the effects are serious. Rising temperatures, unpredictable rainfall, droughts, and extreme weather events threaten crop yields and food security. Women, who make up a large part of the agricultural workforce, are particularly vulnerable. In many rural communities, women take on essential roles in farming, livestock management, seed preservation, and post-harvest tasks. However, they often lack access to land ownership, financial resources, modern farming tools, and decision-making opportunities.

As climate conditions grow more unpredictable, women farmers deal with heavier workloads, lower productivity, and more economic insecurity. Extended droughts or floods damage crops and increase the physical burden of collecting water and finding fuel, which are tasks usually assigned to women. Additionally, cultural and institutional barriers often limit their ability to adopt practices that can withstand climate impacts. The consequences are also social; they affect women's health, education, and overall well-being.

Recognizing the gendered aspects of climate change in agriculture is key to creating effective adaptation and mitigation strategies. Providing women with resources, training, and leadership opportunities can improve agricultural resilience and make climate policies more inclusive. Tackling these challenges is not only about fairness but also vital for achieving sustainable development and food security in a changing climate.

Graphical Analysis

Fig 1: Trends in Female Agricultural Employment and Greenhouse Gas Emissions



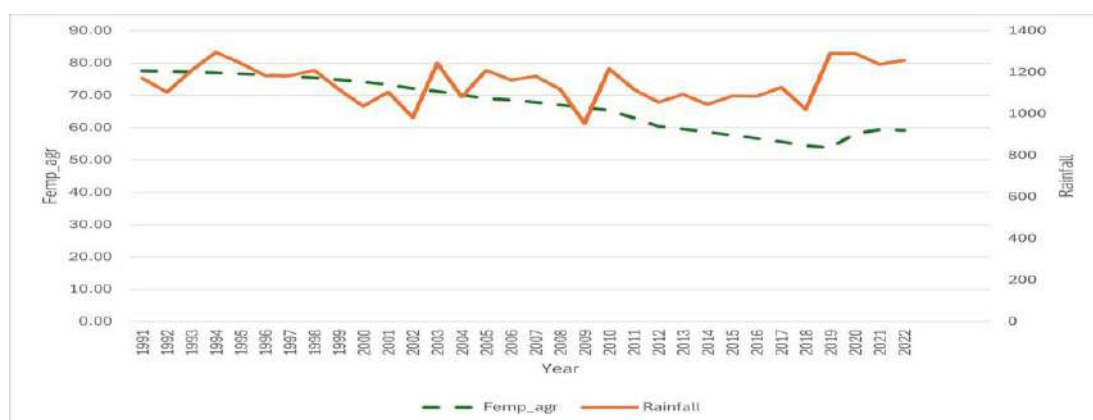
Source: India Meteorological Department (IMD) and World Bank

The graph illustrates the link between female employment in agriculture (Femp_agr) and greenhouse gas emissions (GHG) from 1991 to 2022. From 1991 to 2022, female employment in agriculture dropped from about 78% to 59%. During the same period, greenhouse gas (GHG) emissions increased sharply from around 25% to over 3,500 units. The two trends crossed around 2009, indicating a change where mechanization, industrialization, and intensified farming reduced the need for manual labor, especially from women, while emissions went up. This shows a shift from traditional to modern agriculture, which is often more male-dominated and reliant on machinery. The slight recovery in female agricultural employment after 2018 might be related to changes in rural livelihoods or climate programs that support women's roles, even with high emissions.

Fig 2: Trends in Female Agricultural Employment and Mean Temperature

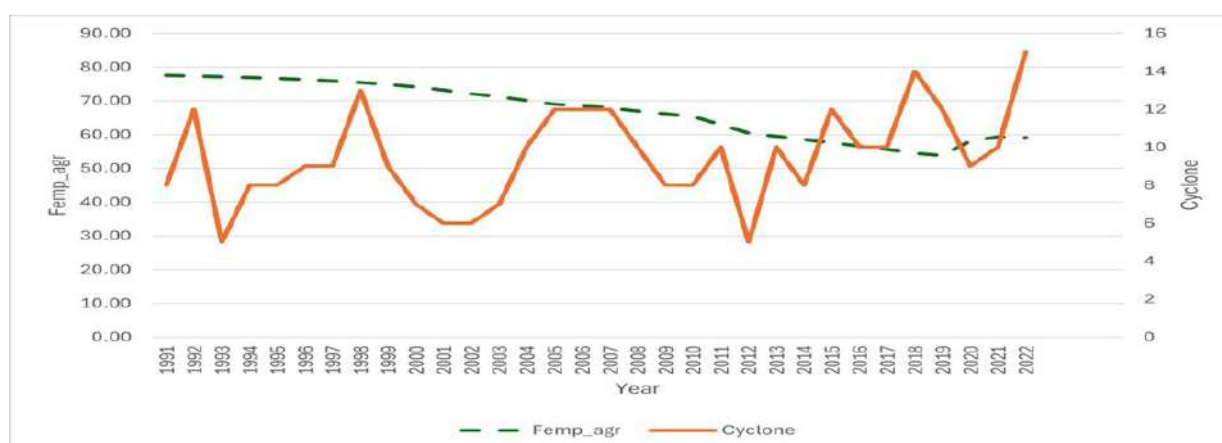
Source: India Meteorological Department (IMD) and World Bank

The graph shows the relationship between female employment in agriculture (Femp_agr) and mean annual temperature (Mean_temp) from 1991 to 2022. From 1991 to 2022 female workers in the agricultural sector decreased from about 80% to 58% with a recovery starting post-2018 while the Mean Annual Temperature increased from about 25°C to almost 26°C. Higher temperatures during 2008-2010 were associated with more precipitous drops in female agricultural employment. It establishes the direct relationship between these two variables, that women are pulled out of agriculture when heat stress sets in, crop yields decline, and water resources become scarce. The small increase after 2018 may be an adaptation process or just a stop-gap measure reflecting a temporary need for labor that leads to feminization as an outcome of climate change.

Fig 3: Trends in Female Agricultural Employment and Rainfall

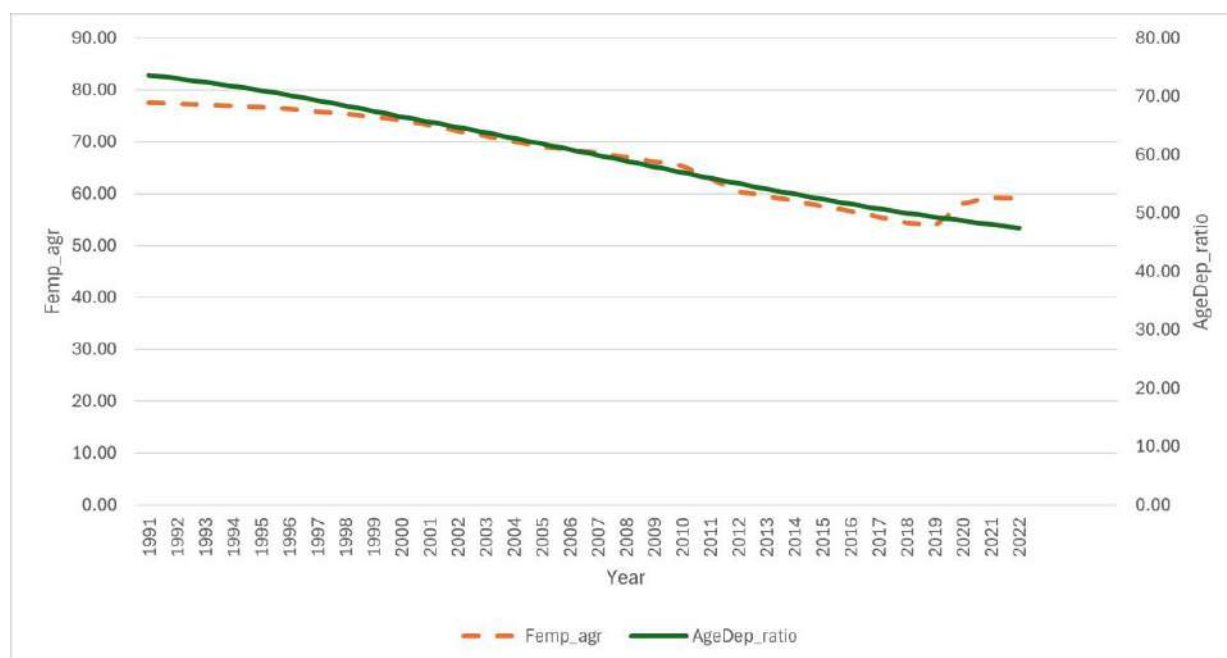
Source: India Meteorological Department (IMD) and World Bank

This graph shows the connection between female employment in agriculture (Femp_agr) and annual rainfall from 1991 to 2022. Female participation in agriculture dropped from around 78% in 1991 to 56% by 2018, with a modest recovery to 59% in 2022. Rainfall fluctuated widely between 900 mm and 1,300 mm, peaking in the early '90s, mid-2000s, and again around 2019–2020. Despite these shifts, there's no obvious link between rainfall and the decline in female farm employment. While extreme weather can disrupt farming, deeper structural and climate-related issues seem to play a bigger role. Overall, the long-term drop in women's agricultural work likely stems from broader socioeconomic changes.

Fig 4: Trends in Female Agricultural Employment and Cyclone

Source: India Meteorological Department (IMD) and World Bank

This graph shows the link between female employment in agriculture (Femp_agr) and the number of cyclones from 1991 to 2022. Female participation in agriculture declined from approximately 78% in 1991 to around 59% in recent years, with a minor recovery post-2018. Cyclone occurrences varied annually, ranging from 3 to over 15, with a notable increase after 2015 and peaking near 2022. This rise in cyclonic activity correlates with the downward trend in female agricultural employment. Cyclones can damage crops and infrastructure, disproportionately affecting women due to limited access to recovery resources. The increased frequency of such events may contribute to reduced agricultural stability and long-term employment challenges for women in the sector.

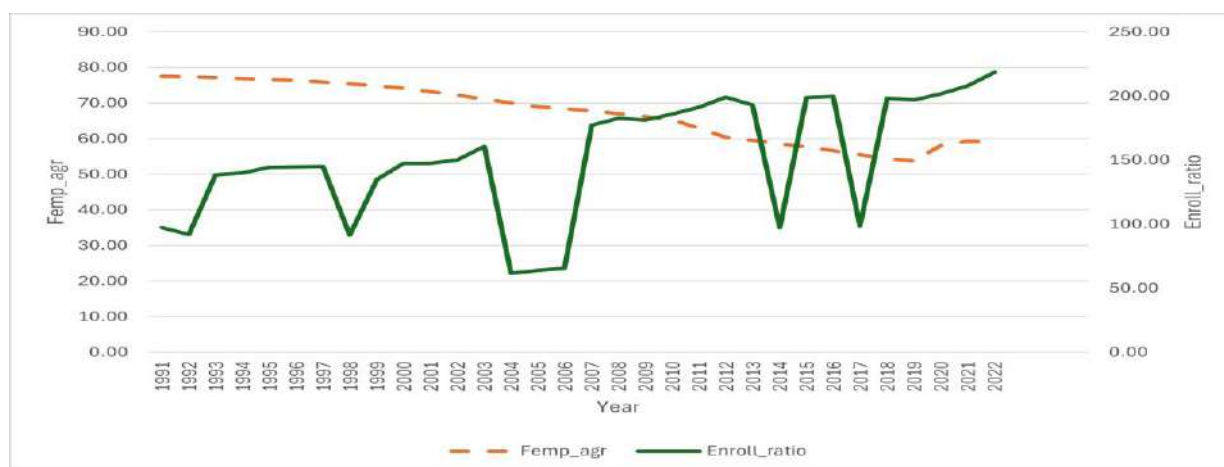
Fig 5: Trends in Female Agricultural Employment and Age Dependency Ratio

Source: Ministry of Education/Mospi.gov and World Bank

This graph compares female employment in agriculture (Femp_agr) with the age dependency ratio (AgeDep_ratio) from 1991 to 2022. The Femp_agr starts at about 77% in 1991 and steadily declines over the years, reaching approximately 56% by 2022, with only a slight recovery after 2018. Likewise, the AgeDep_ratio begins at around 82% in 1991 and also shows a steady downward trend, falling to nearly 49% by 2022. The similar decline in both variables suggests a potential link: as the age dependency ratio decreases,

indicating a larger working-age population, female employment in agriculture also falls. This may result from more opportunities in non-agricultural sectors, urban migration, and mechanization in farming, which lowers the need for agricultural labor.

Fig 6 : Trends in Female Agricultural Employment and Enrollment Ratio



Source: World Bank

This graph illustrates trends from 1991 to 2022, comparing the percentage of female employment in agriculture (Femp_agr) with the gross enrollment ratio in education (Enroll_ratio). Over the period, female employment in agriculture has shown a consistent decline, falling from about 78% in 1991 to under 60% in recent years. In contrast, the gross enrollment ratio has generally risen, despite some fluctuations, pointing to greater access to education. This inverse pattern indicates that as educational enrollment among women increases, participation in agricultural work decreases, reflecting a broader shift towards diversified career options and socio-economic development.

Conclusion

Over the past thirty years, the face of women's work in Indian agriculture has changed dramatically. Once making up nearly 78% of the farm workforce, women now account for less than 60%. This shift hasn't happened in isolation—it has been shaped by rising greenhouse gas emissions, hotter temperatures, unpredictable rains, and more frequent cyclones. These changes make farming harder and less reliable, pushing many women to take on heavier workloads for lower returns, or to leave agriculture altogether. At the same time, social changes are at play. More girls and women are in school than before, and the overall working-age population has grown, opening up opportunities beyond the fields. While this can be a sign of progress, it also means valuable agricultural knowledge passed down through generations risks being lost. The small rebound in women's farm participation after 2018 hints at resilience—perhaps from necessity, perhaps from programs helping women adapt. Going forward, the challenge is to give women equal access to land, tools, training, and leadership roles so they can thrive in a changing climate. Supporting women farmers isn't just about fairness; it's about protecting food security and keeping agriculture strong for the future.

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**GLOBALIZATION AND ECONOMIC GROWTH IN INDIA:
PATHWAY TOWARDS SUSTAINABLE DEVELOPMENT
A SUSTAINABLE DEVELOPMENT-ORIENTED PERSPECTIVE ON
GLOBALIZED INDIA**

*Krishna P Mehta
2nd Year, PG*

Abstract

Economic growth remains a central objective for India, one of the fastest-growing major economies in the world; however, to ensure that such growth is equitable, inclusive, and sustainable, it must align with the Sustainable Development Goals (SDGs). India's growth narrative has been defined by both the opportunities and challenges of integration into the global system. Although globalization has enabled faster growth, access to advanced technologies, and foreign investment, it has also aggravated inequality, environmental degradation, and social challenges.

This article discusses India's engagement with the SDG agenda, emphasizing both the opportunities that globalization offers for accelerating progress and the structural hurdles it poses. It focuses on the goals affected by economic growth and globalization, while arguing that rethinking economic growth through the SDG lens is essential, not only to meet the targets by 2030, but also to ensure that it leads to a more equitable and sustainable future.

JEL Classification

I30, F60, O10, O19, O56

Economic Context and Objectives

Over the past few decades, India's growth trajectory has been incredible, positioning it as one of the fastest-growing economies in the world. However, growth that is not inclusive and equitable raises questions about its long-term viability. Achieving equitable, inclusive, and sustainable growth requires integrating policies with the Sustainable Development Goals (SDGs), which provide a global framework for balanced development across economic, social, and environmental dimensions.

India's growth trajectory in the past three decades has been profoundly shaped by globalization, as international trade, foreign investment, and technological integration have collectively influenced growth. However, this brings along both opportunities as well as challenges for sustainable development. Thus, understanding the interplay between India's domestic growth strategies and global economic integration is essential to assessing how economic expansion can contribute meaningfully to achieving the SDGs.

Globalization, Growth, and SDGs in India

Over the past three decades, globalization has significantly shaped India's growth trajectory by deepening cross-border linkages in trade, capital inflows, and technological advancements. Though economic growth is essential for the development of the country, it must be pursued in a manner that is equitable and sustainable, thus requiring alignment with the SDGs.

Globalization has led to economic growth acceleration through participation in global trade, inflows of foreign direct investment (FDI), and technology transfers, among others. Trade integration has ensured enhanced trade openness, access to global markets for domestic goods and services, and enhanced export competitiveness and opportunities. FDI inflows have brought in capital, advanced technology, and management expertise, which have resulted in the creation of jobs in manufacturing, IT, services, and export-driven sectors. MNCs have enhanced training and knowledge transfer, with technological advancements, digital infrastructure, and new production methods. These factors have enhanced productivity across different sectors and have led to substantial opportunities to accelerate progress towards key SDGs such as poverty reduction, health, education, and climate action, among others.

Nevertheless, globalization poses structural hurdles, including increased income disparities, uneven regional development, and other social issues. The benefits of globalization are yet to trickle down to the marginalized, thus remaining unevenly distributed. Certain regions, having industrial hubs and IT sectors, are growing at a faster rate than the less developed regions, increasing regional imbalance. These factors lead to unequal access to basic survival services, including healthcare and education. Traditional social structure and practices are being lost in the world of rapid urbanization. Alongside these internal challenges, the economy has become vulnerable to global shocks, which end up having strong domestic effects.

Hence, economic growth must be integrated with the principles of equity and sustainability, thereby highlighting the significance of integrating policies with the SDG framework, to ensure growth is equitable, inclusive, and aligned with long-term development objectives.

A closer evaluation of certain selected SDGs reveals how globalization and growth interact with India's development agenda.

SDG 1: NO POVERTY

Higher economic growth and employment opportunities due to globalization have lifted millions out of poverty; however, vulnerability to global shocks may push some back into poverty. According to the press release by Niti Aayog, the Poverty Headcount Ratio calculated on the basis of Multidimensional Poverty Index (MPI), declined from 29.17% in 2013-14 to 11.28% in 2022-23, meaning about 24.82 crore people escaped multidimensional poverty. Also, it claimed that India is likely to achieve SDG target 1.2, that is, reducing multidimensional poverty by at least half much ahead of 2030. However, states like Bihar and Arunachal Pradesh are still lagging. Also, informal workers still lack social protection and may be vulnerable to global disruptions.

SDG 4: QUALITY EDUCATION

Globalization has expanded educational opportunities in the country by enabling cross-border academic collaboration and access to global learning resources. The New Education Policy (NEP 2020) also reflects a push towards a more competitive and multidisciplinary learning pattern. The adjusted net enrolment rate was about 96.5% while the gross enrolment ratio in higher secondary education was 57.6%. States like Assam, Bihar, Madhya Pradesh, Meghalaya, Nagaland, and Odisha are still behind (SDG India Index 2023-24).

SDG 8: DECENT WORK AND ECONOMIC GROWTH

Global market integration has led to growth in services exports and employment generation in key sectors like IT and pharmaceuticals. India climbed to the 15th position in global FDI rankings in 2024 with inflows of USD 27.6 billion (UNCTAD, World Investment Report 2025). While economic growth is taking place, the vast majority of the workforce remains in the informal sector and is vulnerable.

SDG 9: INDUSTRY, INNOVATION, AND INFRASTRUCTURE

Industrial growth and infrastructural development are taking place in the country through FDI inflows and global partnerships. Based on UNCTAD statistics, as stated previously, India's growing industrial interests are reflected. Also, India is ranked 40th in the Global Innovation Index 2023, underlining its start-up and innovation ecosystem growth. Yet, uneven infrastructure and connectivity issues have led to the rural-urban divide and require policies to bridge the gap.

SDG 10: REDUCED INEQUALITIES

Although globalisation has fueled India's growth through trade, FDI, and remittances, it's not evenly distributed. The top 1% captured about 22.6% of the national income in 2022, among the highest globally (World Inequality Database, 2023). Meanwhile, India received \$125 billion in remittances in 2023, which has eased poverty in states like Kerala and Punjab (World Bank, 2023). Nevertheless, rural and marginalized people remain vulnerable to global shocks, and the inequality persists.

Towards Sustainable Growth: Policy Insights

India's engagement with globalization and its quest for sustainable economic development necessitate a set of coherent policy interventions. Based on the interplay between globalization, economic growth, and the SDGs, the following policy insights emerge:

1. **Investment in Human Capital Development** – The demand for skilled manpower and technological upgradation has increased rapidly over the post-reforms period. Expanding access to quality education, skill training, and financial and digital literacy programs would ensure that India's labour force is well-equipped to participate in the global value chains and contribute meaningfully. Steps should be taken to increase women's participation in the workforce, closing the gender gap. This will be supported by the achievement of SDG 4, SDG 5, and SDG 8. Also, policies promoting food security and providing better access to healthcare would ensure human well-being and strengthen resilience among the vulnerable population. This would fulfil the SDGs 2 and 3.
2. **Foster Inclusive Growth through Social Policies** – Since the benefits of globalization are unevenly distributed, policies should focus on enhancing social safety nets, promoting gender equality, narrowing income gaps, formalizing informal employment, and uplifting the marginalized groups. Employment generation in lagging regions would ensure a reduction in regional disparities and also in poverty and inequality. This could be attained by focusing on SDGs 1, 5, and 10.
3. **Boosting Industry, Innovation, and Infrastructure** – Policies encouraging research and development, technological transfer, and sustainable industrial practices must be framed to enhance the productivity of the industries and innovation. Investments must be directed towards making the soundness of the infrastructure more robust. This aligns with the attainment of SDG 9. Coordinated management of natural resources, energy, and urban systems – focusing on clean water, responsible consumption, sustainable cities, and ecosystem conservation would ensure attainment of SDGs 6, 7, 11, 12, 14, 15.
4. **Adopting Sustainable Environmental Policies** – Economic growth should not compromise environmental sustainability. Implementation of stricter emission standards, promotion of renewable energy adoption, and support for green financing instruments are essential to meet SDG 13 while ensuring sustainable growth.

Thus, economic growth alone does not ensure well-being. Through this analysis of how India's growth trajectory intersects with social and environmental outcomes through the lens of SDGs, we find that SDG-aligned economic growth is essential to ensure a more equitable and sustainable future. The policy recommendations emphasize that achieving equitable, sustainable, and inclusive growth requires economic policies to be in line with social justice and environmental responsibility, for which a robust framework is required and an evidence-based decision approach is to be followed to progress towards Viksit Bharat.

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THE IMPACT OF GLOBALIZATION-DRIVEN INFLATION ON RURAL WOMEN'S EDUCATION AND EMPLOYMENT IN INDIA

- Subhrajit Sinha and Sutithi Saha
2nd Year, PG

Abstract

Globalization driven by the deepening integration of national economies has brought significant transformation since the 1990s to India's economic landscape. The country has reaped benefits in the form of higher foreign direct investment, export-led growth, and technological advancement. Yet, these global linkages also render local economies more susceptible to external shocks such as inflation, which tends to affect vulnerable groups most severely particularly women in rural areas. This paper explores through empirical analysis; how inflation, often intensified by global forces, undermines the education and employment opportunities of rural women in India. In a setting where poverty is multidimensional and gender disparities persist, the macroeconomic consequences of globalization further weaken the fragile pillars of female empowerment in rural communities.

JEL Classification

E24, E31, F62, I24, J16, J21

Introduction

Since the 1990s, Globalization has deepened India's integration into the world economy, boosting growth through higher foreign investment, expanded trade, and technological advancement. However, it has also increased vulnerability to global shocks especially inflation-driven by rising commodity prices, costly oil imports, and supply chain disruptions. These pressures hit low-income rural households hardest with rural women, disproportionately affected due to persistent social and economic marginalization. Inflation affects household budgets, limits job opportunities, and reduces investment in girls' education. Between 2000 and 2019, female labour force participation in India fell by 14.4%, before rebounding to 32.8% in 2021–22, supported by declining fertility and better education access. Female literacy rose by 24.3 percentage points over two decades.

This study examines how globalization-driven inflation impacts rural women's education and employment, and suggests policies to safeguard and enhance their progress.

Comparative Analysis of Female Labor Indicators

Statement 1: LFPR, WPR and UR (in per cent) in usual status (ps+ss) from PLFS conducted during January 2023 – December 2023 and January 2024 – December 2024 for persons of age 15 years and above

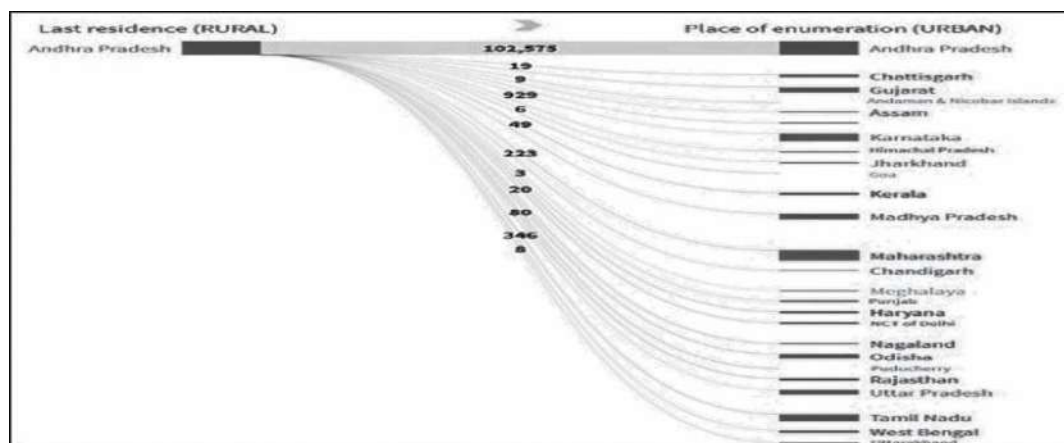
Indicator	Rural			Urban			all-India Rural + Urban		
	male	female	person	male	female	person	male	female	person
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
January 2023 – December 2023									
LFPR	79.8	47.3	63.4	74.9	27.2	51.4	78.3	41.3	59.8
WPR	77.7	46.4	61.9	71.6	25.2	48.8	75.8	40.1	58.0
UR	2.7	1.9	2.4	4.4	7.5	5.2	3.2	3.0	3.1
January 2024 – December 2024									
LFPR	80.6	45.8	62.9	76.2	27.6	52.2	79.2	40.3	59.6
WPR	78.4	44.8	61.4	72.8	25.8	49.6	76.6	39.0	57.7
UR	2.8	2.1	2.5	4.4	6.7	5.0	3.3	3.1	3.2

Source: www.mospi.gov.in.

From the table, LFPR stands for Labour Participation Rate, which indicates the proportion of working-age individuals. WPR is the Worker Population Ratio that tells us the percentage of employed people out of the total population. UR is the Unemployment Rate, which shows the number of people in a labour force without a job. In 2023, rural women in India had a LFPR of 47.3%, WPR of 46.4% and UR of 1.9%. In comparison to women living in urban areas, those in rural regions exhibited higher levels of participation and employment, indicating greater engagement in the economy. Conversely, urban women experienced a higher unemployment rate. In 2024, the LFPR for rural women decreased to 45.8% and their WPR fell from 46.4% to 44.8%, while the UR saw a slight rise to 2.1%. This points to a minor reduction in rural women's involvement in the labour market. Meanwhile, urban women experienced some slight improvements. Despite these shifts, rural women continued to be more economically active than their urban counterparts due to factors such as poverty, lower educational attainment and the characteristics of work in agricultural and informal sectors. Conversely, women in urban areas face challenges including rigid societal expectations, demanding job criteria and the persistent undervaluation of their contributions.

Impact of Inflation and Globalization on rural women's education

Andhra Pradesh had a maximum number of women who migrated from rural areas to urban areas for education mostly within the state.

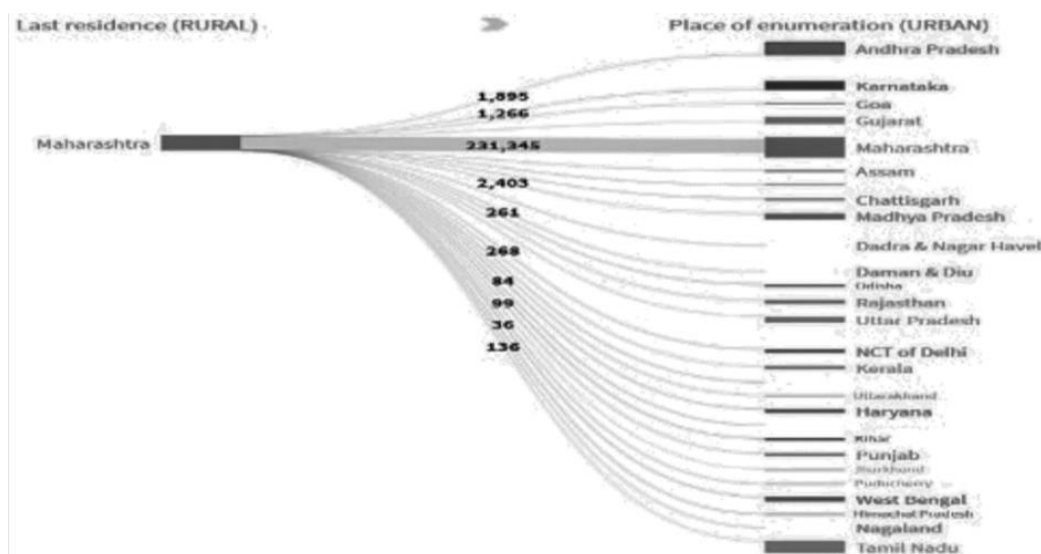


Source: Census 2011

- **Push factors:** Inflation in rural areas (food, transport) may drive household decisions to send girls into urban education institutions.
- **Pull factors:** Andhra Pradesh rises as an education centre with expanding universities and technical institutions after globalization-led investments creates more opportunities for higher education.

Impact of Inflation and Globalization on rural women's employment

Maharashtra had the maximum number of women who left rural regions to seek work in urban areas. A vast majority of women migrated to urban areas within Maharashtra as compared to other states.



Source: Census 2011

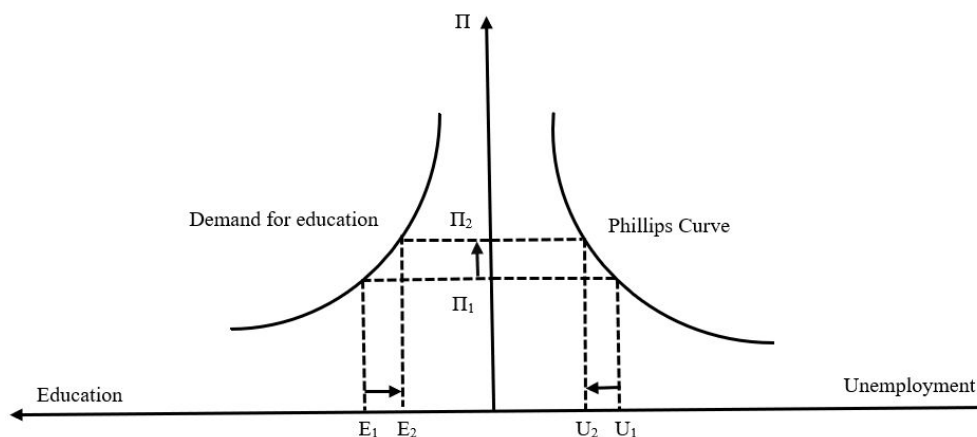
- Globalization raises demand in urban economies (service, construction, manufacturing) that pull rural women into Maharashtra's urbanizing economy (Mumbai, Pune) for informal work.
- Inflation in rural areas especially food prices and agricultural distress may push families to send young women or wives, or some women may opt to relocate to urban centers for better job prospects.

Empirical Analysis by Graphical Representation

In this study, we use the Two-Quarter Framework of Demand for Education and the Phillips Curve. The Phillips Curve, introduced by A.W. Phillips in 1958, shows the inverse relationship between inflation & unemployment. The demand for education here refers to how willing and able the rural middle-class and lower-class women invest time, money, and effort in learning. This depends on things like potential higher wages, career opportunities, and tuition costs. Using this framework, we will look at how inflation affects both education and employment in two cases.

Case 1: High Inflation

In this framework, Let E1 represents the initial education level and U1 the initial unemployment rate of rural women. Inflation is on the horizontal axis (II), while education and unemployment are on the vertical axis. The first quadrant shows the Phillips curve, and the second quadrant represents the demand for education curve.



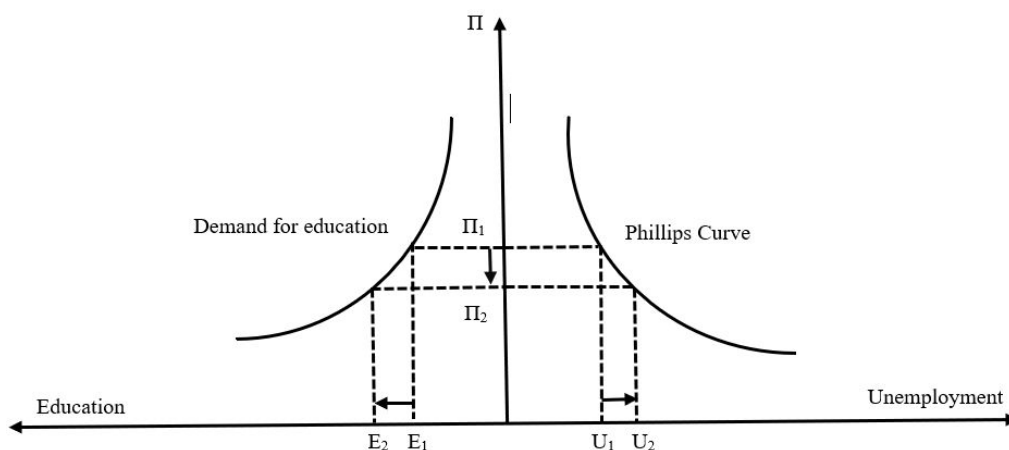
Source: Author's own formulation

In this framework, an increase in inflation from Π_1 to Π_2 causes a reduction in the demand for education for the rural women who are able or willing to pay for their studies from E_1 to E_2 . As a result, it pushes up the cost of education leading to higher school fees and increased prices for study materials. These financial pressures burden rural families, many already struggling with limited resources. As a consequence, fewer women are able or willing to continue their education.

On the other hand, inflation also leads to a positive shift in the labour market. As inflation boosts business revenues, companies expand and invest more, resulting in a decrease in unemployment among rural women from U_1 to U_2 . The increased demand for labour, particularly in sectors accessible to rural women, creates new job opportunities and creates an increment in wages to retain and attract the workers.

Case 2: Low Inflation

As there is a reduction in the inflation i.e. deflation, from Π_1 to Π_2 the demand for education among rural women who can afford it rises, shifting from E_1 to E_2 . This reduction in inflation lowers education costs, including school fees and the prices of essential study materials, making it easier for rural women to continue their education.



Source: Author's own formulation

However, a decrease in inflation has led to a reduction in business expenses making the reduction in the growth, productivity and investments of the companies. As a result of which the unemployment of rural women increases from U1 to U2 making the reduction in hiring and wages for the worker leading to job losses.

Thus, from the above two cases, inflation had a reverse and paradoxical impact on education and employment for the rural women in India.

Conclusion

Globalization has helped the Indian economy's growth by bringing more trade, technology, and capital into the country over the past two decades. Rural women already navigating social and economic marginalization, have borne the effect of rising inflation and volatile global economic currents. States like Andhra Pradesh and Maharashtra illustrate migration patterns of both the potential and the distress caused by inflation. In such conditions, investing in a girl's education or enabling her long-term employment is often the first to be sacrificed. From the empirical analysis, we see that inflation has a reverse impact on employment and education of rural women in India.

Several targeted policies are urgently needed:

- i. **Inflation-Linked Education Subsidies:** Introduce dynamic scholarships and midday meal expansions for girls in rural schools to ensure continued access even during periods of rising prices.
- ii. **Strengthening Rural Employment Programs:** Expand schemes like with a gender focus, ensuring guaranteed workdays, skill training, and wage equity for rural women.
- iii. **Rural Women's Microenterprise Support:** Provide inflation-indexed loans, digital literacy, and market linkages to help rural women build sustainable livelihoods in their local communities.

Only by embedding such policies into the heart of rural development can India shield its women from the harsh edges of globalization and inflation. Empowering rural women through education and dignified employment is not only a question of justice, it is a criterion for sustainable and inclusive economic progress.

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DECOUPLING ECONOMIC GROWTH AND ECONOMIC IMPACT: A TAPIO INDEX PERSPECTIVE

Sahana Mukherjee
2nd year, PG

Abstract

The relationship between economic growth and sustainability can be either complementary or conflicting, depending on national perspectives. While some contend that sustainability fosters economic growth, others argue that growth underpins sustainability. This study seeks to determine whether economic growth and sustainability can be pursued concurrently, providing empirical support through an analysis of six selected countries over the period 2012–2022. Employing the Tapio Decoupling Model, the research conducts a comparative assessment to calculate each nation's degree of decoupling and to examine the corresponding policy implications.

JEL Classification

Q56, Q560

Introduction

Countries have been vigorously seeking ways to increase their GDP by using natural resources to boost productivity in an effort to be included in the elite group of advanced economies. In doing so, they are deviating from the very goal of sustainability. Therefore, the current dilemma is whether sustainability and growth are two distinct ideas or if both can be accomplished simultaneously.

The understanding of ecological boundaries serves as the foundation for the decoupling argument. The Earth's biophysical constraints restrict resource extraction and waste absorption without compromising its resilience. However, disregarding these constraints along with persistent increase in GDP, renders the economic growth unsustainable in the long run. *When economic output rises without a matching increase in environmental degradation, this phenomenon is referred to as decoupling.* According to a blog by the European Parliament, “decoupling has several dimensions: it can be overall or partial; absolute or relative; permanent or temporary; global or local; fast or slow”. Several measures have been taken up to limit the growing exploitation of the natural resources and among them, the Paris Agreement, is one. This landmark agreement came into force during the UN Climate Change Conference, Paris (COP21) in December 2015. The key objectives of this Agreement were; reducing global greenhouse gas emissions in order to keep the rise in global temperatures well below 2°C over pre-industrial levels and work towards a limit of 1.5°C.

The Agreement encompasses the commitment of 195 nations to collaborate on reducing emissions and addressing the effects of climate change. The Agreement mandates that nations submit their Nationally Determined Contributions (NDCs), outlining the measures implemented to mitigate greenhouse gas (GHG) emissions in pursuit of the Agreement's objectives. In this context, decoupling has evolved as a means to an end. Countries have used this technique to promote economic development while also combating climate change.

Methodology

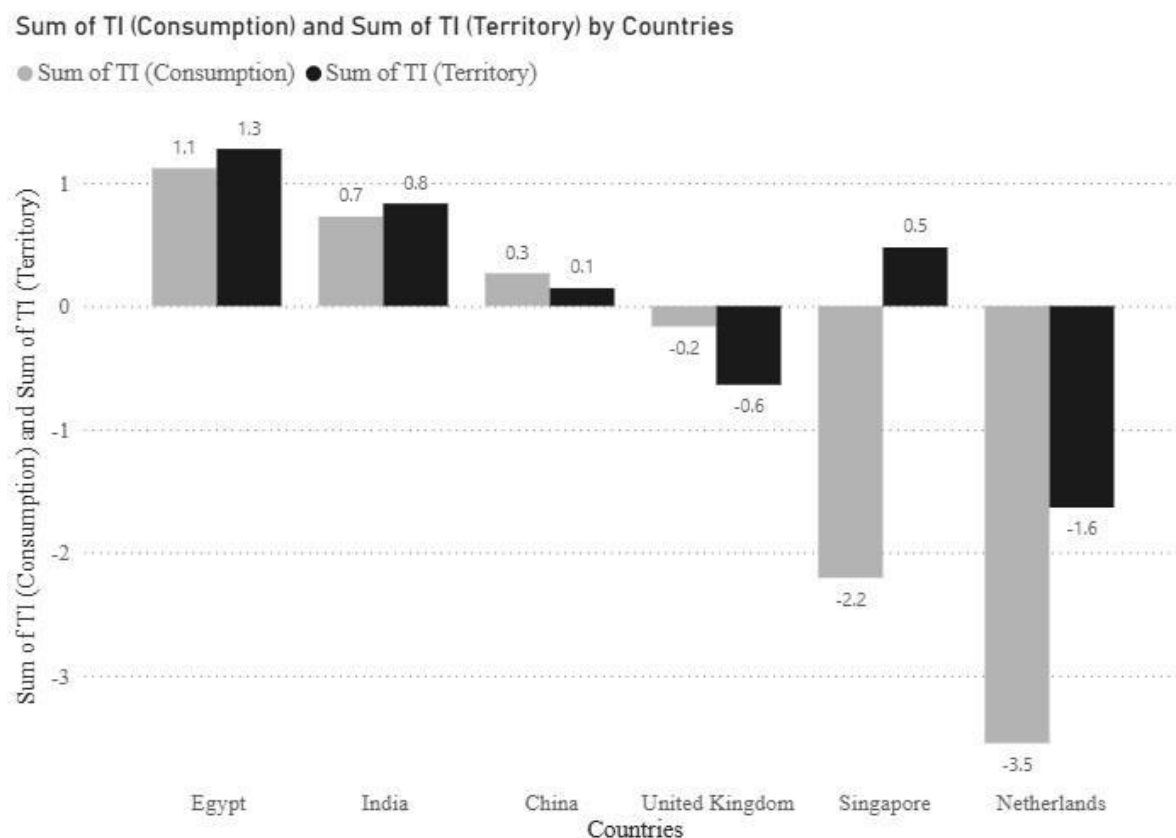
The OECD in its report “Indicators to measure decoupling of environmental pressure from economic growth” developed the degree of decoupling by categorizing them into absolute and relative decoupling. Absolute decoupling occurs when an economy grows without compromising the environment. Conversely, relative decoupling occurs when growth of the economy impacts the environment but at a lesser rate. This study examines the degree of decoupling between economic growth and carbon emissions in six nations that are signatories to the Paris Agreement: the United Kingdom, Singapore, the Netherlands, India, China, and

Egypt. It uses the Tapio Decoupling model to analyse the trend of GDP per capita and the GHG emissions over the period 2012-2022. Here, the emissions are being segregated into two parts, Territory emissions and Consumption-based emissions. Territory-based emission or production emission are those GHG emissions that take place within the domestic boundary of a nation. Consumption-based emissions are those from domestic final consumption, including imports.

Observation

Analysis of the data for the selected countries reveals that the United Kingdom, Singapore, and the Netherlands achieved absolute decoupling over the period 2012–2022. In contrast, India, China, and Egypt only exhibit indicators of relative decoupling. The former countries have shown an impressive declining trend in consumption-based emission with respect to its GDP per capita. This implies that these countries have adopted a total reduction in GHG emissions associated with the consumption of goods and services irrespective of where they have physically occurred while being on the path of economic growth. It also implies a shift in more sustainable consumption patterns. However, Singapore has not been at par with the UK and the Netherlands with its territory-based emissions. The emissions have been constant or increasing over the decade which might imply that the country has mostly relied on imports for its consumption of goods and services. This outsourcing of emissions can create a false image of environmental progress by shifting the burden to its importing countries. India and China have shown evidence of relative decoupling, with emissions growing at a slower pace compared to their GDP. Egypt, while being on the path of decoupling, has yet to achieve commendable levels of relative decoupling. The analysis reveals that the country still has carbon-intensive growth patterns and economic expansion is closely tied to emissions reflecting ineffective policy measures.

Fig 1: Decoupling trends across the selected countries



Source: Our world data

The Tapio Decoupling Index

In 2005, Petri Tapio expanded upon the OECD decoupling index by developing a more refined framework for analysing the relationship between environmental impact and economic growth, introducing nuanced classifications of decoupling. Grounded in the concept of elasticity, the model expresses the ratio of changes in carbon emissions to changes in economic growth, thereby facilitating the assessment of policy effectiveness in reducing environmental impact while sustaining economic development. Given its analytical depth and relevance to the research objectives, the Tapio model is adopted in this study over the OECD framework. It is expressed as the following equation:

$$TI = \frac{\% \Delta C}{\% \Delta G} = \frac{\Delta C / C}{\Delta G / G}$$

where, $TI < 0$, Absolute decoupling

$0 < TI < 1$, Relative Decoupling

$TI > 1$, No decoupling

Here, TI represents the Tapio Index, $\% \Delta C$ and $\% \Delta G$ denote the percentage change in carbon emissions and GDP per capita from the baseline year to the target year, respectively. The terms ΔC and ΔG indicate the absolute change in carbon emissions and GDP, respectively, between the base year and the target year, while C and G refer to the carbon emissions and GDP values in the baseline year. Considering 2012 as the base year, the following table shows the degree of decoupling among the selected countries -

Table 1: Degree of decoupling according to Tapio Index

	United Kingdom	Netherlands	Singapore	India	China	Egypt
Territory Emissions	-0.64	-1.64	0.48	0.83	0.15	1.28
Consumption-based Emissions	-0.17	-3.55	-2.21	0.73	0.27	1.12
Verdict	Absolute	Absolute	Absolute	Relative	Relative	No decoupling

Source: Author's own calculations

This classification assumes that if either measure shows **no decoupling**, it overrides relative/absolute in the final verdict, but if both show decoupling, the stronger form (absolute over relative) is chosen.

Policy implications

The comparative analysis highlights diverse approaches to decoupling economic growth from environmental degradation across selected nations, reflecting the need for area specific policy interventions.

The Netherlands has prioritized energy transition and renewable energy investment, implementing a Circular Economy strategy that emphasizes recycling over natural resource exploitation, alongside complementary sustainability-focused policies.

The United Kingdom has advanced clean electricity initiatives, phased out petrol and diesel vehicles, promoted renewable energy, and introduced a carbon tax to incentivize emission reductions.

Singapore's Public Utilities Board pursued long-term water management strategies, emphasizing efficient usage, waste reduction, alternative water sources, and regulatory measures for water conservation and energy efficiency.

India is advancing a "green growth" agenda, focusing on renewable energy deployment, energy efficiency improvements in buildings and industries, sustainable urban development, and the creation of a low-carbon transportation network.

China has implemented comprehensive measures to decouple economic growth from environmental harm, including stringent carbon reduction targets, energy efficiency promotion, renewable energy investments, and strengthened environmental regulations.

Egypt has undertaken various decoupling initiatives with limited impact, facing ongoing challenges in reducing greenhouse gas emissions and addressing pollution.

Conclusion

Policies should be formulated based on a nation's decoupling status. For absolute decouplers, it is essential to sustain and strengthen carbon reduction policies, promote green infrastructure, share technological and regulatory based practices with developing nations, and prevent rebound effects that could offset efficiency gains.

Relative decouplers should be directed to accelerate the transition from high-carbon energy sources to renewables, enhance industrial and transport energy efficiency, and ensure policy coherence by aligning growth strategies with environmental objectives. For non-decouplers such as Egypt, urgent structural reforms, the adoption of carbon pricing mechanisms, and the leveraging of international climate finance are critical to cap emissions and expand clean energy capacity.

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THE ROLE OF HUMAN CAPITAL AND SDG IN RETHINKING ECONOMIC GROWTH—A CASE STUDY OF INDIA

Mahek Kumar and Shrayanti Bhattacharjee
2nd Year, PG

Abstract

The Indian economy which is currently occupying the fourth rank in GDP growth, is one of the fastest growing economies that is aiming towards achieving a robust, sustainable and inclusive growth by 2047. However, challenges in ensuring equitable economic growth alongside sustainable development still persist. There has remained a gap between the employment level of the economy and the prerequisite education and skills needed by all human beings to contribute to the economy. In this regard, the interaction between level of education, status of employment and human capital plays a crucial role. The article aims to find out the challenges that India is still facing in improving human capital, by emphasizing on education and employment levels. It identifies practical solutions to overcome these impediments. Grounded in a humanistic vision, this article explores how education systems must evolve, in line with the global agenda of sustainability. Taking into consideration the UNDP's Sustainable Development Goals framework, this article discusses how India can rethink its approach towards achieving higher economic prosperity, by shifting its focus from narrow utilitarian goals toward fostering justice, equity, and environmental stewardship.

JEL Classification

E24, I25, J21, J24

Introduction

In the era of rapid globalisation and shifts in technological inventions, the twenty-first century has witnessed the conventional growth models falter, exacerbating inequality and undermining ecological systems. Hence, a profound rethinking of economics is imperative. This is where we refer to the concept of “Sustainomy” linking people, prosperity and planet (3Ps). When we reimagine growth in the globalized period taking into consideration the concepts of equity and sustainability, the interplay between level of education, human capital and employment proves fundamental. Education provides individuals with the necessary platform to obtain knowledge, and skills which are required for sustainable living. The collective accumulation of these individuals' capabilities is human capital that shapes productivity, innovation and resilience. Employment mobilises human capital, reinforcing education systems and socio-economic stability. Critically, the United Nations Sustainable Development Goals (SDGs), emphasize this synergy between education, employability and equitable growth as pillars of sustainable development. In this context, India, aspiring to be a developed nation by 2047, faces persistent socio-economic and technological barriers. Therefore, the task of combining the defined aspirations of the SDGs with the practical situation of the Indian labour market and education system requires a fundamental rethink.

Challenges Faced in Human Capital Development

Human capital is heterogenous, spanning generations with varied interests and ambitions, making it difficult for industries to unlock each individual's full potential. This creates a persistent gap between education system goals and business needs. The main challenges involved in bridging this gap in the Indian economy, are as follows:

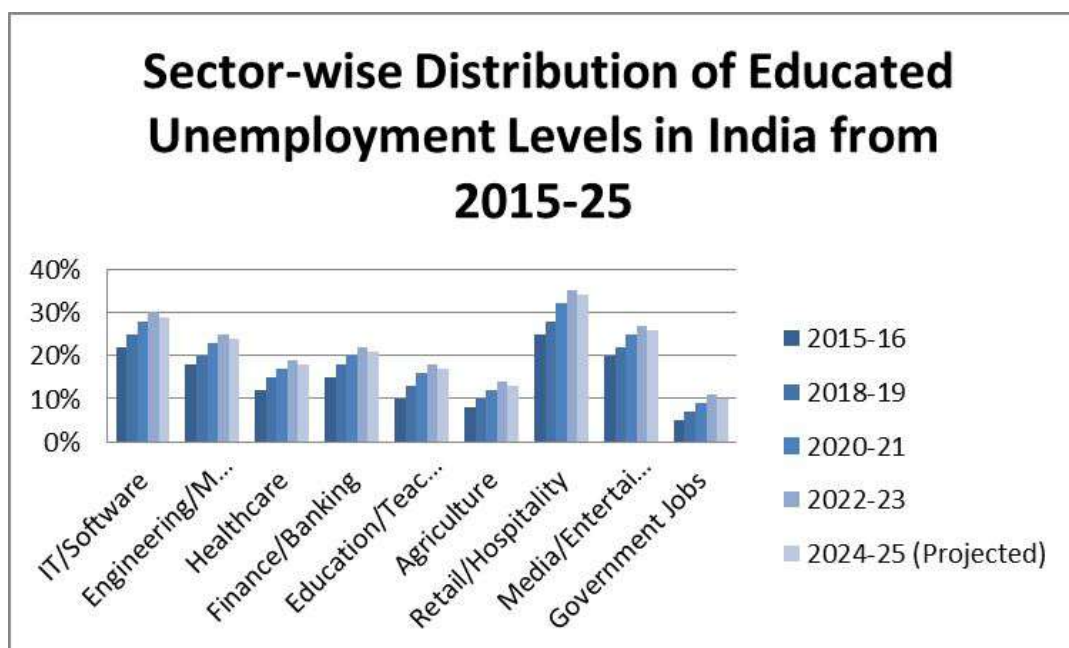
Skill mismatches: Skill mismatch occurs when individuals' qualifications and training do not align with industry requirements, resulting in underemployment or unemployment. It was observed that only 8.25%

In India, this skill mismatch stems from:

- An outdated education system lacking practical skills.
- The advent of artificial intelligence (AI) replacing traditional roles as many workers lack digital literacy.
- A weak vocational training system, with less than 5% of the workforce receiving formal training,

Despite government initiatives and efforts of the private sector, this mismatch stands as a crucial issue hindering employability, industrial competitiveness and economic growth.

Educated unemployment and Underemployment: Closely tied to skill mismatch educated unemployment remains high, despite India's large workforce. In India, as per Periodic Labour Force Survey (PLFS) Data, graduate unemployment increased from 13.7% to 21.4% over the decade from 2016-25, with just 45% of them working in low-skilled jobs. Postgraduates and engineers face even higher joblessness in the country (around 20-25%).



Source: PLFS Data (2015-25)

The reasons include:

- Rapid expansion of higher education with lagging quality, reducing their employability in a competitive job market.
- Inadequate proportion of formal sector jobs, despite GDP growth, partly due to the rise of the gig economy. Furthermore, the demonetization policies of 2016, GST implementation of 2017 and the COVID-19 pandemic worsened the situation.
- Societal pressure also plays a key role in this aspect. The growing demand for financially stable jobs in the public sector and the subsequent rise in the competition for such jobs reduces the chances of employment. The lack of infrastructure and mismanagement in examination and recruitment processes and the rise of start-up culture is draining India of its rich human capital as it pushes the potential candidates to either low-paying sectors or abroad.

Inequitable access to quality education: Education is a fundamental right and it is the key driving force behind the social and economic progress of any country. The Indian government has taken several initiatives like the Right to Education Act (RTE), Samagra Shiksha Abhiyan(2018) and the National Education Policy (NEP) 2020, however, access to quality education remained highly unequal, owing to the disparities in income, gender, geography and social identity. Such systematic barriers continued to debar the growth and implementation of policies related to education. Other reasons include the rural-urban divide, whereby rural schools face severe teacher vacancies and the digital infrastructure for online education (post COVID) is available to only 25% of the rural people. Secondly, drop-out rates remain higher in rural areas, around 30%, due to early marriages, resulting from gender disparity. The enrolment rates are lower for the minority groups, ST (6.3%), SC (15.3%), OBC(37.8% in higher education according to All India Survey on Higher Education (AISHE) data (2021-22).

Measures to Combat the Challenges

Skill mismatch has been found to be the key barrier to human capital development which often hides behind stable employment figures, leading to wasted potential. In order to utilize India's youth potential, the policy initiatives need a human-centric approach. Boosting Skill India Mission, Pradhan Mantri Kaushal Vikas Yojana (PMKVY), National Apprenticeship Promotion Scheme and ensuring inclusivity of rural and marginalized communities through targeted programs. This would directly support *SDG 4's aim for inclusive lifelong and equitable learning*. Access to the digital platforms and portable certifications can provide continuous development and keep people employable as jobs evolve. Policies which promote skills-first hiring and not just on the basis of degrees, align with *SDG 8's vision of decent work for all*.

In order to tackle educated unemployment and underemployment, the education sector must keep pace with industry sector. A strong coordination between them helps close the theory-practice gap by regularly reviewing curriculum. Technical and vocational education should be emphasized alongside academics and every student should get workplace exposure via internships or apprenticeships. Robust career counseling can help young people make informed choices, supporting youth entrepreneurship with training and credit, thus advancing *SDG 8 and SDG 10 (reduced inequalities within and among countries)*.

For ensuring equitable access to quality education, awareness has to be spread from the grassroots level through investments in rural schools, modern teacher training and outreach programs via community radio which can provide quality education to the remotest corners (*SDG 4 and SDG 10*).

India's growth depends upon drawing more women into the workforce. Policy initiatives should focus on providing safe and flexible work environments, child-care support, extending paid leave and making re-entry easier for women returning after maternity leave. Skill development programs must proactively target women, especially in *STEM*, digital domains and non-traditional trades. Anti-discrimination laws and workplace awareness campaigns can challenge stereotypes and biases ensuring and empowering women's talent as supported by *SDG 5 (gender equality) and SDG 8*.

In order to fulfill the SDG commitments, India needs an empowered, independent monitoring agency which ideally uses digital platforms and real-time data, can audit learning outcomes, monitor teacher attendance and training, track dropout rates and gather feedback directly from students and parents. Regular, transparent public reports on funding and day-to-day-realities of rural education, would spotlight gaps and hold authorities accountable. This should ensure that every rupee spent on the education infrastructure translates into real learning for India's rural youth, making universal quality education a reality, not just a policy promise.

Conclusion

With education aligned to industry needs, skill mismatches would diminish, enabling a workforce that is innovative, adaptable and globally competitive, also, with women playing an equal role in the workforce. Through targeted investments, the rural-urban divides have narrowed and policy initiatives, aligned with SDGs 4, 5, 8 and 10 have transformed India into a competitive, innovative and equitable economy. This new India balances economic progress with social justice and environmental responsibility, positioning itself as a resilient, knowledge-based leader on the global stage, and finally marking its place as a developed economy by 2047.

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RETHINKING CONSUMPTION AND LIFESTYLE FOR A SUSTAINABLE GLOBAL ECONOMY

Koyena Das and Projit Ray

2nd Year, PG

Abstract

A sustainable lifestyle can be understood as a set of daily practices, social behaviours, and individual choices that collectively aim to minimize environmental degradation. The concept stresses on the responsible use of natural resources, the curtailing of harmful emissions and the adoption of effective measures to mitigate pollution, while simultaneously advancing equitable socio-economic development and enhancing overall quality of life. Projections indicate that by 2050 the global population may reach nearly 10 billion, a demographic expansion that will inevitably intensify demands for food, clothing, housing, transportation, and related aspirations. This article examines sustainable consumption through a people-centered lens, combining systemic approaches with behavioural insights. Structurally, sustainable lifestyles must be grounded in local contexts, promoting sufficiency, community engagement, and equitable access to resources. In the current times of global biodiversity loss and associated climate change our daily life decisions are putting the environment at risk. The discussion underscores the necessity of integrated approaches involving policy innovation, cultural transformation, and equitable resource distribution. The conclusion offers a framework for embedding sustainable consumption in economic planning, aligning individual well-being with planetary boundaries..

JEL Classification

D12, H23, I31, Q01, Q44, Q56, Q57

Introduction

Economic growth has long been considered as a hallmark of progress with higher consumption levels viewed as evidence of improved living standards. Yet, the current growth-driven model anchored in linear “take-make-dispose” patterns has strained ecological systems and deepened social inequalities. Global material consumption is projected to double by 2060, with significant consequences for climate stability, biodiversity, and resource security. In India, per capita energy consumption is currently about 25% of the global average, yet is increasing rapidly alongside urbanization and income growth (UNEP, 2021). This rising demand is set against stark ecological constraints: over 600 million people face high to extreme water stress, agriculture accounts for approximately 80% of freshwater withdrawals, and solid waste generation-currently 62 million tonnes per year-is projected to reach 165 million tonnes by 2030(Government of India, 2018). As behavioural research reveals that awareness and values alone do not guarantee action. A controlled behavioral experiment found that consumers frequently face a social dilemma: while they endorse sustainability in principle, they avoid bearing the full cost themselves, preferring that others act first (van der Linden, 2017). Such findings suggest that successful strategies for promoting sustainable consumption must address not only the structural and economic barriers but also the behavioural dynamics that influence decision-making.

Why Rethink Consumption?

- ***Environmental Imperatives:*** Globally, human consumption patterns are pushing planetary boundaries. Material extraction has more than tripled since 1970 and could double again by 2060 if current trends continue (UNEP, 2019). This surge in demand drives greenhouse gas emissions, biodiversity loss, soil degradation, and water scarcity. The world already consumes resources equivalent to 1.7 Earths each year (Global Footprint Network, 2023), meaning we are depleting natural capital faster than it can regenerate.

Without a systemic shift towards sustainable production and consumption, climate change impacts will intensify, ecosystems will degrade irreversibly, and global food and water security will be threatened.

- ***Economic and social equity:*** The benefits of global consumption are distributed unevenly. High-income countries, representing just 16% of the world's population, are responsible for more than 70% of historical CO₂ emissions (IPCC, 2022) and consume disproportionately large shares of energy, materials, and land. In contrast, billions in low-income countries still lack access to basic goods and services. This imbalance not only exacerbates poverty but also raises ethical questions about resource allocation and intergenerational equity.
- ***Cultural well-being:*** Research on well-being shows diminishing returns from material consumption beyond a certain threshold (Jackson, 2017). The challenge is to create a "fair consumption space" for all, within which individuals and societies are secured an equitable distribution of resources and opportunities to fulfill their needs and to achieve well-being (Akenji et al. Citation 2021).

India's People-Centered Approach to Sustainable Consumption

A people-centered framework emphasizes participation, empowerment, and local ownership of solutions. In India, this translates into:

1. **Community-based resource management:** Reviving traditional water harvesting structures such as baolis and jihads in Rajasthan has restored groundwater levels and strengthened agricultural resilience.
2. **Sufficiency economy principles:** Rooted in Gandhian ethics, these principles promote "enoughness" over excess, encouraging moderation in consumption as a virtue.
3. **Fair and ethical markets:** Cooperatives and fair-trade supply chains provide income security for small producers while reducing ecological footprints.
4. **Decentralised governance:** Panchayati Raj institutions can integrate sustainability into local planning, ensuring measures are culturally resonant and context-appropriate.

Behavioural Barriers: The Social Dilemma

The sustainable consumption dilemmas study provides key insights: In an experiment involving over 300 participants, individuals had to choose between sustainable and conventional varieties of meat and chocolate, with the sustainable options priced higher. Over 60% of participants who rarely purchased sustainable goods agreed to switch when informed that others in their group would also commit. Approximately 40% cited the personal satisfaction ("warm glow") of contributing to a collective good as a motivator, despite the higher personal cost. About 70% preferred "soft" incentives such as subsidies over "hard" bans, even when the latter would deliver greater environmental benefits, valuing freedom of choice. Many were reluctant to impose sustainability obligations on others, reflecting a moral tension between autonomy and collective responsibility (van der Linden, 2017). This suggests that consumer action is not purely an individual decision but a coordinated one, shaped by perceptions of fairness, reciprocity, and social norms.

Bridging the Gap: Integrated Policy Strategies

Achieving sustainable consumption requires a blend of structural reforms that shift the economic and regulatory environment and behavioural interventions that address the social and psychological barriers to change. The following six strategies expand on practical measures for both global and Indian contexts.

1. ***Make sustainable choices the default:*** Research shows that when sustainable options are presented as the default such as renewable energy plans automatically assigned to households—adoption rates rise significantly without restricting freedom of choice. Governments can mandate default eco-friendly procurement in public institutions, energy-efficient appliances in housing projects, and make low-emission vehicles the default option in public fleets.
2. ***Signal collective action:*** Many people are more willing to change behavior if they know others are doing the same—a phenomenon known as “conditional cooperation.” Public dashboards showing city-level waste segregation rates or national adoption of rooftop solar can create visible proof of collective effort.
3. ***Align incentives with long-term goals:*** Subsidies and tax credits lower the financial barrier for adopting sustainable products, while clear timelines for phasing out harmful goods ensure a planned transition. For instance, a gradual increase in taxes on single-use plastics, combined with incentives for biodegradable alternatives, can balance immediate economic concerns with environmental targets.
4. ***Educate for life-cycle awareness:*** Education systems should integrate sustainability literacy, teaching not only the environmental impact of consumption but also the economic and social consequences. Life-cycle analysis (LCA) concepts can help students and consumers understand the full impact of products, from extraction to disposal. In workplaces, sustainability training can be tied to procurement and operational decisions.
5. ***Embed equity safeguards:*** Transitioning to sustainable consumption should not exacerbate existing inequalities. Policies must include targeted support for low-income households, such as subsidies for energy-efficient appliances, low-interest loans for installing solar panels, or free public transport in underserved areas.

These strategies, when implemented in combination, create reinforcing effects, visible participation drives social norms, incentives make changes economically viable, localised systems reduce dependence on global supply chains, education shapes long-term values, and equity safeguards ensure broad public support.

Conclusion

Sustainable consumption is not simply an environmental agenda; it is a foundation for economic resilience, social justice, and cultural well-being. Globally, the challenge is to reduce overconsumption in high-income societies while enabling dignified living standards in developing economies. This requires confronting entrenched economic models that equate growth with increased throughput and embracing alternatives that prioritize sufficiency, regeneration, and equity. Behavioral economics reinforces that visible collective action and emotional rewards like the “warm glow” can unlock willingness to participate, even when costs are higher. A coordinated global effort—rooted in policy innovation, cultural change, and local empowerment—can transform consumption from a driver of ecological crisis into a lever for human and planetary well-being. The future global economy must measure success not by how much we consume, but by how well we thrive within ecological limits.

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FROM STRAIN TO STRENGTH: NAVIGATING INDIA'S HOUSEHOLD CONSUMPTION AND CREDIT LANDSCAPE

- *Md Farhan Aslam*

2nd Year PG

Abstract

India's post-pandemic recovery ranks among the strongest globally, with GDP growth outpacing peers. Yet, this resilience masks a growing fragility: the rising debt of the middle class. Household debt has surged to an estimated 42.9% of GDP between 2020 and 2024, driven by unsecured lending, stagnating real incomes, and inflation eroding savings. While this credit boom has sustained consumption, it risks triggering long-term financial stress.

Drawing on Reserve Bank of India data, Financial Times analysis, IMF and World Bank data and national statistics, this article explores the paradox of high growth fueled by debt-financed consumption. Falling savings rates, rising liabilities, and shifts in spending patterns reveal an increasing dependence on high-risk credit segments. Sectoral loan disbursement trends and the uptick in non-performing assets underscore the mounting vulnerability of the banking system.

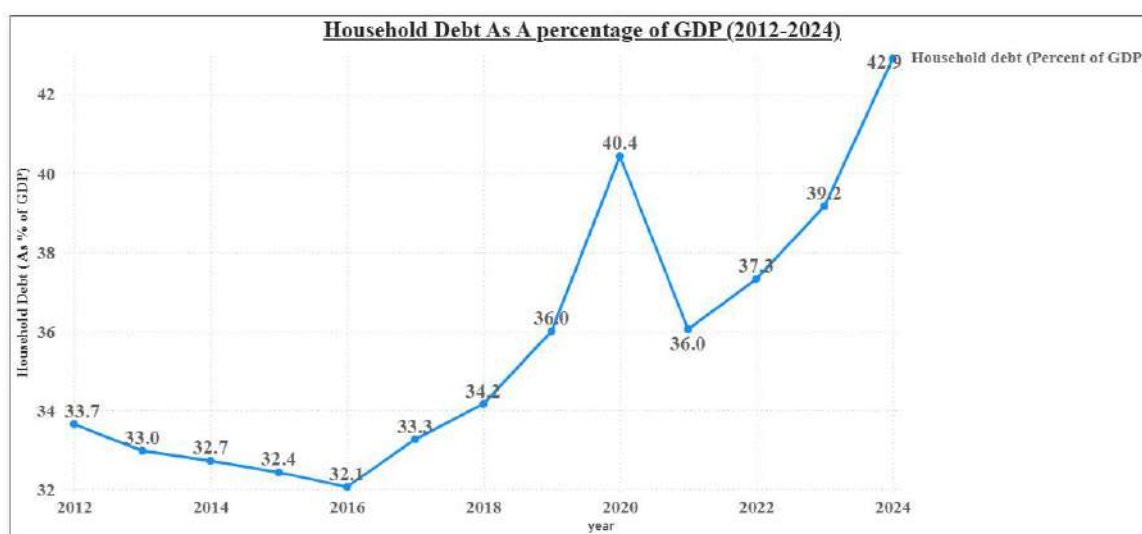
India's consumption-led growth is becoming debt-reliant, exposing households and banks to interest rate shocks, income stagnation, and global volatility. Without intervention, this trajectory could curb future demand and destabilize financial institutions. The article concludes with policy recommendations strengthening debt literacy, bolstering consumer protection, and implementing calibrated RBI measures to ensure that India's engagement with the global economy rests on strong and sustainable domestic financial foundations.

JEL Classification

E21, E31, G21

Introduction: The Paradox of Prosperity and Peril

At first glance, India's post-pandemic recovery feels like a success story: surging GDP growth, high rising skyscrapers, renewed consumption, and a burgeoning middle class. Yet, beneath this optimism lies a deeply concerning issue of mounting financial fragility. Household debt in India has climbed sharply from just over

Figure: Household Debt as a Percentage of GDP, 2012–2024

Source : World Bank

The graph above illustrates this paradox. While the early 2010s show a gradual decline in leverage, the post-pandemic years mark a worrying rise in household debt, tipping over 40% of GDP for the first time. This sharp climb suggests India's consumption boom may be debt-fuelled rather than income-driven, indicating a structural imbalance with long-term risks.

This trend reflects deeper shifts in household behaviour. Real incomes have stagnated amid inflationary pressures, eroding savings and pushing families toward credit simply to maintain consumption. IMF data shows savings, once averaging 30% of GDP during 2013–2022, dropped to 28.4% by FY23. Net financial savings plunged from over 39% to under 29%, indicating households are increasingly leveraging rather than saving for their future ahead.

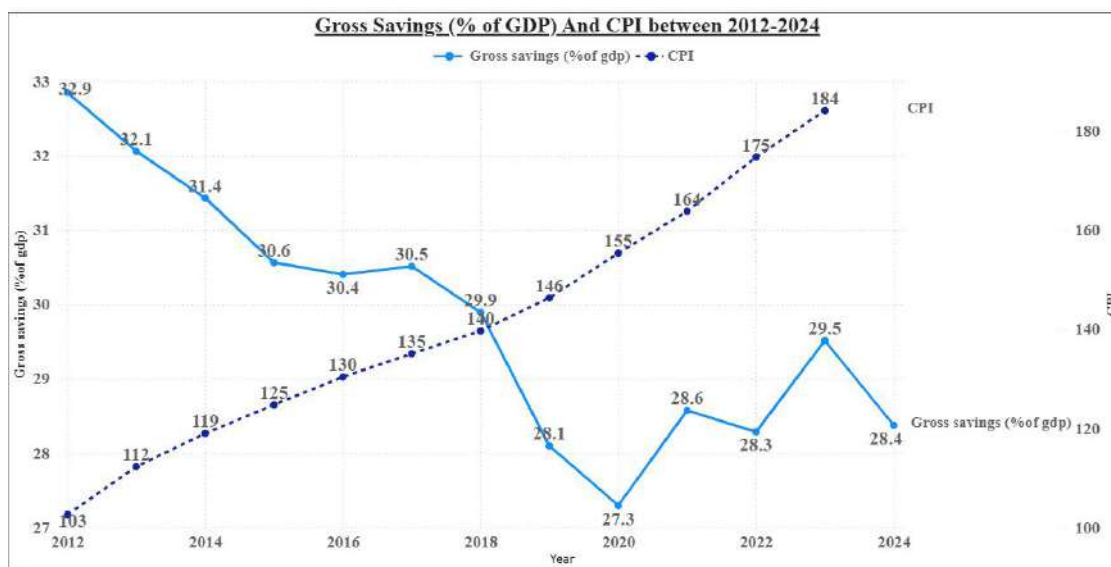
Moreover, non-housing retail loans largely for consumption purposes like credit cards, vehicle and personal purchases, now account for half of total personal loans (2020-2024), signalling a shift towards a lifestyle of borrowing rather than asset-backed financing.

This surge in liabilities threatens household balance sheets and undermines financial system resilience. The RBI and analysts have raised alarms over rising unsecured defaults, prompting tighter risk weights on risky retail lending.

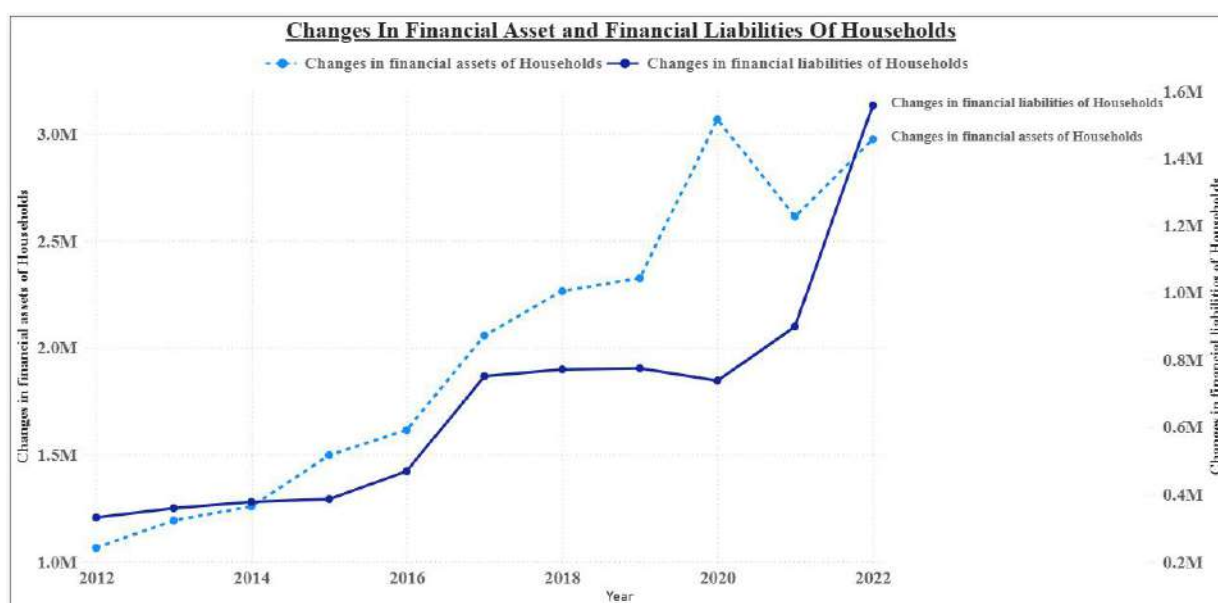
In a globalized, digitized economy, India's middle class drives optimism. Yet sustainable and equitable growth must begin with addressing domestic imbalances. Ultimately, India's macroeconomic strength depends not on headline GDP figures, but on the financial health of its citizens.

Evolving Contours of Household Financial Health

The upward march of household debt as a share of GDP reflects a deeper structural shift in household finances. Mapping financial assets against liabilities reveals a clear divergence: liabilities are rising faster and more persistently than asset accumulation, especially post-pandemic.

Figure: Savings as a Percentage of GDP, CPI (2012–2024)

Source : IMF , RBI Handbook of Statistics

Figure : Changes in Financial Asset and Financial Liabilities Of Households

Source : RBI Handbook of Statistics

Between 2012 and 2016, financial assets comfortably outpaced liabilities. Assets rose from roughly ₹1.06 M to ₹1.61 M per household, while liabilities inched from ₹0.33 M to ₹0.47 M. Households were adding to their net worth. From 2017 onward, however, asset growth slowed while liabilities accelerated sharply after 2020, when liabilities climbed from about ₹0.9 M to ₹1.56 M by 2022. The margin between assets and liabilities compressed sharply, signalling erosion in financial resilience.

This surge coincides with a steady decline in gross household savings as a percentage of GDP from 32.9% in 2012 to 27.3% in 2020, with only modest recovery later. Meanwhile, the Consumer Price Index (CPI) rose from 103 in 2012 to 184 in 2024. This inverse relationship between rising inflation alongside falling savings shows that households are increasingly dipping into savings or borrowing to sustain consumption.

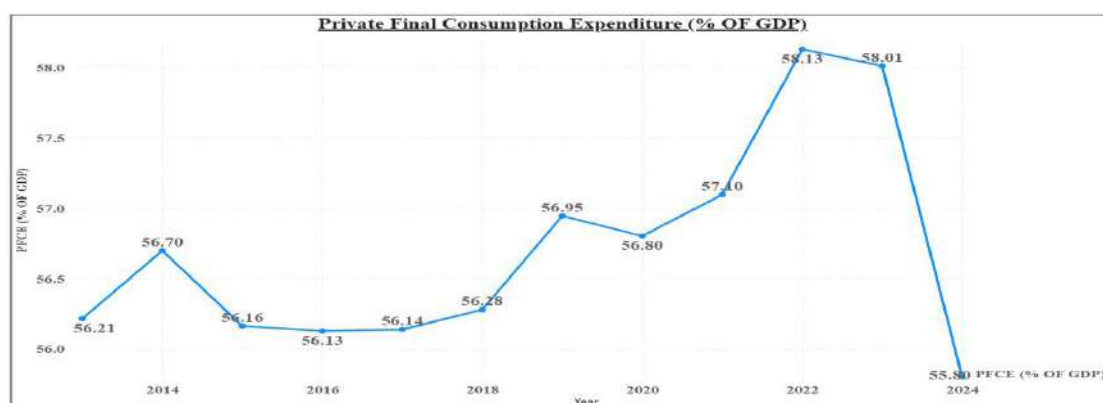
The combined data suggests inflation has been eroding disposable income, with credit expansion bridging the shortfall rather than savings replenishment. This dynamic carries three long-term risks: reduced savings rates shrink the domestic pool of capital for investment; heavier debt loads increase vulnerability to interest rate hikes, job losses, or income shocks; and the narrowing asset-liability gap leaves fewer buffers in crises.

Borrowing composition has also shifted toward unsecured credit personal loans, consumer durables, and credit cards which sustain short-term spending but do little for long-term financial security. In essence, Indian households are on a financial tightrope, with asset growth no longer outpacing debt, savings declining in real terms, and inflation tightening the squeeze.

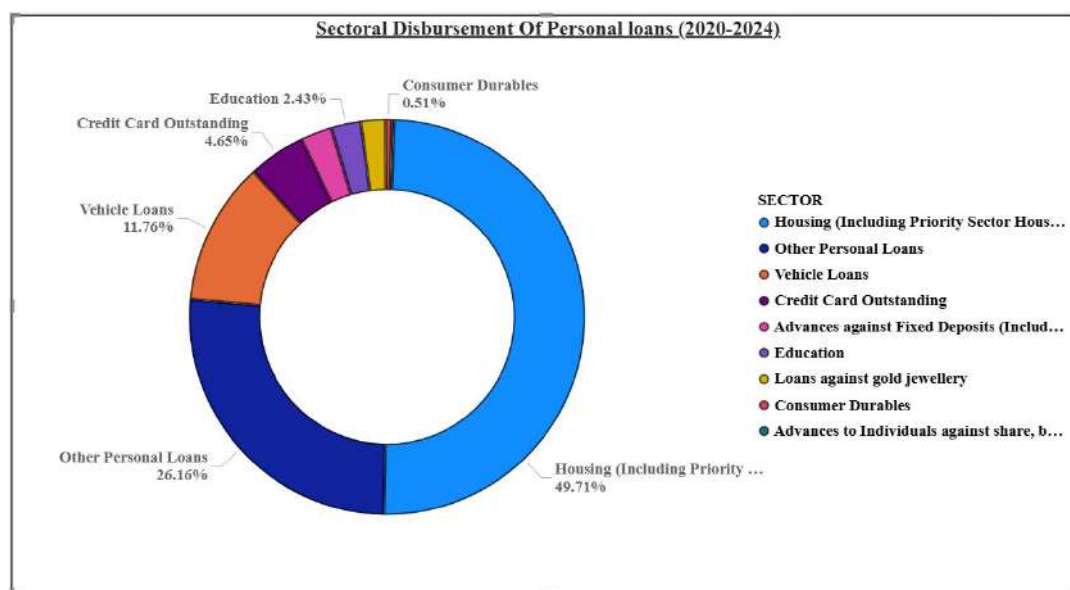
Trends in Household Debt, Consumption, and Sectoral Credit Allocation

The trajectory of household debt, consumption expenditure, and credit allocation from 2012 to 2024 reveals key shifts in India's macroeconomic landscape. From 2012 to 2016, household debt-to-GDP remained stable at 32–34%. Post-2016, the ratio climbed sharply, accelerating after 2018 to 40.4% in 2020. Pandemic-related income disruptions and precautionary borrowing drove a temporary spike, followed by a 2021 correction. The subsequent rise to 42.9% in 2024 signals a structural shift toward higher leverage, mirroring global post-pandemic trends fueled by accommodative monetary policy, rising consumer aspirations, and housing demand. Private Final Consumption Expenditure (PFCE) stayed above 56% of GDP for most of the decade. A post-pandemic rebound lifted PFCE to 58.13% in 2022, driven by pent-up demand and liquidity support. However, the drop to 55.80% in 2024 suggests that rising debt burdens, inflation, and tighter credit might be constraining household spending.

Figure : Private Final Consumption Expenditure (% of GDP)



Source : RBI Handbook of Statistics

Figure : Sectoral Disbursement Of Personal Loans (2020-2024)

Source : RBI Handbook of Statistics

Sectoral personal loan data (2020–2024) shows housing loans dominating with nearly 50% of disbursements, supported by urbanization, low interest rates, and homeownership incentives. “Other Personal Loans” at 26.16% reflect liquidity needs for consumption smoothing and lifestyle financing. Vehicle loans account for 11.76%, while credit card debt (4.65%) and consumer durables highlight growing unsecured credit markets.

This composition indicates that debt growth is both consumption- and asset-oriented, with housing being the driver of economic activity and wealth-building. Yet, the rising share of unsecured loans raises vulnerability if income growth lags behind repayment needs.

The data presents a dual-edged narrative: increased borrowing, especially for housing, has supported growth, jobs, and infrastructure; yet the fall in PFCE alongside higher debt ratios could signal moderation in consumption-led growth if financial stress rises. Overall, 2012–2024 marks India’s shift toward a more credit-reliant consumer economy offering growth potential but also macro-financial risks.

Unraveling the Web: Interlinkages and Causal Pathways

The interplay between household debt, consumption, savings, and balance sheet strength offers vital insight into India’s economic health. Four datasets Household Debt as a Percentage of GDP, Private Final Consumption Expenditure (PFCE) as a Percentage of GDP, Household Savings vs Consumer Price Index (CPI), and Household Liabilities vs Assets reveal evolving financial behavior.

From 2012 to 2016, household debt-to-GDP stayed stable at 32–34%, with PFCE’s GDP share also steady, indicating consumption was fueled by income and savings rather than leveraging. Household savings declined modestly in real terms, reflecting asset purchases and rising living costs, as seen in CPI trends.

WPost-2016, debt climbed sharply, accelerating after 2018 and peaking at nearly 43% of GDP in 2024. This rise coincided with a modest PFCE increase, suggesting borrowing partly supported consumption. However, debt growth outpaced consumption gains, implying substantial credit was directed to asset acquisition, refinancing, or non-consumption purposes.

Household Liabilities vs Assets data supports the view that financial assets outpaced liabilities, but the gap narrowed recently as liabilities surged. By 2022, liabilities hit 1.56 million crore INR, up from under 1 million crore just two years earlier, raising repayment capacity concerns if income growth lags.

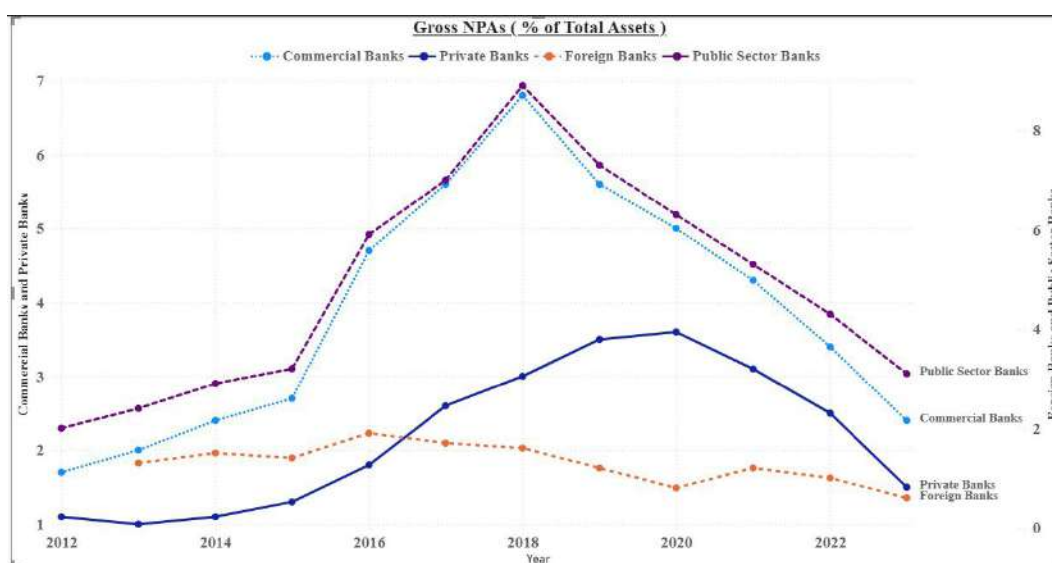
Savings trends add complexity. The Household Savings vs CPI data shows real savings under pressure during high inflation. Inflation spikes often align with sharper debt increases, hinting at borrowing to maintain consumption when purchasing power falls—a substitution effect where debt replaces inadequate real savings.

The causal links are clear: rising consumption boosts GDP and borrowing, while credit availability fuels short-term spending. But if debt growth outpaces assets and incomes, systemic risks emerge. The narrowing asset-liability gap and inflation-driven savings squeeze signal caution. India's shift from a savings-led to credit-augmented consumption model supports growth in the medium term but demands close monitoring to avoid unsustainable leverage cycles.

Banking Sector Resilience and the Shifting Landscape of Lending

The banking sector's health drives credit availability, borrowing costs, and spending. Two key metrics - Gross Non-Performing Assets (NPAs) and sectoral personal loan disbursement show how banks have balanced asset quality with retail expansion.

Figure : Gross NPAs (% of Total Assets)



Source : RBI Handbook of Statistics

From 2012–2015, gross NPAs were contained: commercial banks under 3%, public sector banks near 3%, private banks 1 – 1.2%, and foreign banks 1.8 – 2%. Between 2015–2018, asset quality deteriorated sharply, with public sector NPAs peaking at nearly 7% and commercial banks at 6.8%, driven by the RBI's Asset Quality Review (AQR), thus exposing stressed infrastructure and corporate loans.

Post-2018, NPAs declined steadily, public sector NPAs were halved, commercial banks fell to just over 2%, private banks neared 1% helped by recoveries under the Insolvency and Bankruptcy Code (IBC), provisioning, and stricter discipline. This improvement fueled a retail credit push.

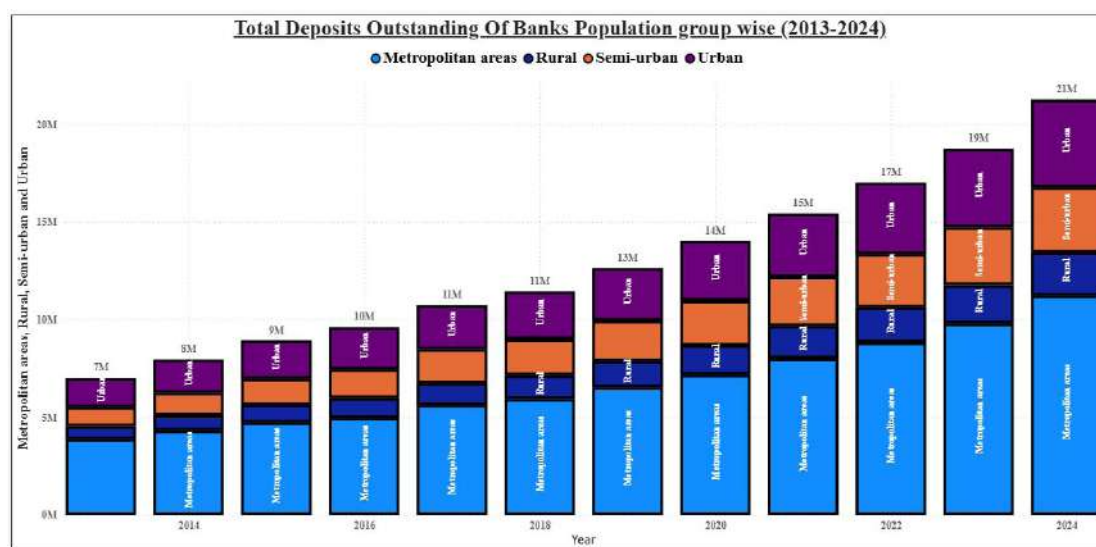
Housing loans dominated disbursements, reflecting a preference for secured lending. Vehicle and education loans held steady, while credit card and consumer durables financing rose, signaling higher discretionary spending. Post-2018 growth in unsecured loans, led by private and foreign banks, reflected calculated risk-taking but carried latent risk.

Public sector banks, long dominant in housing finance, lost ground in faster-growing credit card and personal loan segments. While secured lending anchored stability, rising unsecured shares warranted monitoring if conditions ever tightened.

Regional Banking Trends & Policy Interventions—A Ray of Optimism

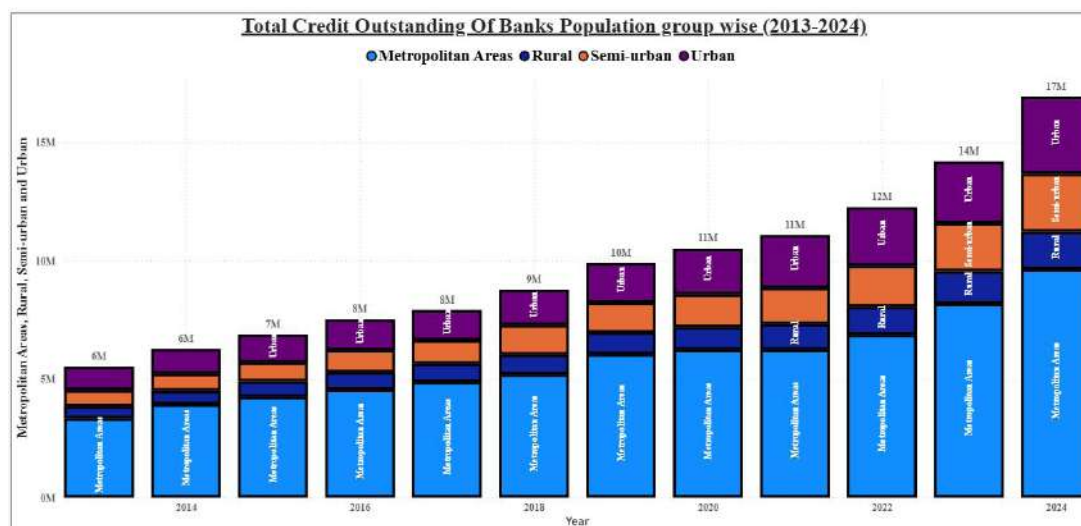
From 2013–2024, metros dominated deposits and credit, followed by urban and semi-urban areas, with rural regions lagging. Yet rural and semi-urban credit growth is accelerating, narrowing the gap, supported by digital outreach, branch expansion, and tailored products paving the way for more balanced growth.

Figure : Total Deposits Outstanding Of Banks Population group wise (2013-2024)



Source : RBI Handbook of Statistics

Figure : Total Credit Outstanding Of Banks Population group wise (2013-2024)



Source : RBI Handbook of Statistics

Policy Initiatives Lighting the Way Forward

- ❖ **Income Tax Relief** – Budget 2025 raised the tax-free threshold from ₹7 lakh to ₹12 lakh, delivering ₹1 lakh crore in relief; RBI expects this and moderating inflation to lift consumption and savings.
- ❖ **Targeted Subsidies** – ₹30,000 crore support to Oil Marketing Companies sustains subsidized LPG under Ujjwala, protecting spending power.
- ❖ **Inclusive Financial Access** – PMJDY, Kisan Credit Cards, Mudra loans, and rural banking expand formal finance to underserved areas.
- ❖ **Digital Infrastructure** – National Broadband Mission 2.0 to extend high-speed internet to 2.7 lakh villages by 2030, boosting digital payments and e-commerce.
- ❖ **Consumption Efficiency** – PM Surya Ghar Muft Bijli Yojana and energy-efficiency programs cut utility costs, freeing household income.

A Hopeful Trajectory

Together, these measures boost liquidity, lower essential costs, expand credit, and deepen inclusion—supporting a shift from urban-centric to inclusive, sustainable growth, with rural and semi-urban consumption at its core.

Conclusion – Towards a Resilient and Inclusive Consumption Economy

India's household finance trends reveal both promise and caution. Household debt-to-GDP has risen steadily, reflecting greater borrowing capacity and growing aspirations. In many cases, this leverage is backed by asset growth, yet declining savings amid inflation exposes households to shocks. Policy measures like tax relief, targeted subsidies, and rural credit expansion are beginning to restore financial stability.

Banking sector resilience reinforces this outlook. Public sector NPAs, which peaked in 2018, have since halved, aided by regulatory reforms, provisioning, and economic recovery. Lending patterns highlight sustained financing for housing, vehicles, and education—showing consumer resilience and banks' confidence in long-term household needs.

A notable shift is in regional finance. While metros dominate deposits and credit, rural and semi-urban areas are expanding their share, supported by digital penetration, financial inclusion schemes, and infrastructure growth. This diversification is critical for balanced, sustainable consumption.

India is at a pivot point. If inflation remains contained, financial access widens, and policy momentum continues, household balance sheets could strengthen markedly. The convergence of sound policy, healthier banks, and rising consumer confidence offers a clear prospect: inclusive, consumption-led growth reaching beyond urban centers and embedding resilience in India's economic foundation.

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RESEARCH ARTICLES

MAKING ROOM FOR PROFIT - THE SPECIFIC FACTOR MODEL UNDER MONOPSONY

Avishek Bose¹

*Postgraduate and Research Department of Economics,
St. Xavier's College (Autonomous), Kolkata, India.*

Abstract

The paper is an attempt to examine the role of monopsonistic exploitation in an otherwise globally competitive product market for a small dependent economy. In so doing, the paper uses a specific factor model of international trade, where monopsonistic exploitation is an inherent feature given the feature of factor mobility, which may possibly lead to the emergence of monopsony power.

Keywords

Monopsony, Factor Market, General Equilibrium

JEL Classification:

D50, J30

1. Introduction

For decades, the Heckscher-Ohlin (H-O) model has been one of the most popular workhorses of international trade theory to address the basis of international trade. Their close examination of *the effects of factor endowments on international trade* has given rise to the theorem of the same name². However, the theorem rests on a set of rather stringent assumptions, such as homogeneous goods and factors of production across countries, perfect domestic mobility of factors of production across sectors, identical tastes and preferences across countries, and, most importantly, perfect competition in both countries. Jones (1965) provides a model of a similar dependent economy with two goods and two factors of production and is often considered the most lucid and analytically traceable exposition of the H-O theorem³. There has been a plethora of scholarly work using the mentioned structure, which has been widely accepted in policy evaluation for small open economies. But very soon the restrictive nature of such a class of models became evident, as a result, their suggestions often became misleading. Scholars across the academic community thus found it necessary to include the role of market imperfections to depict reality as far as possible.

Bishop (1966) was among the pioneers to develop a theory of monopoly general equilibrium. Batra (1972) followed by developing a model in line with the set-up as in Jones (1965), but after relaxing the role of perfect competition in both product markets. Similarly, in the context of factor markets, McCulloch and Yellen (1979) and Markusen and Robson (1980) examine the role of monopsony in the factor market in an otherwise 2×2 general equilibrium structure. The application of such models has been to examine whether or not such modifications influence standard trade theorems. However, it is the latter two papers that are more of interest as the current paper attempts to address the issue of the existence of monopsony in an otherwise specific factor model, much in the spirit of Jones (1971). While McCulloch and Yellen (1979) and Markusen and Robson (1980) introduce monopsony in an otherwise general equilibrium setup of the economy, where both factors of production are perfectly mobile across sectors. This raises a question, whether or not monopsonistic exploitation can prevail given the perfect mobility of factors across sectors⁴.

¹The author is currently a Research Scholar as part of the doctoral program and can be reached at boseavishek555@gmail.com.

²The H-O theorem states, a country will export the commodity that uses relatively intensively its relatively abundant factors of production, and will import the good that uses relatively intensively its scarce factor of production.

³Such models came to be known as 2×2 models, representing two goods and the same number of factors of productions.

⁴Monopsonistic exploitation is reflected through a factor payment less than the value of its marginal product. This would encourage the owner of such factors of production to relocate their service to the other sector which pays according to the value of marginal product. Hence, such a form of exploitation is unlikely to prevail.

However, given that the factor of production is specific to the sector, that is, it has no use in the remaining sectors, it offers the employer (monopsonist) an edge to exercise their power to drive down factor rewards. It is at this very juncture that the current paper intervenes⁵.

The remainder of the paper is arranged as follows. Section 2 provides a brief outline of the model, whereas Section 3 discusses the specific factor model in the presence of monopsony in a general equilibrium set-up. Necessary propositions, proofs, and lemmas will be addressed in section 3, and section 4 finally concludes the paper.

2.A Brief Outline of the Model

The assumptions this paper draws are typically the same as the traditional specific factor model, the only exception being that there exists monopsony in one of the factor markets. There are two sectors of production, the unskilled sector (sector 1) and the skilled sector (sector 2), with the outputs in these sectors denoted respectively by X_1 and X_2 . Capital (K) as a factor of production is perfectly mobile between the two sectors. Additionally, sector 1 uses unskilled labour (L), whereas sector 2 uses skilled labour (S), both of which are sector-specific. There exists monopsony in the market for skilled labour, whereas the other two factor markets are perfectly competitive⁶. The assumption of full employment is applicable only for the market for unskilled workers and capital⁷. Both sectors exhibit constant returns to scale and are price-takers in the world market.

3.The Specific Factor Model Revisited

3.1. The Model

The section begins with its departure from the existing body of literature, especially McCulloch and Yellen (1979) and Markusen and Robson (1980), by assuming the necessity of a specific factor economy for monopsony to exist in an otherwise general equilibrium setup. This is evident in what follows,

Lemma 1: In an economy with “n” sectors and “m” factors of production, provided that $(m-n)>0$, and “ m_j ” represents the factors subject to monopsony such that $\max\{m_j\}=n \forall j=\{1, \dots, m\}$ ⁸.

The above lemma can be intuitively explained as follows. For an economy to represent the standard Ricardo-Viner type specific factor model, factors must outnumber sectors. The maximum possible factors subject to monopsonistic exploitation can never exceed the number of final goods-producing sectors. These factors are sector-specific in the model. Putting it otherwise, the maximum possible number of specific factors must not exceed the number of sectors. Provided these employers of such factors have an edge to bargain down the factor payments, as the owners of such factors cannot employ their services in other sectors, given their nature. Following from the above assumptions, the production functions in both sectors are:

$$X_1 = L_1 f(k_1) \quad (1)$$

$$X_2 = S_2 f(k_2) \quad (2)$$

where $\forall i=\{1,2\}$, k_i is the mobile to specific factor ratio in the i-th sector and L_i is the input of unskilled labour, while S_i is the input of skilled labour, each used by their respective sectors only⁹. The marginal product of capital in the i-th sector is given as f_i' and the marginal product for the specific factors are $(f_i - k_i f_i')$.

⁵The current paper uses what is otherwise known as a 2×3 production structure with two sectors and three factors of production, one of which is perfectly mobile across both sectors and the remaining two are specific to the respective sector. This is similar to the Ricardo-Viner model of international trade, the analytically traceable general equilibrium version of which can be attributed to Jones (1971).

⁶The capital market due to the feature of perfect mobility across sectors cannot be monopsonised. For monopsony to exist in a multi-sector setup the respective factor must be sector specific.

⁷Monopsony as a form of factor market imperfection acts as a detriment to full employment in the market for skilled workers.

⁸Where the remainder $m-n$ factors are subject to mobility.

⁹ $f(k_i)$ represents the respective production function in terms of output per-unit labour (which is sector specific).

The model assumes Inada conditions. That is to say,
 $f_i(k_i) > 0$, $f'_i(k_i) > 0$, $f''_i(k_i) < 0$, $f'_i(0) = \infty$, and $f'_i(\infty) = 0$.

Under competitive conditions in all markets, the reward of each factor equals its marginal value of product and is the same in both sectors. However, in the presence of monopsony in the market for skilled workers, the marginal value of the product exceeds the reward to the factor¹⁰. Let w stand for the wage rate to unskilled workers, w_s to that of skilled workers, r for the rental of capital and p_i for the price of the i -th output.

The factor rewards can be written as

$$r = p_1 f'_1 = p_2 f'_2 \quad (3)$$

$$w = p_1 (f_1 - k_1 f'_1) \quad (4)$$

$$w_s \left[1 + \frac{1}{\varepsilon_s} \right] = p_2 (f_2 - k_2 f'_2) \quad (5)$$

$$\omega_i = \left(\frac{f_i}{f'_i} \right) - k_i \quad (6)$$

where, ω_i denote the relative factor prices. Under perfect competition, the reward to each factor equals the value of the marginal product as represented using equations (3) and (4). However, since the market for skilled workers is subject to monopsony, which allows the employer to push down wages, as a result of which the return to skilled workers falls short of the value of the marginal product (VMP_s)¹¹. This allows TR to exceed TC, and the difference equals the excess profit of the monopsonist. Thus, the per-unit profit for the monopsonist is given by,

$$a_{\pi 2} = \frac{\pi_2}{X_2} = p_2 - w_s a_{s2} - r a_{k2} \quad (7)$$

Sector 1 is competitive, and the zero-profit condition for which is given as,

$$w a_{L1} + r a_{K1} = p_1 \quad (8)$$

Full employment of capital (K) and unskilled (L) workers are ensured from the following,

$$\sum_{i=1}^2 a_{Ki} X_i = \underline{K} \quad (9)$$

$$a_{L1} X_1 = \underline{L} \quad (10)$$

The presence of monopsony as a form of factor market imperfection leads to underemployment. Total number of skilled workers without employment (U_s) in the model is given as,

$$U_s = S(w_s) - a_{s2} X_2 \quad (11)$$

Therefore the general equilibrium structure consists of eight equations ((3)-(5) and (7)-(11)) and the same number of unknowns namely, $w_s, w, r, a_{\pi 2}, X_1, X_2$ and $U_s \forall i = \{1, 2\}$.¹² By solving equations (3) and (4) w and r can be determined independently. From equation (5) w_s is obtained in terms of ε_s and $a_{\pi 2}$ is solved from equation (7). Similarly, equation (8) helps determine by $a_{\pi 1}$ which, however, by the virtue of perfect competition, is valued at zero. Equation (10) solves for X_1 and on substituting in (9) determine X_2 . Finally, the total number of unemployed skilled workers is determined from equation (11).

¹⁰This is by virtue of the fact that the Marginal Expenditure MES incurred to employ an additional unit of skilled workers exceeds the Average Expenditure AES. We have, $MES = AES + 1/S$ where, $MES > AES$ as long as the elasticity of labour supply (S) is strictly positive.

¹¹Which can be interpreted as, $w_s = p_2(f_2 - k_2 f'_2) / [1 + 1/S] - 1 = VMPS [1 + 1/S] - 1$ i.e., $w_s < VMPS$.

¹²Considering $a_{ij} = a_{ij}(w_i)$ representing the unit factor demand where $j = \{L, S, K\}$ can be determined from equation (6). It is to be noted that the unit factor demands are decreasing in their own relative price.

Global competitiveness in production and the existence of profit

As argued above sector 1 experiences perfect competition in both product and factor markets, which is sufficient to ensure zero economic profit. However, this is not valid if either of these two markets experiences some degree of imperfections. This is what the paper will try to demonstrate, given sector 2 observes imperfections in the form of a monopsony in the market for skilled workers, which here is the specific factor.

Proposition 1 *Despite global competitiveness in both product markets, a well-defined elasticity of supply for skilled labour ensures positive economic profit to the monopsonised sector i.e., $\forall \varepsilon_S < \infty \exists a_{\pi 2} > 0$.*

Proof: Following equation (7),

$$a_{\pi 2} = \frac{p_2 X_2 - w_S S_2 - r K_2}{X_2} \quad (7.1)$$

Using (3) and (5),

$$a_{\pi 2} = \frac{p_2 \left(X_2 - K_2 MP_K^2 - S_2 MP_S^2 \left[1 + \frac{1}{\varepsilon_S} \right]^{-1} \right)}{X_2}$$

Using Euler's theorem, the simplified expression is as follows,

$$a_{\pi 2} = \frac{p_2 S_2 MP_S^2}{X_2} \left[1 - \left(1 + \frac{1}{\varepsilon_S} \right)^{-1} \right]$$

The final expression boils down to,

$$a_{\pi 2} = \frac{w_S a_{K2}}{\varepsilon_S} > 0 \quad (12)$$

The above proposition is sufficient to argue that in the presence of competition in both product markets, the role of factor market imperfection by virtue of factor immobility can ensure positive profits for the monopsonist. In order to facilitate further exposition, the paper now states the following lemma.

Lemma 2: Irrespective of any factor-intensity condition, $a_{\pi 2}$ is a monotonic decreasing function of ε_S , $\forall \varepsilon_S \geq 0$; i.e., $a_{\pi 2}(\varepsilon_S) = 0^{13}$.

Proof: The proof can be easily verified using the L'Hospital's Rule.

From the above lemma, it is evident that in the most extreme case where the supply of skilled workers is perfectly elastic, the marginal expenditure of employing an extra unit of skilled worker exactly matches its average expenditure¹⁴. This, in turn, ensures simultaneous clearing of all factor markets. The following proposition is thus immediate,

Proposition 2: *Following Lemma 1, it can be argued that the Specific Factor Model as in Jones (1971) is a limiting case of the monopsonistic version of the specific factor general equilibrium structure.*

Given that each factor of production is now rewarded based on the value of its marginal product ensures the simultaneous clearing of all factor markets. This, coupled with the fact that both product markets are globally competitive, rules out the possibility of making any positive profit by either sector. The system, therefore, becomes a collective of two zero-profit conditions, one for each sector, and three endowment conditions in which capital is perfectly mobile across sectors. This is exactly identical to the Jones (1971) production structure for a small open economy.

¹³To determine the value of $a_{\pi 2}$ it is important that S be pre-determined from the household's choice. However, this paper only presents a production side model.

¹⁴As a result, there is now full employment of skilled workers given monopsonistic exploitation no longer prevails

Conclusion

The paper explores the popular specific factor model, a workhorse in international trade theory, by introducing monopsony in one of the factor markets. Departing from existing scholarly works, the author finds reason to believe that monopsony is nonexistent in a multi-sector model with perfect factor mobility across all sectors. The paper is an attempt to fill this gap, the outcome of which shows that such factor market imperfections can, in turn, lead to positive economic profits despite global competitiveness in the product market. Finally, the paper ends by showing that the popular specific factor model can be obtained as a limiting case of the present model. The present paper is part of an ongoing exercise attempting to examine the relevance of standard trade theorems in the specific factor model under the incidence of monopsonistic exploitation.

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GREEN INFRASTRUCTURE: A SHORT REVIEW

Amantika Shaw¹⁵

*Postgraduate and Research Department of Economics,
St. Xavier's College (Autonomous), Kolkata.*

Abstract

As urbanization is increasing, the adverse effects of Climate Change (CC) are now more prominently felt. Thus, the need to combat CC has become a priority for sustaining lives on earth, especially for the susceptible. Many developed countries do so by adapting to Green Infrastructure (GI). Implementing these semi-natural solutions into practice requires an understanding of the costs and benefits involved. Consequently, its valuation comes into play. Integration of this urban GI in the real world requires tailor-made policy and guidelines and an initiative for community participation. Notwithstanding the technical barriers involved, the implementation of nature-based solutions involves a bi-directional exchange, while humans integrate these solutions into the natural environment, the environment itself must possess the adaptive capacity to accept and integrate these changes.

Keywords: Climate Change Adaptation, Green Infrastructure, Urban Planning

JEL Classification

Q51, Q54, R11

1. Introduction

India is at the high risk of climatic emergency and ecosystem collapse (ranks 7th in the world) (Economic Survey 2024-25). Global climate change is posing serious threats to human life on earth. Risks caused by climate change related factors include biodiversity loss, rise in global temperature, precipitation, cyclones, thunderstorms, landslides, coastal flooding, sea level rise, forest fires, drought, heatwaves, glacial melting, avalanches, bacterial and viral pathogens. These not only cause financial damage both to the public and government but also puts public health and safety at risk and also impacts our agricultural productivity. (Gao et al., 2015; IPCC, 2014)

India's GDP grew by 6.5% in FY 2024-25, that is the fourth highest after the United States, China and Germany (PIB, 2025). The economic survey states 'estimates of India's loss due to extreme weather events are about \$9-10 billion annually and 80% of these losses remain uninsured. The 2014 floods in Kashmir cost more than \$15 billion and the cyclone Hudhud in the same year cost \$11 billion.'

Increasing urbanization has put a lot of pressure on land use transitions causing cities to become dense often at the expense of green areas which results in changing weather and climatic patterns (Oijstaeijen et al., 2020). India's urban areas saw a significant decline (average decrease of 15% in blue cover) in Blue-Green Infrastructure because of increase in built-up areas between 2000-2015 (Goswami et al., 2023). Densely built urban structures are now more common and sealed or hard surfaces lead to storm-water run-off.

Bengaluru is the leading Indian city to experience a 54.3% decline in blue-green cover in the past four decades, leading to a 925% increase in its built-up area. (Ramachandra et al., 2017) Nevertheless, administrators have recognized the needs and have started taking action. For example, to restore or increase green cover implementation of government initiatives like the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) scheme (Ministry of Housing & Urban Affairs, 2022), roadside vegetation or plantation along the median of the roads etc. These are often perceived as landscape aesthetics (Norton et al., 2015), according to Benedict and McMahon (2006), GI is a necessity for our survival, not a luxury. Protecting and restoring natural ecosystems is essential and not an amenity.

¹⁵The author is currently a Research Scholar as part of the doctoral program.

Therefore, rising population has given birth to rapid urbanization, propelled by factors such as demographic shifts, rural-urban migration, due to the economic and social opportunities available in urban areas etc. which in turn leads to loss of green cover, since land is limited and people find its only rescue is to cut down trees for residential or commercial purposes (S'anchez and Govindarajulu, 2023) which in turn results in adverse climatic impacts and the potential solution for the same being adaptation of Green Infrastructure (henceforth, GI) which is mainly studied in the context of urban economy.

For achieving environmental efficiency, which is a growing topic in literature, GI should be used judiciously. The ultimate objective is to create resilient ecosystem services that incorporate GI. GI investments are to be done in such a way that it maximizes co-benefits while minimizing costs, thus, a cost-effective strategy. Few literatures also state it as 'minimizing public bads and indirectly providing public goods'. (Ying et al., 2022)

(ISFR, 2023) India's total green space is 25.17% of the nation's total land area amongst which 21.76% is forest cover and 3.41% tree cover. In developing economies, urbanization is a priori (indicator of economic growth), which is attained at the cost of the environment. But economic development and environmental conservation are not mutually exclusive and must be achieved concurrently which will help achieve a more sustainable and inclusive future. The demand for ecosystem services is the highest, while its supply is negligible (Tian et al., 2025).

2. Introduction to Green Infrastructure

Green infrastructure refers to the use of natural and semi-natural resources or landscapes such as plants, trees, green wall, soil etc. to combat environmental challenges (like climate change, urban heat island effect, flooding, drought, forest fires) simultaneously enhances ecosystem services (like contributes to biodiversity) and provides recreational facilities (Naumann et al. 2011). It involves designing and implementing infrastructure that mimics nature to achieve specific environmental benefits.

In literature, there have been different definitions of GI which boils down to the same point that it is the infrastructure that comprises multifunctional green and open spaces, for example, forests, vertical greening systems, wetlands, green roofs, parks, domestic and community gardens etc. (Demuzere et al., 2014) which contributes to ecosystem resilience, that is, there exists a "harmonious coexistence between human and nature". (Benedict & McMahon, 2002)

Whilst a much newer and nature-friendly concept coined around, 2008 (Lamond & Everett, 2019) is Blue-Green Infrastructure (BGI), which integrates both blue elements like seas, rivers, lakes, wetlands, and other water utilities along with our previously stated green elements (Mankikar and Driver, 2021). This comprehensive approach helps particularly in tackling urban flooding.

Though GI may not always give us optimal results (Church, 2015). Sometimes it is to be combined with our traditional 'grey infrastructure'. For example, in the case of stormwater management when gutters, drains, pipes and retention basins (grey) are used together with permeable pavement, rain gardens, bioswales, vegetative swales, rainwater harvesting, infiltration trenches etc. better shield the environment against urban flooding. (United States Environmental Protection Agency (US EPA), 2024)

Types of Green Infrastructure (not exhaustively) comprises of public parks and community and domestic gardens, greenways, street verges, open space pockets in residential streets, urban trees and forests, sports and other recreational facilities, permeable pavements, private and semi-private gardens, green roofs and walls, squares and plazas, natural green space, utility areas, agricultural and other productive land (Pitman et al., 2015).

The concept of GI date back to 1995 where the first paper on GI was published. Till the year 2008, not more than 10 papers were published while the trend took an upsurge between 2009-2014, where the numbers exceeded 100 in a short span of time. Post 2014, there has been a steep rise in the yearly publication on GI, with the figures sky-rocketing to 594 in 2019. Thus, depicting it is a topic worth to be discussed in the current era of 'climatic emergency'. (Ying et al., 2022)

European and American nations are the pioneers in the field of GI. With the US, China and UK together account for more than 50% of the publication in GI whereas the developing countries, specifically the Asian economies lack much behind in this context. The major fields of GI studied are in environmental sciences (over 50% studies) followed by engineering (stormwater management) and agriculture, ecology, geological geography, water resources, botany, architecture. (Ying et al., 2022)

The Indian government first coined the term GI in their 4th Five Year Plan (FYP) (1964-69) to conserve the environment but not many initiatives were undertaken. It was in the year 1980 when the Department of Environment was established and in 2014 it was re-named as the Ministry of Environment, Forest and Climate Change; this was specifically done to address climate change. (Prakash and Aggarwal, 2022)

Some of the major governmental GI initiatives includes (Department of Science and Technology) National Action Plan on Climate Change (NAPCC, 2008) outlining 8 National Missions on climate change, National Mission for a Green India (GIM), the Smart Cities Mission, Sovereign Green Bonds, Green City, Clean City- a state govt initiative of West Bengal. Despite all the initiatives, the implementation of GI policies remains bleak in Indian society, the reasons for which will be discussed in the later section of the paper. (Prakash and Aggarwal, 2022)

3. Literature Review

Vandermeulen et al., (2011) in its paper find out the economic valuation of GI investments. The paper identifies the benefits as use value and non-use value (existence value, legacy value and altruistic value) and costs being project investment costs. By using cost-benefit analysis and multiplier analysis, the monetary values were generated. The evaluation of the investment project will aid policy makers to appraise the project and to decide on future investments.

Chennai and Kochi (2 Indian cities) have also integrated BGI in their urban planning. The project was evaluated by S'anchez and Govindarajulu (2023). The project has increased local knowledge on climate and urban flood risks, which has resulted in a greater capacity for adaptation. Two entity's roles have been identified- first, local people i.e. community participation and second government via funds, policy actions which helped Kochi become Kerala's first sponge city.

The "sponge city" concept, is a Chinese initiative, introduced in 2013 which focuses on using natural and engineered systems, designed to equip urban localities to tackle floods and harvest rainwater efficiently (Liu et al., 2017). Moreover, the idea behind sponge city is to promote the renovation of drainage systems, the improved connectivity of water systems and sewage pipe networks, and other modern engineering measures to enhance the city's ability to cope with water problems.

GI has played a highly effective role (either directly or indirectly) in achieving the Sustainable Development Goals and targets. GI contributes directly to SDGs 2, 3, 6, 10, 11, 13, 14, and 15 and 32 SDG targets. Lin et al., (2025) employed the Data Envelopment Analysis method integrated with Machine Learning algorithms (DEA-ML model) for assessing environmental efficiency. The benefits from GI were clubbed into four categories- Provisioning, Regulating, Supporting and Cultural.

A study undertaken in Nigeria (a developing country) underscores the limitations faced while adopting GI (Adegun, 2021). The research highlights that investments should focus on access to resources and rights that counteract poverty and promote community cohesion and stability. Considering that GI development might be technically challenging and capital intensive, the master plan could be implemented with support from the private sector through public-private partnerships.

Derkzen et al., (2017) emphasized on two major climatic impacts i.e. heat and flooding and performed a case-study in the Netherlands using WTP approach. The method revealed preferences for particular adaptation designs and detected why policy for climate adaptation may be hampered. Analysis showed that individual preferences were guided mostly by visual attractiveness and usefulness or that infrastructures are currently lacking in their neighborhood and not necessarily guided by climatic information

Matthews et al., (2015) identified path dependence as a major political-institutional barrier in adopting GI techniques. Other reasons involving planning regimes, governance systems and resident's attitudes and perceptions may combine to hinder the deployment of green infrastructure. This leads to a slow adaptation process and sometimes solutions may be expensive and also affect the rights of private property owners.

US EPA (2014) conducted a case study in the city of Lancaster and estimated the monetized costs and benefits of GI projects. The traditional grey infrastructure costs over \$250 million while implementing a 25-year plan which includes permeable pavement, green roofs, bioretention and infiltration, tree planting and rainwater harvesting has reduced costs of energy and water and other non-monetized costs include increased property values, habitat improvement among others.

Groffman et al., (2023) performed a case study in New York City and estimated \$1.5 billion could be saved from GI in controlling sewer overflows. Despite these advantages, the underlying problem remains that is lack of detailed design and reliability specifications as compared to engineered gray infrastructure, which hinders its adoption.

Pakzad and Osmond (2015) developed a framework assessing the sustainability of GI across four categories- Ecological indicators (air quality, carbon sequestration, water regulation, biodiversity) Health indicators (physical, mental, and social well-being), Socio-cultural indicators (recreation, education, crime reduction, sense of place), Economic indicators (property value, healthcare savings, avoided infrastructure costs).

4. Short-Comings

The literature briefly discusses the benefits of GI but still this approach is not widely recognized among the general public and its implementation into practice is at its minimal level especially in the context of developing economies. (Dhakal & Chevalier, 2017)

1. **Path dependence-** a major institutional barrier in adopting GI for climate adaption. (Matthews et al., 2015) Path dependence describes a situation where institutions' future actions are guided by past decisions, thus slow in its adaptation process with new changes i.e. adaptive expectations (Low and Astle, 2009; Matthews, 2013). An example of institutional path dependence is 'focus on traditional planning issues, rather than emerging imperatives'.
2. **Technical challenges-** Spatial planning and GIS mapping techniques though the most effective way of adapting to GI has a few challenges like difficulty in conceptualizing GI, challenges in employing, problems related to planning tools and processes (Wright, 2011).
3. **Budgetary requirements-** Employing GI is a capital-intensive process (project investment costs, project maintenance costs). Intensive valuation on a site level requires both money and time commitment and authorities often lack in resources, space, environmental education, awareness amongst the general public (Benedict and McMahon, 2006).
4. **Lack of research-** on proper species selection for trees or for home gardens as the thermal temperature reduction depends on the tree canopy, tree size etc. (Benedict and McMahon, 2006; Hostetler et al., 2011; Pataki et al., 2011a).
5. **Socio-political factors-** lack of or slow legislative actions (Young and McPherson, 2013), management issues, public involvement challenges (Netusil et al., 2014). Decision-making accounts for prevailing political sentiments, fiscal pressures, the perceptions, needs and concerns of local residents. (Davison and Kirkpatrick, 2014)
6. **Co-ordination failure-** between different government agencies operating across various institutional scales with a stake in GI decision-making (Matthews, 2015).
7. **Mortality and health issues-** Shedding of trees during storms kills people and inhalation of pollen leads to asthma. (Roy et al., 2012)
8. **The enforcement challenge-** The Indian government has undertaken few measures with regard to the protection and conservation of green spaces. The government for the very first time in its 74th Constitutional Amendment Act (1992) has led to the creation of Urban Local Bodies (ULBs) and also paved the way for a decentralized system of city planning for urban development and governance. But later on, it was realized

that despite the constitutional amendment the administrative powers were not transferred from the states to the ULBs, highlighting the fact that the urban governance remains weak in many states, which calls for prompt action. (Batra, 2009; Sharma and Tomar, 2010).

9. **Public good and free-rider problem-** Since the environment is a public good and thus the free-rider problem persists with it, governments should undertake such activity of integrating GI in our urban environment and provide it to the general public for free. Many studies in literature deployed several methods like Willingness to Pay approach (WTP), Contingent Valuation Survey etc. for its valuation of the costs and benefits involved but what is realized is this type of projects are beneficial to all and often when it comes to the general public, they don't attach proper monetary values with its payment or are uninterested in paying (free-ride) and even some people are not conscious of the effect. (Derkzen et al., 2017)
10. **Laxity in laws enforced-** Majority of the people who are susceptible to the climatic hazards often do not comply with the standards set like construction around the low-lying coastal areas. (S'anchez and Govindarajulu, 2023) The Coastal Regulation Zone (CRZ) classifies the land area from the High Tide Line (HTL) to 500 m. on the landward side along the seafront and 50 m., or the width of the creek, as a no-development zone (GoI, 2019).

5. Policy prescriptions

1. Collective action plays a key role in achieving the environmental solutions. The National Forest Policy (1988), has promoted community involvement through the Joint Forest Management Committees (JFMCs) for better forest and wildlife protection, ensuring local participation in management and conservation activities. This would create more awareness and responsibility among the people highlighting the need for implementing programmes at the micro level i.e. at the neighborhood scale.
2. The outcomes of a specific paper can't be generalized. Each study has been done with respect to a specific location and the landscape typology of each area is different, ex, scale of the area available for greening, history of site contamination, location specific effect of green spaces (Schipperijn et al., 2010). Thus, each toolkit should be tailor-made in accordance with the needs (Oijstaeijen et al., 2020).
3. Since this type of project has direct and indirect positive effects. (Broussard, Washington-Ottombre, & Miller, 2008). It is advisable for cities to create public support not only by making people aware of climate change impacts but also by providing information on the multiple benefits of GI. Understanding the different dimensions that shape preferences for GI measures can help urban planners identify more effective policy responses, thus effectively reducing impacts of climate change in cities. (Derkzen et al., 2017)
4. To exploit the potentials, all stakeholders need to collaborate to make GI development happen concurrently with ongoing urban development (Adegun et al., 2021). Acceptability increases when residents do not feel an outsider when installing a rain garden or a green roof. (Uren, Dzidic, & Bishop, 2015; Visscher et al., 2014).
5. The integration of greening into the urban landscape is a veritable strategy to mitigate associated climate impacts. Thus, it should be mainstreamed in local and national climate action policies and plans. The technical issues can be overcome through careful site selection and management.

6. Conclusion

The limitations and recommendations in adapting to urban Green Infrastructure (GI) are briefly discussed in this paper which will be relevant to policymakers and urban planners. The developed nations have made significant progress towards GI adaptation and valuation but the developing countries still lag behind since it is a much newer concept. For a successful implementation of such projects requires an in-depth understanding of the costs and benefits involved (i.e. economic valuation). Though the exact values are somewhat cumbersome to be estimated especially in case of non-use values or intangible benefits. Though few attempts have been made in India for a climate resilient and sustainable future, but for a successful implementation of GI it requires raising awareness amongst the local people to foster collective action. Moreover, there is a lack of access to data and information on such matters.

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HOUSEHOLD AIR POLLUTION AND HEALTH: AN OVERVIEW

Chinmoyee Seal¹⁶

*Postgraduate and Research Department of Economics St Xavier's College (Autonomous)
Kolkata*

Abstract

Solid fuel use is a major global health problem and an estimated 3.6 billion people, mainly women and children from low and middle-income countries (LMICs), are exposed to household air pollution from its burning. The World Health Organization (WHO) considers HAP to be the second most important risk factor for mortality and accounts for approximately 3.2 million deaths every year. This review collates available evidence on the adverse health effects and health and economic costs of household air pollution under four categories of diseases (respiratory, cardiovascular, cognitive, and maternal-child health), as well as evidence on the cost-effectiveness of clean cooking interventions and economic valuation methodologies. Recent literature is systematically reviewed, including large trials, followed by epidemiological and policy studies amongst others. Results are presented according to health domains, economic burden estimates, and effectiveness of interventions, and with a focus on implementation challenges in low- and middle-income countries.

JEL Codes

I12, I18

Keywords

household air pollution, health effects, cognitive health, clean cooking interventions, economic impact

¹⁶The author is currently a Research Scholar as part of the doctoral program.

1. Introduction

HAP is a serious public health concern globally, with close to 3 billion people depending on solid fuels for cooking and heating (Smith et al., 2014; Lee et al., 2020). Unlike ambient air pollution, HAP is less regulated, and the burden of its impact on health is extreme for some of the most at risk populations, i.e., women and children in low and middle income countries (LMICs) (Maharana et al., 2018; Johnson et al., 2011). Conventional solid fuel burning stoves generate high levels of toxic pollutants (Lee et al., 2020; Johnson et al., 2011).

This is also a matter of environmental justice, energy development, and gender equity (Sah, 2024; Maharana et al., 2018). Women, being the central food preparers, are known to have increased smoke exposure which exacerbates the health inequities in marginalized communities (India State-Level Disease Burden Initiative Air Pollution Collaborators, 2019; Maharana et al., 2018).

India is a case in point with more than 20 cities having unsafe levels of particulate matters (India State-Level Disease Burden Initiative Air Pollution Collaborators, 2019; Kumar et al., 2022). Economic burden of air pollution in India constitutes about 3% of GDP per annum in terms of health cost and productivity loss leading to a reported 1.3 billion work days lost in 2019 (Tikle et al., 2021; Kumar et al., 2022). The impact of air pollution is more prevalent for the vulnerable population of low-middle income areas (India State-Level Disease Burden Initiative Air Pollution Collaborators, 2021; Sarode & Sarode, 2022).

Despite initiatives such as the National Clean Air Programme (NCAP) in north India, air quality is bad (Sah, 2024; Government of India, 2021), bearing on widespread health problems, hospital charges, and implications for the future economy (Lee et al., 2020; Kumar et al., 2022; Tyagi, 2022). An analysis encompassing both health and economic data is immediately required for taking policy decisions (Sah, 2024; Kumar et al., 2022). This review outlines studies related to household air pollution (HAP) and health outcomes, and interventions used to mitigate exposure, focusing on respiratory, cardiovascular, and cognitive effects.

2. Health Effects Due to Household Air Pollution

2.1 Respiratory Health Outcomes

The respiratory system is the most sensitive target organ system of HAP-exposure, as evidenced by many studies, showing acute as well as chronic health effects. The RESPIRE trial from Guatemala is the most convincing experimental evidence about the health effects of HAP. This RCT showed a reduced risk ratio for childhood pneumonia using the intervention stove vs. the control stove: RR 0.79 (95% CI: 0.5, 1.3). The study had a number of strengths, including the use of masked physician assessments and measurements of personal exposure to carbon monoxide as a proxy for wood smoke exposure.

Johnson et al. (2011) carried out a household survey of 900 rural women who had never smoked in Tamil Nadu, India, and found that 2.44% exposure to biomass smoke was associated with the prevalence of chronic obstructive pulmonary disease (COPD). This prevalence was higher than the WHO's global estimate, and was associated independently with cooking with biomass fuel, cooking duration, and kitchen structure. Pulmonary function tests were done in accordance with American Thoracic Society (ATS) recommendations, providing an objective indicator rather than relying just managing based on symptoms.

Lee et al. (2020) conducted the most extensive global review, including a systematic review and meta-analysis of 476 studies from 123 countries involving over 15.5 million participants. Results showed that all respiratory diseases felt victim of a significant increase for any one of the air pollutants including COPD (RR 1.70, 95 % CI 1.47–1.97), lung cancer (RR 1.69, 1.44–1.98), acute respiratory infections in adults (RR 1.53)

and children (RR 1.39), asthma (RR 1.23, 1.11–1.36) and tuberculosis (RR 1.26, 1.08–1.48).

2.2 Cardiovascular Health Effects

Recent studies have identified significant associations between HAP and CVDs (Adekoya et al. 2022). Lee et al. (2020) found moderate evidence of a link between household air pollution and circulatory diseases, including ischaemic heart disease (RR 1.10) and cerebrovascular disease (RR 1.09). Trends in relative risks for these outcomes are small in comparison with those for respiratory disease, but even small changes in relative risk values may confer large population impacts due to pervasive distributions across populations. Cardiovascular effects may be due to the same pathways thought to be implicated in ambient air pollution, i.e., systemic inflammation, oxidative stress, and endothelial dysfunction. However, given the unique components and greater levels of pollutants from biomass combustion indoors, the pathophysiologic patterns may be different and need further investigation. Long-term exposure to domestic environments, where people spend a substantial amount of time, may be involved in chronic lipid inflammation and accelerated formation of atherosclerosis.

2.3 Maternal and child health

HAP is also a major threat to the health of women and children. Lee et al. (2020) found that there were increased risks for adverse pregnancy outcomes, comprising low birth weight (RR: 1.36) and stillbirth (RR: 1.22). These results are worrisome as pregnant women, who are often responsible for domestic cooking, are particularly exposed. Biological mechanisms may include placental inflammation, oxidative stress, and reduced fetal oxygenation secondary to carbon monoxide.

The disease burden associated with child health is significant: Children under five exposed to HAP have a 25 % greater risk of mortality (Aithal et al., 2023). However much progress had been made on child mortality from household air pollution, it remained unacceptably high, dropping from 1.6 million in 2000 to 0.78 million in 2017, clustered in various ways in the poorest parts of the world.

2.4 Cognitive Health Effects

Saha et al. (2024), who examined the link between HAP and cognitive function based on the Longitudinal Ageing in India (LASI) study, a study of 35,059 adults aged 45 years or older. The study found that those exposed to HAP had significantly lower scores for memory, orientation, arithmetic skills, and the ability to understand and follow instructions.

Dakua et al. (2022), which included 22,535 rural women aged 45 or older, and approximately 19% were exposed to HAP. Exposed women had lower raw cognitive scores compared with unexposed women, but this difference was statistically nonsignificant, $\beta = -0.72$ (95% CI -0.92, -0.51). Impaired cognition was particularly more severe in elderly women and those with a lower level of education and low socio-economic status. The underlying pathologic mechanisms could be related to neuroinflammation, oxidative stress, and cerebrovascular damage, but their exact paths are still uncertain. Micro-pollutants may cross the blood-brain barrier, inducing inflammatory cascades that lead to neurodegeneration. These results have important implications for elderly individuals in endemic areas with high levels of exposure to HAP, and may imply that HAP is a worsening factor for cognition in the susceptible population.

3. Economic Burden and Healthcare Costs

3.1 Global Disease Burden

The worldwide economic consequences of HAP are broad-reaching and very complex. In 2017, Lee et al. (2020) calculated that household air pollution accounted for 1.8 million deaths (95% CI: 1.1–2.7 million) and 60.9 million disability-adjusted life years (DALYs) (34.6–93.3 million) in the world. This burden was especially focused in low- and middle-income countries where more than 99% (99.6%) of the distribution of DALYs was collected. India, China, and Nigeria had the highest absolute burdens, and the South-East Asia region had the largest overall disease burden. From 2000 to 2017, global mortality and disease burden due to household air pollution dropped by a third, with the greatest reductions found in Europe and smaller gains in high burden regions.

3.2 Cost-Effectiveness of Interventions

Economic evaluations of the interventions for clean cooking have shown significant returns on investment, in terms of proper metrics being used. Pillarisetti et al. (2016) evaluated household energy interventions in Haryana, India, using an extended cost-effectiveness analysis.²⁴ Three intervention scenarios were compared: low-cost cement chimney stoves, improved combustion biomass stoves, and transition to liquid petroleum gas (LPG). The GDPP for government in saving a life by an LPG access over 5 years was substantially higher than any other intervention studied (USD ~825), with approximately 44,000 deaths and 1.5 million DALYs averted.

This estimation suggested that interventions save both health costs (owing to the reduction in ARI incidence) and time (time savings can be monetized using the wage rate for time saved from fuel collection). Nano-stoves also save time, since women generally are responsible for fuel gathering, and time saved can be reinvested in income-generating activities or schooling. Both the financial savings from avoided medical expenses and time savings (for care and work) are regressive, meaning that poorer families gain more from lower exposure, underscoring the potential that clean cooking programs may provide to reduce income inequality and improve health.

Moreover, the benefit: cost ratios include environmental gains, including as reduced deforestation (to lessen habitat degradation), improved HAP for household members, and possibly climate impacts from mitigated black carbon emissions. Research consistently shows high benefit-cost ratios of three or more to one, focusing on health benefits (with higher ratios if broader social and economic benefits are considered).

3.3 Estimation of the economic value of health costs from HAP

Estimating the monetary burden of disease due to HAP in rural regions is fraught with difficulties for policymakers who are trying to determine the resources required to reduce risks. HAP, predominantly originating from the incomplete combustion of solid fuels burned in inefficient stoves, is associated with morbidity and mortality from a range of diseases, including respiratory and cardiovascular disease, with significant macroeconomic costs (Shannon et al., 2019; Chattopadhyay, 2020).

Research using contingent valuation methods (CVM) has quantified the amount that individuals, individuals' willingness to pay (WTP) to mitigate the health risks posed by HAP, which may be a proxy of perceived private health benefits (Smith and Leigh, 1979). For example, in Chattopadhyay (2020), the average annual WTP was INR 665, and the share of household annual income as WTP was 1% which indicated the marginal though average sensitivity of the rural populace towards relatively lower health risks. Similarly, Shannon et al. (2019) found that rural businesses in the Indian state of Rajasthan were more likely to pay for

water treatment technologies than for air purification, possibly influenced by the increased perceived threat of digestive rather than respiratory risk in these settings. Both studies highlight that WTP is responsive to socio-economic and health status characteristics, with higher levels of perceived health risks associated with a higher value for HAP mitigation. The findings highlight the economic burden of HAP and the importance of incorporating household preferences and beliefs in the development of cost-effective and culturally appropriate interventions. In addition, cognitive biases, such as anchoring effects in CVM responses, also warn policy makers to use WTP estimates with a pinch of salt while deciding on subsidies or targeted interventions (Chattopadhyay, 2020). Ultimately, the valuation findings are critical for incorporating health cost considerations into air quality policy in ways that inform efforts that are multi-dimensional in terms of being multi-attribute, by accounting for both health and economic dimensions when targeting actionable interventions in vulnerable low-income populations.

4. Policy Actions and Clean Cooking Programs

4.1 Large-Scale Program Implementation

One of the world's largest clean cookstove programmes, the Pradhan Mantri Ujjwala Yojana (PMUY) in India, has subsidized LPG connections to millions of rural households since 2016. Intended to cover 80 million poor households living below the poverty line, PMUY is the largest initiative targeting household fuel transition. However, Gupta et al. (2020) established substantial limitations against continued clean fuel access uptake despite enhanced access.

Their study observed that while the percentage of households with at least one LPG connection increased from 32% in 2014 to 75% in 2018 in the study area, only around 27% of the households were exclusive LPG cooking users, and nearly 37% continued to be solid fuel users. "The disparity highlights the crucial difference between access and sustainable adoption: simply providing the technology does not ensure better health".

Continued use of solid fuels despite facilitating factors linked to LPG ownership are compounded by a number of complex barriers including economic factors (cost of LPG vs free biomass collection), gender dynamics and household power relations (the perceived necessity of LPG, perceptions of women's workloads and joint decision-making in cooking practices), cultural practices of traditional cooking and geographical access to LPG refills in rural areas. These findings show that access to clean fuels is by itself inadequate, with entrenched social and cultural factors preventing sustained uptake.

4.2. Efficacy and Difficulties of the Intervention

Results suggest that improved biomass stoves are unlikely to offer sufficient health benefits relative to a switch to clean fuels. Lee et al. (2020) found that enhanced biomass stoves failed to provide the expected health benefits, and instead recommended transitioning to cleaner LPG or electricity. This finding contradicts assumptions about the effectiveness of improved stoves and has serious implications for intervention planning and allocation of resources.

The suboptimal effect of improved biomass stoves is a result of various reasons: incomplete combustion still results in significant emissions, user habits might imply the parallel use of traditional and improved stoves, and malfunctioning improved stoves degrade from their performance prior to intervention. Even the best-case biomass burning also results in toxicant emissions largely in excess of clean fuels.

There needs to be a coordinated response that merges technical solutions with those of behavioural change, financial fraternity, and governance. Ensuring continued use of purely clean cooking technologies requires ongoing fuel subsidies, effective rural logistics in the delivery of fuels, and the more active participation of adult male household members in cooking-related decisions. In addition, interventions may develop success

through the use of community-based approaches that influence social norms and promote peer support for behaviour change.

5. Methodological Approaches and Assessment

5.1 Exposure Assessment Methods

The precise quantification of HAP exposure creates some special methodological problems that have changed dramatically in recent years. Smith et al. (2014) constructed high-resolution global models of solid fuel use and personal exposure based on household readings in India, to estimate population-level PM_{2.5} exposure to cooking with solid fuels. This novel work combined evidence from a variety of combustion sources (household air pollution, ambient air pollution, and tobacco smoke) with evidence from epidemiological studies to estimate integrated exposure/response relationships for a series of high-burden diseases.

Historically, more outdated exposure assessment techniques by questionnaire have focused on fuel type and pattern of use and involved substantial misclassification error. Recent health studies have used sophisticated techniques, including measuring indoor pollutants, using personal monitoring using personal monitors, and using biological markers to validate exposure estimates. For example, Verma (2020) estimated indoor concentrations of organic carbon (240 $\mu\text{g}/\text{m}^3$) and elemental carbon (118 $\mu\text{g}/\text{m}^3$) produced by the biomass burning on traditional stoves in an Indo-Gangetic Himalayan village. The study also confirmed that the mixed fuel use (biomass+LPG) had substantially reduced the concentrations of aerosols and the levels of OC and EC were decreased by 53% and 41%, respectively and their values decreased drastically with exclusive use of LPG. These estimates offer crucial dose-response indicators for health effects modelling.

5.2 Advanced Modelling Approaches

Koivisto et al. (2019), a comprehensive framework for estimating the indoor aerosol exposure was developed which highlighted the importance of source-specific emission libraries and advanced exposure modelling. Since human beings are indoors 80% of the time and indoor air quality has a significant impact on the amount of exposure received and ultimately impacts overall health, it is alarming that current environmental regulations are focused on outdoor pollution while indoor sources of pollution remain largely undefined.

They recommend standardized emissions characterization protocols and stringent mass balance models for indoor aerosol exposure. Commonly used models are the single-zone "well-mixed" models and the two-zone Near-Field/Far-Field models, with the latter being particularly well-suited for near-source exposure situations, such as in cooking, where the concentration gradients are high.

Recent methodological advances include both real-time sensing and exposure-relevant machine learning models, which have recently moved beyond solely considering spatial resolution towards spatiotemporal models and taking into account temporal activity patterns and microenvironment variation for exposure predictions. Although these advances hold the potential for more accurate exposure assessment and stronger evidence in support of causal relationships in health impact studies, continued challenges exist in the harmonization and validation of exposure estimates across different environments.

6. Air Quality in Healthcare Facilities

6.1 Healthcare Environment Challenges

Recently, concerns about HAP have escalated from the domestic household to the hospital setting, which is the specialized area for those susceptible to infections. We found that hospitals were the study location most frequently covered in the literature and that studies were investigating a myriad of physicochemical pollutants such as CO₂, PM_{2.5}, sum of volatile organic compounds (VOCs), formaldehyde, and NO₂ (Loureiro et al. 2025)

Hospitals represent a special environment where IAQ is a challenge because of the high population density, the presence of vulnerable individuals (such as immunocompromised patients), as well as the intense use of chemical products for cleaning and disinfection. HAIs, added to poor indoor air quality in health care environments, have been implicated in respiratory symptoms, higher risk of infection transmission, fatigue, and cognitive effects, both in patients and healthcare personnel. Still, these results are worrisome in the sense that vulnerable people who are already sick may be more affected by air pollution than are healthier people.

6.2 Methodological Developments

By contrast, most of the research works to assess the indoor air quality in hospital environments have involved experimental approaches using portable sensors supported by a few low-cost monitoring devices. These findings highlight the importance of integrated approaches, focusing on continuous monitoring of chemical and physical parameters, transaction investment in infrastructure upgrades, and modification of operating procedures that contribute to IAQ improvement.

Novel approaches have been developed in health-related settings (including a connection between air quality monitoring and health information systems, setting up patient-based exposure assessment strategies, and application of health interventions in real clinical practice). These methods are useful in the assessment of indoor air quality in such institutional settings, and they also contribute to the general knowledge of exposure assessment in confinement.

7. Emerging Evidence and Future Directions

7.1 Long-term Health Effects

These early indications of cognitive health outcomes represent a considerable step in understanding the spectrum of health impacts related to HAP. Studies by Saha et al. (2024) and Dakua et al. (2022) speculate that the acceleration of cognitive decline that may result from HAP has implications for particularly vulnerable subgroups such as women, older adults, and those of lower social class. These estimates suggest that the burden of disease due to HAP is potentially much larger than previously recognized, including respiratory and cardiovascular outcomes.

The implications of evidence of cognitive health are fundamental to health care policy, economic productivity, and intergenerational health. If HAP is associated with accelerated cognitive deterioration and dementia risk, and given the costs of dementia care, long-term estimates of the economic burden might be dominated by dementia, rather than respiratory and cardiovascular disease. Furthermore, cognitive impairment in children may interfere with academic performance and potential lifetime earnings, which would have wider socio-economic implications.

Future studies should focus on longitudinal investigations of exposure in relation to cognitive decline to determine how long it took before associations began to appear, study opportunities for cognitive effects, and the potential for reversibility if exposure is reduced. Additionally, studies of gene-environment interactions might provide insights into more vulnerable subsets of the population and could aid in the development of targeted interventions.

7.2 Research Gaps and Methodology Needs

There are still important knowledge gaps in understanding the full extent of HAP effects and the effectiveness of its interventions. The frequent use of questionnaire-based exposure assessments in epidemiological studies has introduced substantial misclassification bias that may have served to underestimate health effects. Further

opportunities for enhancing these estimates are provided through advanced exposure assessment methodologies and measures, including personal monitoring, improved modelling approaches, and biomarker validation for improved causal inference.

Cohort studies are very useful in determining temporal relations between exposure and health effects, especially for chronic endpoints, such as neurotoxicity and carcinogenicity. The majority of the available literature is from cross-sectional studies that are unable to reach definite causal conclusions; however, the accumulation of evidence from studies of different designs supports the causality.

Furthermore, studies are needed to further understand the effects of behavioural and policy-level interventions in order to develop evidence-based program design. A deeper understanding of drivers of sustained adoption of clean cooking practice, the influence of social networks and community dynamics, as well as different financial incentive options, will be important in developing more effective intervention designs and resource utilization.

8. Conclusion

In this comprehensive review, there is a wide range of health effects of HAP caused by household energy use that extend to respiratory, cardiovascular, cognitive, and maternal-child health. While the evidence for interventions in this area is growing quickly, evidence suggests a large burden of disease and opportunity for impact with carefully designed clean cooking programs and policies.

HAP's health effects have been extensively studied and are primarily related to respiratory morbidity, including chronic obstructive pulmonary disease, lung cancer, and acute respiratory infections. Emerging evidence of cardiovascular and cognitive morbidity indicates that the overall impact may be even more pronounced than previously believed, particularly with respect to aging populations in regions of high exposure. That the toll falls so heavily on women and children illustrates the environmental justice implications of this problem, and there is a need for a just response.

Economic evaluations invariably show favourable benefit-cost ratios for clean cooking interventions, particularly the switch to clean fuel, such as LPG, across different analytic frameworks. But obtaining consistent exclusive use of clean fuels requires influencing a variety of social, economic, and cultural as well as behavioural determinants, as well as access. The continued strong use of solid fuels after better alternatives are introduced highlights the need for holistic intervention strategies that combine technical solutions with the promotion of alternative behaviour through continued subsidy and improved supply chains.

Methodological developments in exposure assessment and estimation of health impact have greatly expanded the evidence base over the last few years, but there are still some gaps. Standardized emission profiling, more accurate measurement of personal exposure, and better longitudinal study designs are all important research themes for targeting in the future. In addition, expanding the investigation to include healthcare and other institutional environments offers unique potential to study the impact of HAP in varied populations and settings.

The priorities in the future research agenda for tackling HAP should concentrate on sustainable behavioural changes in clean cooking adoption, solidifying the current evidence on cognitive health effects in longitudinal studies, extending research in healthcare and institutional settings, and improving exposure assessment techniques with creativity using innovative technologies, as well as greater standardization. The inclusion of HAP within a wider sustainable development agenda, including the UN Sustainable Development Goals, can provide substantial opportunities for international cooperation and investment.

The evidence reviewed in this review provides a strong basis for immediate policy action, and a compelling argument for continued efforts to avert one of the world's foremost epidemics of preventable causes of disease and premature death. This goal can only be achieved through comprehensive efforts involving health, energy, environment, and economic sectors that deliver clean and safe cooking solutions to the billions who are currently being exposed to unhealthy levels of HAP in a way that ensures sustainability of the solutions. Potential health benefits, economic benefits of the interventions, and co-benefits in the environment have made HAP control a high-priority issue in global health and sustainable development projects.

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Macroeconomic Duality: An AD-AS Reconsideration with Surplus Labour- A Theoretical Note

Shouryo Basu¹⁷

Postgraduate and Research Department of Economics, St Xavier's College (Autonomous) Kolkata

Abstract

This short theoretical note tries to develop a small model of aggregate demand and supply in a developing economy with surplus labour. The migration of workers occurs between informal and formal sectors. An aggregate demand and an aggregate supply curve is drawn connecting relative prices of formal sector and the economy's aggregate output. We arrive at equilibrium values of relative formal price and aggregate output.

JEL Classification: E1, J2300, O110

Keywords: Aggregate Demand, Aggregate Supply, Duality, Labour demand.

1. Introduction

Surplus labour in rural sectors is an integral feature of less developed countries (LDCs). The fact that urban unemployed can squeeze into rural sectors makes it key to understand the macroeconomics of developing countries. Originating with Lewis (1954)¹, existence of duality in LDCs has been analysed extensively. This paper makes a very modest attempt at developing an AD-AS (aggregate demand and aggregate supply) framework incorporating surplus labour. The paper is divided into a brief review of literature, model and a conclusion.

2. Literature Review

Rakshit (1989) have analysed developing economies using macroeconomic models but without explicit mention of rural-urban migration (Harris and Todaro, 1970). A Harris-Todaro type migration finds place in Gang and Gangopadhyay (1985) while incorporating an aggregate demand curve into the dual economy structure of Basu (1980). However, Marjit et al. (2023) analyses aggregate supply for both informal and formal sectors both producing final goods but with a given aggregate demand. This paper takes an attempt to find equilibrium values of output and relative prices for the economy comprising a formal and informal sector as in Marjit et al. (2023). In doing so we construct a theoretical model having both demand and supply sides.

¹⁷ The author is currently a Research Scholar as part of the doctoral program.

3. Model

The economy consists of two sectors namely a formal (F) sector and an informal (I) sector. F employs each labour paying a fixed wage $\overline{W}_F$ and sector I pays a flexible wage W_I . Therefore, it is understood that unemployment exists in the formal sector. Labour force measures as n divided into L_F involved in formal work and remaining L_I works informally. Products of the informal and formal sectors are valued at P_I and P_F respectively.

An i th representative agent is considered with a CES preference $U_i = (x_{iF}^\beta + x_{iI}^\beta)^{\frac{1}{\beta}}$; $\beta \neq 0, -\infty < \beta < 1$. He/she maximises utility with respect to income consuming both formal and informal products denoted as x_{iF}^* and are x_{iI}^* respectively. The domestic aggregate demand is therefore $n(x_{iF}^* + x_{iI}^*)$, i.e. $AD = \frac{nM}{(P_F^r + P_I^r)} (P_F^{r-1} + P_I^{r-1})$ ----- (1)ⁱⁱ.

It should be noted that $M_i = P(L_F)\overline{W}_F + (1 - P(L_F))W_I$ is i th agent's income where $P(L_F)$ is probability of formal employment. Defining $P(L_F) = \frac{L_F}{n-L_I}$ ----- (2) following Basu (2012)ⁱⁱⁱ where L_F is labour demand in formal sector and $(n - L_I)$ are those prospective workers waiting to get placed formally. Now migration between formal and informal sectors is defined by equality between real informal wage and expected real formal wage i.e.

$w_I = \overline{W}_F \cdot \frac{L_F}{n-L_I}$ ----- (3) and $\overline{W}_F - w_I > 0$) (see Gang and Gangopadhyay, 1985). It should be noted that L_I is determined from (3).

Taking capital stock as given, formal and informal outputs are $Y_F = Y_F(L_F)$ and $Y_I = Y_I(L_I)$; $Y_j' > 0$, $Y_j'' < 0$ for $j = I, F$. Aggregate supply in the economy in terms of P_F is

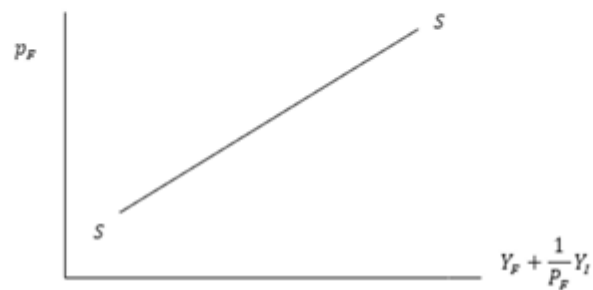
$$AS = Y_F \left(\frac{\overline{W}_F}{P_F} \right) + \frac{1}{P_F} Y_I \left(n - \frac{\overline{W}_F^2}{W_I^2} \cdot \frac{1}{P_F^2} \right) \text{ ----- (4)^{iv}}$$

$$\text{And } AD = \frac{nM}{(P_F^r + P_I^r)} (P_F^{r-1} + 1) \text{ from (1)}$$

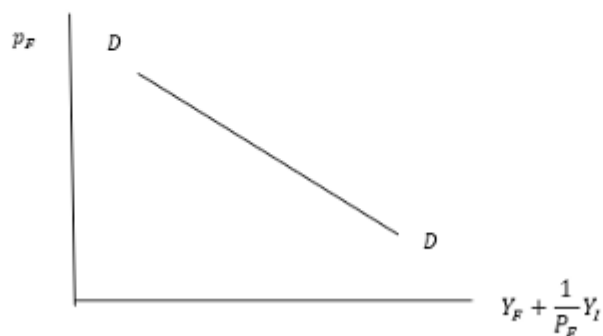
$$\Rightarrow AD = \frac{nM}{(p_F^r + 1)} (1 + p_F^{r-1}) \text{ ----- (5)}$$

In (1), a rise in p_F causes marginal productivity to fall in sector F. This means employment rises in the formal sector, as a result formal output increases. It should be noted however that informal

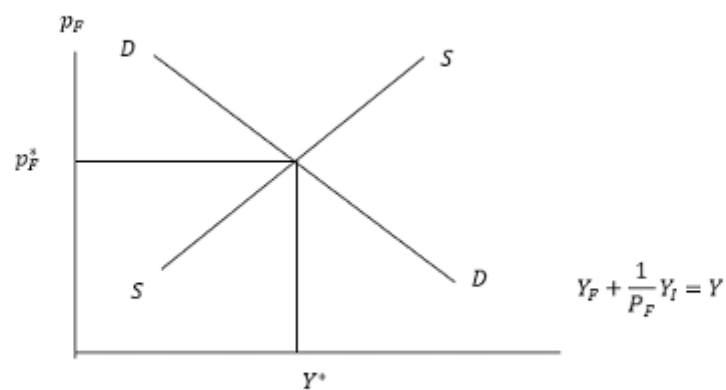
output may fall. Therefore, we have an upward sloping aggregate supply curve shown below if and only if increase in formal output dominates fall in informal output.



In (2), a rise in p_F reduces demand for output of formal sector. Therefore, a downward sloping aggregate demand is obtained as shown below.



From intersection of (4) and (5), we get the following equilibrium



Both informal and formal markets clear at this equilibrium where DD and SS intersect reaching values of Y and p_F .

4. Conclusion

This article shows how we can use a simple yet important structure of the Harris-Todaro model of rural-urban migration, to reach an AD-AS equilibrium in presence of surplus labour. The future plan of action, model can be extended to an open economy, where both formal and informal sectors engage in trade. We also intend to see the effects of an optimal subsidy as in Gang and Gangopadhyay (1985) in our model.

Note: This is an ongoing work of my Ph. D thesis. Therefore, only this much is presented. Comments and suggestions are encouraged. This is a working model on the path of further development and hence a small snippet is provided here. All mistakes in this work are my own.

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APPENDIX

1. $U_i = (x_{iF}^\beta + x_{iI}^\beta)^{\frac{1}{\beta}}$; $\beta \neq 0, -\infty < \beta < 1$. x_{iF} is the individual demand for sector F's output and x_{iI} is the same for sector I's output. Maximising utility with respect to $M_i = P(L_F)\overline{W}_{F_i} +$

$(1 - P(L_F))W_{I_i}$ i.e. individual income, following Marshallian demands are obtained as $x_{iF}^* = \frac{M}{(P_F^r + P_I^r)} P_F^{r-1}$ and $x_{iI}^* = \frac{M}{(P_F^r + P_I^r)} P_I^{r-1}$ respectively. Aggregate demand is therefore $n(x_{iF}^* + x_{iI}^*) = \frac{nM}{(P_F^r + P_I^r)} (P_F^{r-1} + P_I^{r-1}) = \frac{nM}{(p_F^r + 1)} (1 + p_F^{r-1})$ (we assume P_I to be unity, so price relative to formal output is p_F).

$x_{il}^*) = \frac{nM}{(P_F^r + P_I^r)} (P_F^{r-1} + P_I^{r-1}) = \frac{nM}{(p_F^r + 1)} (1 + p_F^{r-1})$ (we assume P_I to be unity, so price relative to formal output is p_F).

2. The aggregate supply is

$$AS = Y_F + \frac{1}{p_F} Y_I = Y_F \left(\frac{\bar{W}_F}{p_F} \right) + \frac{1}{p_F} Y_I \left(n - \frac{\bar{W}_F}{w_I} L_F \right) = Y_F \left(\frac{\bar{W}_F}{p_F} \right) + \frac{1}{p_F} Y_I \left(n - \frac{\bar{W}_F}{w_I} \cdot \bar{W}_F \right)$$

ⁱ However, origin of duality in the literature can be traced back to Boeke (1953) and Furnivall (1939).

ⁱⁱ See Appendix (1.) for AD curve derivation.

ⁱⁱⁱ Everyone does not get a job in the formal sector.

^{iv} See Appendix (2.)



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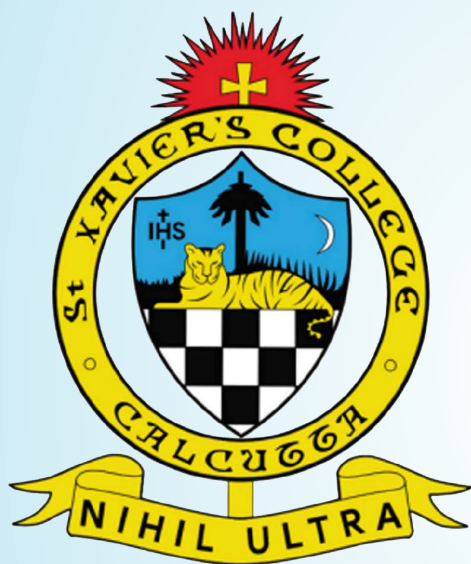
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