

ANNUAL JOURNAL

2025

Department of Economics

Lady Shri Ram College for Women

ECOLOGICAL



2025

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FACULTY NOTE

We are delighted to unveil the 2025 edition of our annual academic journal, Ecolloquial. This publication acts as a valuable platform for students to delve into and analyze current economic issues, articulate their opinions, and showcase their research.

We incredibly appreciate the hard work and dedication of all the students who have underwritten papers and articles focused on assorted domains of Economics such as public welfare, macroeconomics, green energy, political economy, behavioral economics, and more to the current edition of Ecolloquial.

We further outspread our heartfelt appreciation to the Editorial Team, whose diligent efforts and dedication ensured the timely publication of this journal and initiated activities to foster research endeavors among students. Their commitment to excellence is evident in the quality of the articles featured in this edition. Additionally, we express our gratitude to Dr. Bornali Bhandari and Ms. Mitali Nikore, for generously dedicating their valuable time to us. We trust that this journal offers an enriching experience for our readers.

Ms. Shubhi Singh
Ms. Sangeeta Butolia
Assistant Professors
Department of Economics

EDITOR'S NOTE

The Editorial Board is glad to have completed a fruitful year of impactful achievements and insightful interactions. This year's team consisted of a total of 14 members, 8 editorial associates and 6 design associates. Over the course of 10 months, the team successfully reviewed, edited and compiled Ecolloquial 2025, the annual journal of the Economics Department.

This year's issue will be the 21st volume of the journal and features 20+ entries including research papers, articles, book reviews and interviews on a plethora of topics ranging from international trade, public policy, agricultural economics, finance to behavioral economics. Apart from the compilation of the journal, the team successfully engaged in activities aimed at encouraging academic discourse in the department. Activities conducted as part of the same included reading circles where students discussed the findings and conclusions of research works and maintenance of an Editorial Board Research Repository.

The Editorial Board also conducted the annual Dr Saroj Gupta Memorial Paper Presentation Competition as part of Econvista 2025, which saw participation from colleges across the country. We would like to express our sincere gratitude to Dr Bornali Bhandari and Ms. Mitali Nikore for dedicating their valuable time towards sharing their insights and knowledge through this journal.

The Editorial Board would also like to thank our faculty advisor Ms Shubhi Singh and Ms Sangeeta Butolia for extending their support throughout the compilation of this journal. We especially appreciate all the brilliant and ambitious young researchers for contributing their valuable and impactful research work and making this journal a success. And on that note, we present to you Ecolloquial 2025!

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ANNUAL REPORT 2024-25

Dr. Shamika Ravi – Status Update on India's Real Economy

In a comprehensive and data-rich session, Dr. Shamika Ravi, Member of the Economic Advisory Council to the Prime Minister of India and Senior Fellow at the Brookings Institution., provided an in-depth analysis of India's real economy and its transformation over the past decades. She highlighted the nation's trajectory of growth with development—emphasizing sectors like food and energy security, manufacturing revival, and the social impact of improved infrastructure and public service delivery. From declining infant and maternal mortality rates to reductions in sexual assault and healthcare burden, the session illustrated how policy saturation has led to measurable outcomes. Dr. Ravi also tackled challenges in youth unemployment and the need for precision-targeted policymaking through programs like Aspirational Districts and Skill India, offering a grounded narrative of India's evolving economic landscape.



Ms. Kaumudi Sharma – Energy Infrastructure in India.

Ms. Kaumudi Sharma, Deputy Director at the Ministry of Finance, Government of India, led a deeply insightful seminar on India's evolving energy infrastructure. Drawing from her policy experience, she unpacked the complexities of balancing economic growth with sustainability in the energy sector. The discussion focused on the current state of infrastructure, challenges in renewable energy adoption, and the need for grid modernization and innovative financing. She elaborated on how strategic government interventions and policy frameworks are shaping investments and accelerating India's transition to clean energy. Students gained a nuanced perspective on how infrastructure development intersects with economic planning and how policy plays a critical role in achieving both growth and environmental goals



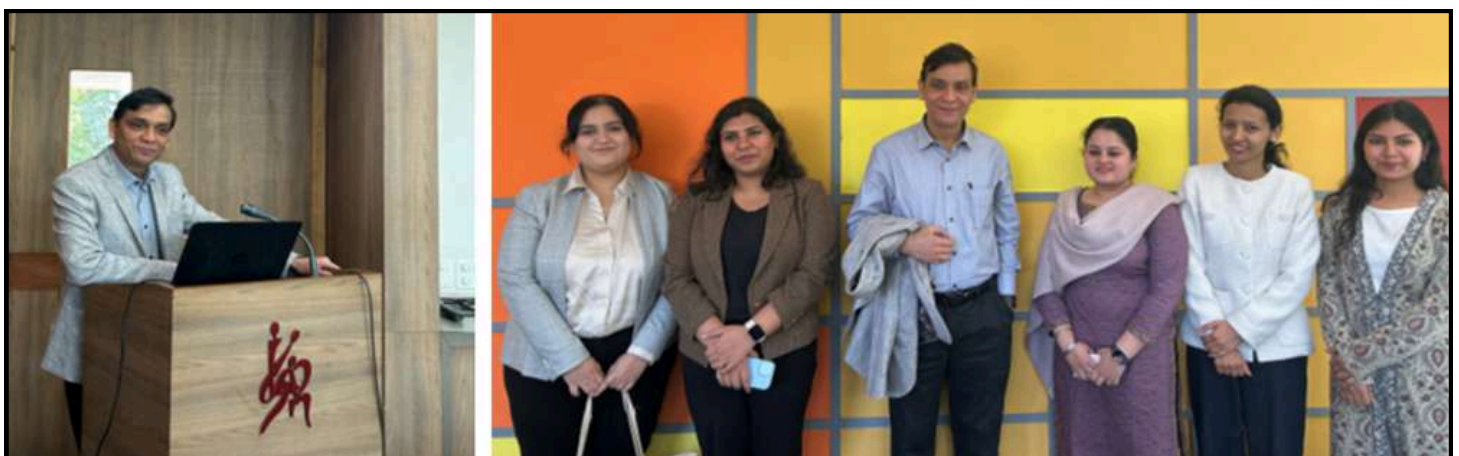
Dr. Parikshit Ghosh – Insights into Behavioral Economics

In a compelling session with Dr. Parikshit Ghosh, Professor at the Delhi School of Economics and a distinguished economist, students explored the fascinating world where psychology intersects with economics. The talk challenged the assumptions of rational choice theory by introducing cognitive biases, heuristics, and bounded rationality that often drive real-world decision-making. Dr. Ghosh emphasized how emotions and mental shortcuts influence market behavior, highlighting concepts like loss aversion, prospect theory, and time-inconsistent preferences. These ideas not only reshape traditional economic models but also play a crucial role in policy design and market regulation. His insights encouraged students to consider human behavior as central to understanding economic outcomes, moving beyond abstract numbers to the people and patterns that shape them.



Dr. Danish A. Hashim- “Ease of doing business”

Dr. Danish A. Hashim, a renowned expert in business policy and economic reforms, delivered an insightful seminar on “Unlocking Business Potential: Ease of Doing Business” on February 13th, hosted by the Economics Department of Lady Shri Ram College for Women in collaboration with IQAC. Dr. Hashim offered a deep dive into how regulatory efficiency and streamlined processes can foster a more conducive business environment in India. The seminar explored key themes such as market structure, innovation, FDI policies, taxation, and startup challenges. He also highlighted the importance of capital access, mentorship, and knowledge spillovers for entrepreneurial growth. The session was highly engaging and informative, sparking meaningful discussions.



ECONVISTA'25

KEYNOTE SESSION:

Dr. Auguste Tano Kouame- “Chasing equilibrium- India 2047 as a global economic power

Dr. Auguste Tano Kouame, Country Director of the World Bank, India, at Econvista'25 delivered a keynote session on topic “Chasing Equilibrium – India 2047 as a Global Economic Power.” Dr. Kouamé delivered a compelling analysis of India’s pathway to global economic leadership, highlighting the need for sustained reforms, green energy investment, and climate-conscious policies. He also stressed increasing female labour force participation and strengthening education, skill development, and research to leverage India’s demographic dividend. The session sparked enriching dialogue among students and faculty, underscoring the role of informed policymaking in shaping the nation’s future.



Panel Discussion

At Econvista'25, the panel discussion on “Chasing Equilibrium: India 2047 as a Global Economic Power” brought together distinguished experts who offered multifaceted insights into India’s development trajectory. Dr. Praveen Jha (JNU) emphasized agriculture as the cornerstone of inclusive growth, advocating for policy innovations and investments in education and skill development. Dr. Sitikantha Pattanaik (Chief Economist, NABARD) discussed agricultural advancements and the employment-production dilemma, stressing structural reforms and the rising importance of the services sector in employment generation. Dr. Bornali Bhandari (Professor, NCAER) highlighted the need to align economic growth with job creation, calling for strategic policy interventions and efforts to leverage India’s demographic dividend. Mr. Aurelien Kruse (Lead Country Economist, World Bank) offered a global perspective, analyzing India’s economic indicators, policy challenges, and the role of decentralization and social protection. Together, the panelists provided a holistic view of India’s path to global economic leadership, sparking rich dialogue among students and faculty alike.



RESEARCH PAPERS

THE LONDON LOOPHOLE: WHY FINANCIAL FUGITIVES FIND REFUGE IN BRITAIN'S CAPITAL

PRAMIT DE

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ABSTRACT

This paper analyses how the financial ecosystem of London creates an incentive structure that enables financial fugitives to exploit loopholes in law and regulation, thus supporting economic growth in the city. Through an analysis of weak anti-money laundering enforcement, real estate as a vehicle for illicit wealth, and the geopolitical implications of financial opacity, this study sheds light on the systemic nature of the "London Loophole." Our analysis emphasises the trade-offs between economic openness and regulatory integrity, filling an important gap in global finance discourse. The recommendations, therefore, reflect targeted reforms aimed at restoring London's reputation as a credible and trustworthy financial centre in the long term.

KEYWORDS

London loophole, Financial fugitives, Money laundering, Regulatory frameworks, Luxury real estate, Global governance

JEL CLASSIFICATION CODES

G18, H26, K22, P33, R31

INTRODUCTION

London, once the world's financial capital, has long inspired the global commercial sector to realise their fantasies and dreams. From budding entrepreneurs to well-established billionaires owning giant corporations at the city's heart, London has something in store for everybody interested in exploiting its riches. Nonetheless, it has acquired a kind of dual identity over time—as a haven for global commerce and enterprise; and as a den of financial fugitives—and sometimes, this tension between the two poles has come under considerable scrutiny. While the reputation of the city as a bastion of finance and an economic haven attracts legitimate businesses and investors, its laxity in terms of regulation, the complex nature of the legal system, and its cultural appeal have also driven it to become a home for billionaires looking to escape justice in their native shores.

This distinct feature has earned London a broad range of monikers by international media agencies, most prominent among them being "*Londongrad*" or "*the world's laundromat*," thanks to notorious activities surrounding money laundering by powerful individuals and groups forming part of the city's elite. By focusing on two such individuals, namely *Russian oligarch Roman Abramovich* and *Indian fugitive billionaire Lalit Modi*, this paper shall try to throw light on the established nexus between behemoth corporations and power-hungry individuals who have continued to exploit London's flexible and appealing financial markets perpetually and systematically.

RESEARCH AIMS AND OBJECTIVES

The primary question guiding this study is: How does London's financial and regulatory ecosystem create an economic incentive structure that enables high-net-worth financial fugitives to exploit legal and institutional loopholes while contributing to the city's financial growth? This paper discusses three core dimensions related to the subject: the use of regulatory arbitrage to finance illegal financial activities, the macroeconomic implications of the capital inflows from financial fugitives into the London markets, and the trade-off between financial openness and systemic integrity.

This research fills a critical gap in the discourse on financial globalisation and illicit capital flows by shifting focus from legal debates to the economic incentives sustaining London's role as a financial refuge. While existing studies examine money laundering and tax evasion separately, this study integrates financial economics, regulatory theory, and political economy to assess how financial fugitives both influence and exploit London's economy. By analysing the trade-offs in regulatory leniency, it highlights the unintended consequences of financial deregulation and its impact on global economic stability, offering valuable insights for policymakers, regulators, and scholars alike

THE ECONOMIC FOUNDATIONS OF LONDON'S FINANCIAL DOMINANCE

London's ascendancy to a global financial superpower status draws on its very long history, legal adaptability, and open policies to economics. As a city within one of the oldest financial centres worldwide, it is capable of reaching a capacity for capital attraction that is unmatched—the city provides an approachable regulatory business framework as well as having stable institutions providing far-reaching international connectivity.

HISTORICAL EVOLUTION OF LONDON AS AN INTERNATIONAL FINANCIAL CENTRE

London's earliest role as an international trading centre was the foundation of its financial leadership. By the end of the 17th century, London had become the nerve centre of worldwide trade that was spurred by the *establishment of the Bank of England in 1694* and financial institutions' growth to support British Empire trade (Michie, 2006). In the 19th century, London's dominance solidified, and it became the heart of capital flows around the world as British merchants, bankers, and insurers spread their wings across continents. The British pound sterling emerged as the *de facto reserve currency* of that era, consolidating the stranglehold that the city exercised over global financial markets.

The *London Stock Exchange (LSE)* was established in 1801, institutionalising the capital markets and providing an organised financial system with which corporations were financed, government debt was traded, and foreign investments were encouraged. When the rest of the financial centres rose and fell with economic shifts, London was less shift; it adapted to every financial crisis, war, and change in political ecology. Through its regulatory innovation and institutional credibility, the city sustained itself. Even after the decline of the British Empire, London remained at the forefront because of its strong legal grounds and the great reach of English common law outside the British political boundaries (Moran, 2003).

The other change in London's financial scenario in the 20th century was the *emergence of the Eurodollar market* in the 1950s. Since the U.S. allowed only dollar-denominated transactions within its markets, liberalisation was a golden opportunity for London to capitalise and create a booming offshore financial market. Thus, London became a global financial power by allowing multinational corporations and foreign governments the freedom of jurisdiction from monetary constraints. Deregulation policies like the *Big Bang reforms of 1986*^[1] transformed London's financial architecture by the end of the 20th century to bring unprecedented liberalisation in market terms, bringing about unprecedented levels of foreign capital inflows.

STRUCTURAL ADVANTAGES: FINANCIAL REGULATION, LEGAL FRAMEWORKS, AND INSTITUTIONAL STABILITY

London's ability to maintain its financial supremacy can be attributed to the unique admixture of *regulatory flexibility and institutional stability*. Unlike other jurisdictions with tight control over finance, the UK operates a principles-based system of regulation; hence, financial institutions and investors have enough leeway in structuring their operations under such a system. It is an enabler of innovation in financial services and a regulatory environment that appeals to global investors.

The other pillar of London's financial supremacy has been the *English legal system*. As a well-known framework around the world, English common law provides predictability, enforceability, and credibility in contract law, dispute resolution, and property rights (*Moran, 2003*). This has made London a preferred arbitration centre for multinational corporations, sovereign entities, and high-net-worth individuals seeking legal security for their financial dealings.

The city, of course, also has a completely developed financial structure and is serviced by a pool of deep, expert financial strength. The banking, asset management, and investing sectors are at the centre when the city speaks about the well-established institutions found there—the Bank of England, the London Stock Exchange, and the Financial Conduct Authority (FCA), to name three. The *Lloyd's of London*^[2] helps position the city as one of the world's premier insurance markets as well.

Nevertheless, although this regulatory flexibility has enhanced London's business attractiveness, it has been accompanied by the perpetuation of financial loopholes. The overemphasis on creating a business-friendly climate has somewhat blurred the line as investors exploited jurisdictional gaps to diminish their exposure to financial scrutiny through regulatory arbitrage. This paradox between openness and oversight was the hallmark of London's financial ecosystem—critical for its economic dynamism yet friendly to financial misconduct.

GLOBAL CAPITAL FLOWS AND LONDON'S APPEAL TO FOREIGN WEALTH

The monetary supremacy of London is enhanced by the fact that the city can absorb huge inflows of foreign capital. The geographical location of the city splits the time difference between North America and Asia, making it an ideal place for international finance. Thus, London deals with trillions of dollars in cross-border transactions every single day, acting as a middleman for global markets.

The primary impetus for foreign capital inflows has been London's luxury real estate market. Russia, the Middle East, China, and India have seen a growing number of high-net-worth individuals flock to the city as a haven and an attractive destination for property investment. FDI into UK real estate has been astonishingly high, at over £1.3 trillion in 2020 alone (Office for National Statistics, 2020). It, however, raised issues of money laundering and the lack of transparency in finance. This is done very often through obscure corporations and overseas entities (Transparency International, 2022).

Another factor that contributes to London's global appeal as an international financial centre is its pro-investor visa policies. Since 2008, the Tier 1 Investor Visa program (Golden Visa) has provided high-net-worth individuals with a route to streamlined UK residency for making a significant investment in the UK economy. It was, in many cases, a haven for real entrepreneurs but also marked a gateway of access for political and banking fugitives to means of immunity and sanctuary in the United Kingdom (Home Office, 2021). This program was ultimately closed down at the end of 2022 after a crescendo of mounting anxiety about financial crime. The impact of that program, though, remained on and helped create a more enhanced, attractive framework for the world's elite.

It further allows London's deep integration into the global financial network, which then enables it to operate as a centre of offshore finance. The city is well connected through *British Overseas Territories*, from the *Cayman Islands* and the *British Virgin Islands* to *Bermuda*. This has served as the backbone of a mammoth network for offshore financial services that allow little or no regulation of capital flows (Shaxson, 2011). This complex financial web has seen its opponents talk about London as being the world's largest "money-laundering hub," courtesy of its role in hiding dirty wealth.

There exists a basic tension in London's financial governance: between increasing economic openness and ensuring regulatory integrity. On the one hand, policymakers have instituted instruments like *UWOs* (*Unexplained Wealth Orders*)^[3] and the *Register of Overseas Entities* to further enhance financial transparency. However, cracks in enforcement still exist (*UK Government*, 2023). Whether London can maintain its financial superiority without undermining the edges that have made it appealing globally is still to be answered.

THE "LONDON LOOPHOLE": REGULATORY AND ECONOMIC INCENTIVES FOR FINANCIAL FUGITIVES

There are evident systemic regulatory gaps in London that have allowed illicit financial activity, propelling the city to emerge as a global financial powerhouse. Even as the city's jurisdiction is often appreciated for the efficient workings of its legal and financial institutions, they have inadvertently created a haven for high-net-worth individuals being scrutinised in their countries of origin owing to the protection of their assets. In light of lax regulations, economic incentives, and intricate legal complexities that have made it extremely attractive to financial fugitives, the so-called "London Loophole" is, in fact, the combined result of all that.

This loophole is a consequence of fault lines seen in regulatory shortcomings, despite various legislative steps having been undertaken to correct financial wrongs. The UK has *Anti-Money Laundering (AML)* legislation that remains grossly underfunded and is extremely erratic in its enforcement mechanism. According to the report from FATF 2023, weaknesses in enforcement undermine otherwise strong legislation, providing undeterred openings in the system. The anonymity of shell companies is a case in point.

According to Transparency International, over 11,000 UK properties, valued at £6.7 billion, are registered with offshore entities, many of which conceal illicit wealth (*Transparency International, 2022*). The *2022 Register of Overseas Entities*^[4] was supposed to increase transparency in the process. However, beneficial ownership information is incomplete and uncertain, making it even harder for adverse actors to be scrutinised (*UK Government, 2023*).

Another key component of the London Loophole is its relationship with offshore tax havens, particularly British Overseas Territories such as the Cayman Islands and Bermuda. Though London itself is not a tax haven, its close relationship with these jurisdictions easily allows money of unknown origin to flow freely. These jurisdictions help facilitate tax avoidance and secrecy to shield the high-net-worth individuals' wealth from scrutiny (Shaxson, 2011). This nexus of London and offshore tax havens constitutes a critical component of the financial system; ethical questions arise related to its transparency and accountability. The structural entanglement between London and these offshore financial centres means that illicit capital can be laundered through legal financial instruments, complicating international efforts to track down and recover the stolen wealth

Investor visa schemes have deepened the city's attraction as a financial haven. Tier 1 Investor Visa program of the UK, otherwise called the "Golden Visa," has further intensified the attraction of London to the economic elite (Kunz, 2020[5]). The program was introduced in 2008, accelerating residence permits for applicants who had at least £2 million or more invested in UK assets (Home Office, 2021). Despite being seen as a genuine step to bring respectable investors into the country,

This program has been severely criticised for allowing "dirty money" into the country from politically exposed persons and oligarchs trying to find refuge there (Transparency International, 2022). The program lacked screening, and people accused of corruption and financial impropriety entered the UK without much scrutiny. Even though it was suspended in 2022 due to money laundering concerns, its legacy continues to shape the financial landscape of the city.

Luxury real estate is another sector through which financial fugitives embed themselves within London's economy. The stability and international appeal of the London property market have been attracting billions of pounds of dirty money every year. Ultra-luxurious houses are purchased anonymously through offshore companies in high-income neighbourhoods, such as Kensington and Mayfair. Global Witness investigations have continuously identified the ownership of properties by corrupt politicians and business persons (Global Witness, 2017[6]).

Although estate agents and solicitors are legally bound to report suspicious transactions, compliance is at an all-time low. Transparency International (2019), three years from the reporting phase, reports that out of 6,000 estate agents, only 32 SARs^[7] were filed, and it mirrors systemic neglect in AML obligations. The opacity of property ownership, combined with weak enforcement mechanisms, has allowed financial fugitives to launder their wealth through London's real estate sector with relative impunity.

Beyond regulatory gaps, political and economic incentives have played a crucial role in perpetuating the London Loophole. Foreign capital flows into London's financial sector, real estate market, and luxury industries, much of it of dubious origin. In 2020, the UK saw £1.3 trillion in foreign direct investment, with much of this coming from high-net-worth individuals seeking asset security (Office for National Statistics, 2020). The now-cancelled Tier 1 Investor Visa, or "Golden Visa," also helped with concerns of financial secrecy.

From a political perspective, successive UK governments have demonstrated reluctance to implement stricter financial oversight due to concerns about economic competitiveness. Steps to make policies more transparent were opposed by great lobbying groups, as the economy depended on foreign capital inflow and harsh regulations were seen as a hindering factor. This symbiotic relationship between political elites and financial institutions has ensured that legislative efforts to enhance transparency are either watered down or delayed, preserving the regulatory status quo

CASE STUDY: ROMAN ABRAMOVICH AND THE ECONOMICS OF OLIGARCHIC WEALTH IN LONDON

Roman Abramovich's rise to wealth and influence was a result of both economic and political factors that intersected with the globalisation of markets and the vulnerabilities of regulatory frameworks, particularly in London. His story provides an illustrative case study on how financial power is cultivated within systems that enable oligarchic control, allowing individuals to thrive through an interplay of private ambition, political affiliation, and international market forces. Abramovich, born into a humble background in Soviet Russia, capitalised on the privatisation of state assets after the collapse of the Soviet Union. He took control of the oil company Sibneft, which became symbolic of the corrupt privatisation process in the 1990s, when he entered into a business partnership with Boris Berezovsky.

Acquired for a \$100 million price tag, Abramovich subsequently sold the enterprise to *Gazprom* for billions. Thus, entry into the inner circle of the wealthiest oligarchs in Russia followed. It had not been because of entrepreneurship in the first instance but by association with the Russian state (*Forbes*, 2003^[8]).

Abramovich's career as *governor in Chukotka* from the year 2000 demonstrated such a symbiotic relationship between capital and political might in post-Soviet Russia. His rule, which also involved an important injection of his wealth into infrastructure and development in Chukotka, was also perceived as a means of securing loyalty to the administration of President Vladimir Putin (*The Guardian*, 2008^[9]). By positioning his business interests within the Kremlin, Abramovich secured his place in the inner circle of Russian elites, whose wealth was secured by an ongoing relationship with political power. Analysts have recurrently portrayed him as a "loyal oligarch," in whose financial circumstances lay the expectation of conformity to the priorities set by the government of Russia.

Though Abramovich's fortune had been founded upon these political links, his business interests in London were instrumental to his international persona. The purchase of *Chelsea Football Club* in 2003, for example, was a turning point in both the personal image portrayed by him as well as for the role being played by oligarchs from Russia in international finance.

Acquired for £140 million, Abramovich saw the potential of investing over £1.5 billion, which transformed an underperforming team into the most successful football club in the world (*ESPN India*, 2022^[10]). His investment in football was not just for sports but raised global eyeballs as well.

As Chelsea's success grew, Abramovich's stature as a philanthropist and businessman increasingly overshadowed his reputation as a Russian oligarch. His ownership of Chelsea became a symbol of the diversification strategies employed by many oligarchs who sought to legitimise their wealth and influence through investments abroad, particularly in high-profile, publicly visible assets.

Apart from football, investments in luxury real estate and art markets in London furthered Abramovich's foothold in the UK financial ecosystem. He purchased properties in such prime locations as London, New York, and the French Riviera, and a \$500 million yacht called *Eclipse* (BBC, 2022[11]).

Additionally, his collection of art valued at more than \$1 billion demonstrated his investment in the international art market, which further stretched his network of influence. Examples of these investments demonstrate how the relatively flexible regulatory environment in the City of London made it the perfect location for oligarchs to secure and legitimise politically sensitive sources of wealth.

However, the geopolitical turns following the Russian invasion of Ukraine in 2022 heralded a distinct challenge that threatened Abramovich's financial empire. The imposition of sanctions from multiple Western nations, including the UK and the US, froze his assets and restricted him from travelling at will (UK Parliament, 2024[12]). His close associations with the Kremlin were said to be one of the primary reasons for the imposition of sanctions against him.

Though Abramovich has repeatedly denied the accusations, saying that he is merely a private businessman with no political agenda, the economic effect was evident. His assets, which included Chelsea Football Club, were frozen in effect, forcing him to sell the club in 2022. The £4.25 billion sale contained provisions for the diversion of the proceeds to fund humanitarian efforts for victims of the war in Ukraine (Financial Times, 2022). It marked a radical paradigm shift in Abramovich's role in the Russian and global financial sphere, sounding a clarion call to the vulnerabilities of oligarchs, with their fortunes intricately tied up with the fortunes of authoritarian regimes. As such, his case serves as both a cautionary tale and a lesson in how financial systems like London's may unintentionally serve the interests of the world's wealthiest and most politically connected individuals.

CASE STUDY: LALIT MODI AND THE ECONOMICS OF FINANCIAL EXILE

Lalit Modi's ascendancy as a force within the Indian cricket landscape and his leadership role in turning the Indian Premier League (IPL) into a global commercial success is an archetypal case of the intersection of finance, politics, and international law. A mastermind behind the IPL, Modi transformed cricket from a pastime sport to a multi-billion-dollar entertainment business. This conversion is often reported to be one of the most significant breakthroughs in sports monetisation around the world, just like the American leagues, for instance, the NBA (Forbes, 2010).

However, with this commercial success came allegations of financial impropriety, which included corruption and money laundering, which sent him into self-imposed exile in London. This case study analyses the economic dynamics underpinning Modi's rise, the financial and legal controversies that forced his departure from India, and the role of London's financial and legal systems in sheltering him from prosecution.

Modi's commercialisation of cricket through the creation of the IPL has been hailed as one of the most successful innovations in the history of international sports. Established in 2008, the IPL was not merely a cricket tournament but a highly profitable business venture that attracted vast sums through sponsorships, broadcasting rights, and investments (Forbes, 2010). The brand was valued at over \$4 billion by 2010. Modi was cited as being the mastermind behind the rise of league cricket. The modernisation of cricket's business model through *player auctions, franchise systems, and glamorous opening ceremonies* associated with American sports leagues have contributed to the success of the league. This provided a platform for cricket that helped bridge regional fissures and bring the sport into the global commercial fold. In addition to this commercial success, the tenure of Modi as the chairman of IPL has been blighted by allegations of financial mismanagement, corruption, and illegal betting, with enormous attention coming during the *scandalous season of the league in 2013 due to spot-fixing and betting scandals*.

The UK's legal and financial systems have long been regarded as relatively *favourable* to wealthy individuals, particularly those with political connections, providing a protective shield for those facing legal challenges in their home countries. For Modi, the legal system in the UK, with its strong financial system and leniency toward people of high financial potential, allowed him to continue working in the business world despite the controversies surrounding his career. His involvement in several ventures, largely in real estate and startup investments, was the subject of attention given his problematic past. However, it would be seen that the financial infrastructure of London proves to be an excellent haven and platform where people like Modi can continue gathering more of this same old chunk of wealth, away from the full force of legal actions.

The case of Modi also has deep political implications; the linkage of Modi with British political elites is increasing the mystery surrounding the case. Modi's relationships with individuals like *Vasundhara Raje, the former Chief Minister of Rajasthan*, and several British politicians raised questions about how political influence can shape financial outcomes. These connections illustrate how London, as a global financial hub, can become a space for individuals to utilise their political ties for personal gain, potentially circumventing legal systems that might otherwise hold them accountable.

THE ECONOMIC AND POLICY DILEMMAS OF THE LONDON LOOPHOLE

One of the main culprits in the framework is London's property market, in its entirety, which most obviously influences unchecked inflows of foreign capital, in as much as the rich and high-net-worth individuals increased its usage and exploitation over the years primarily for capital preservation. The Office for National Statistics (2020) report stated that foreign ownership dominated above 30 percent of high-value real estate deals in prime areas of London, quite often through unobvious offshoring entities. Even though such investments have short-term economic benefits for the construction sector, meaning that such money inflow has artificially raised property prices and worsened the affordability crisis that residents face, financial institutions dependent on high-net-worth foreign investors may sometimes place short-term profit above regulatory compliance that exposes long-term financial instability in the UK economy (Financial Action Task Force, 2023[14]).

London's financial ecosystem operates within a *paradox*: while its open-ended economic model attracts global wealth and reinforces its status as a premier financial hub, the same permissiveness facilitates illicit financial flows, undermining regulatory integrity and political credibility. The economic and political implications of these loopholes are far-reaching, influencing *market stability, housing affordability, international diplomatic relations*, and the UK's reputation in global finance.

While successive governments have acknowledged the risks associated with financial crime, policy interventions have often been reactive rather than systemic, reflecting an inherent tension between economic incentives and regulatory enforcement. Addressing the vulnerabilities in London's financial framework requires a *balanced* approach—one that preserves economic competitiveness while reinforcing financial transparency and accountability.

Apart from the real estate domain, the perpetuation of vulnerabilities in money laundering within the London financial markets brings the capital flow into question concerning integrity. Dependence on weak implementation of AML measures, with the existence of frameworks such as the Proceeds of Crime Act (2002) and the Economic Crime Act (2022), has made the UK more susceptible to accusations of being a jurisdiction that has an affinity towards regulatory arbitrage. According to a UK Parliament report of 2022, only less than 1% of Suspicious Activity Reports (SARs) are given the right scrutiny, thus showing huge gaps in the enforcement of the financial intelligence system. This not only gives more confidence to the financial fugitives but also threatens London to face diplomatic pressures as the international regulatory bodies raise pressure on the UK to abide by global standards of financial transparency (Transparency International, 2022).

The political costs of financial opacity are evident in London's diplomatic relations. The UK has borne several criticisms from institutions, which range from Transparency International and the European Union to the FATF, all of whom have been critical and are calling upon the UK government to improve measures on illicit finance. The delayed response of the government post-2022 Ukraine invasion freezing Russian oligarch assets unveiled structural weaknesses in the mechanisms of enforcement. The vulnerabilities in London's financial system are still in place and are very easy to exploit for geopolitical interests (UK Government, 2023). Such lapses erode international confidence in the regulatory credibility of the UK. This has therefore called for stronger financial oversight and a repositioning of confidence in the city's role as a responsible financial centre.

This systemic weakness calls for the most comprehensive and measured policy response—a response that tries to balance the need for economic openness with a fair regulatory mechanism on the other end. One imperative area of reform is regarding AML enforcement, which remains underfunded and applied poorly. Funding agencies, whether it is the FCA or the NCA—the National Crime Agency—require strengthened legal powers along with better financing for the handling of monetary-related crimes effectively, both at the level of investigation and trial. Stiffened and harsher penalties for financial institutions complicit in money laundering, coupled with enhanced compliance obligations, could serve as deterrents against financial misconduct.

An important policy imperative can also be to ensure *corporate and property-level transparency*. *Real-time verification mechanisms*, especially if properly integrated with stiffer penalties connected to disobedience, would notably enhance financial accountability. Even though the statutory body of the *Register of Overseas Entities (ROE)* launched in 2022 demands the unveiling of ownership of foreign properties, its enforcement and reporting levels are riddled with loopholes. Closing loopholes on the formation of shell companies and LLPs^[15], which people usually use to hide illicit transactions, would strengthen due diligence measures on the financial setup.

Investor visa schemes should not be overlooked either. In this regard, the old Tier 1 Investor Visa, "Golden Visa," which was awarded to high-net-worth expats and accorded them UK residency, had very *lax financial checks*. The new visa policies will require robust vetting procedures and source-of-wealth checks to ensure that financial fugitives do not seek asylum by leveraging their residency (*Home Office, 2021*). This is the only way to address the threat of uncontrolled foreign capital: visa regimes that highly prioritise financial integrity rather than capital flows.

On a more panoramic level, the UK needs cooperation with other *international regulatory entities* so that their monetary policies would also be in line with general AML regimes across the world. The *British divergence from EU financial crime policy post-Brexit* has sparked concerns of further financial isolation unless reforms related to transparency are initiated (*Financial Times, 2022*). Strengthening engagement with the FATF, the European Union, and the United States through *financial intelligence-sharing agreements* will boost the detection and prevention of transnational financial crimes.

Ensuring London's long-term credibility as a global financial hub necessitates a recalibration of regulatory policies to ensure they do not prioritise economic expediency over financial integrity. While London's open-market framework has historically positioned it as a leading destination for global capital, unchecked regulatory loopholes have exposed the UK to financial instability, international scrutiny, and political risk. Policymakers face a fundamental choice: implement meaningful financial reforms to restore London's credibility or risk long-term reputational and economic decline. The ability to strike this balance effectively will determine the city's future as a financial powerhouse in the global economy.

CONCLUSION

This study has shown that the "London Loophole" is not an anomaly but an integral part of the UK financial system, a combined result of the historical liberalisation, regulatory lacunae, and economic imperatives to seek capital inflows over financial integrity. However, in another way, London's allure as a financial centre has also been its bane—its real estate and financial markets have been distorted by illegal capital, and its global credibility has weakened owing to its role in enabling financial fugitives. Indeed, all recent reforms promise an encouraging future, but weak and politicised enforcement continues to impede substantive change.

Our research extends *beyond legal critique and digs deeper into economic rationality* that makes financial permissiveness possible and fills an essential gap in the general public debate on financial globalisation and regulatory arbitrage. The London Loophole is more an expression of global financial asymmetries brought about by the speed of capital mobility outpacing regulatory change than a UK-specific aberration. Whether London can regain its reputation as the financial capital of the world once again while balancing openness with accountability remains to be seen—a test that will decide its position and trajectory in the changing world economy.

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ROSTOW'S STAGES: A FITTING FRAMEWORK FOR INDIA'S DEVELOPMENT?

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ABSTRACT

This paper critically examines W.W. Rostow's *Stages of Economic Growth* model, a prominent theory of economic development, in the context of India's economic growth. Rostow's model outlines a linear sequence of stages- traditional society, preconditions for take-off, take-off, drive to maturity, and age of high mass consumption. This review explores the relevance, limitations, and applicability of Rostow's model to India's socio-economic and political landscape. It assesses India's economic trajectory and explores the extent to which Rostow's stages can account for the complexities and unique characteristics of India's development. This paper finds that India is currently in the 4th stage i.e. "Drive to Maturity" of the Rostow model.

KEYWORDS

Economic growth, traditional society, preconditions for take-off, take-off, drive to maturity, mass consumption, linear stages, modernisation, innovation, technological change

JEL CLASSIFICATION CODES

O11, O14, O33, O47, O53, F43

INTRODUCTION

Geographers often seek to categorise places using a scale of development, frequently dividing nations into the "developed" and "developing," "first world" and "third world," or "core" and "periphery." All of these labels are based on judging a country's development, but this raises the question: what exactly does it mean to be "developed," and why have some countries developed while others have not? This question has been the focus of geographers and those working in the broad field of Development Studies since the turn of the 20th century. In the process, they have developed a variety of models to explain this occurrence. One of the key thinkers in twentieth-century Development Studies was W.W. Rostow, an American economist, and government official. Prior to Rostow, approaches to development had been based on the assumption that "modernization" was characterised by the Western world (wealthier, more powerful countries at the time), which were able to advance from the initial stages of underdevelopment. Therefore, other nations ought to take inspiration from the West and aim for a liberal democracy and a "modern" form of capitalism. Using these ideas, Rostow penned his classic Stages of Economic Growth. W.W. Rostow's "Stages of Economic Growth" is a classic stages of growth model of economic development, proposed in 1960, has been widely regarded as a foundational theory of economic development.

The model suggests that economies progress through five linear stages, moving from traditional economies to societies characterised by high mass consumption. Rostow's theory was revolutionary at its time, as it provided a structured lens through which to view economic progress. Rostow's Stages of Growth model is one of the most influential development theories of the twentieth century. One of the most significant development theories of the 20th century is Rostow's Stages of Growth model. But it was also based on the political and historical setting in which he wrote. With the subtitle "A Non-Communist Manifesto," Stages of Economic Growth, which was published in 1960 at the height of the Cold War, was political. Rostow was fiercely anti-communist and right-wing; he modelled his theory after western capitalist countries, which had industrialised and urbanised. As a staff member in President John F. Kennedy's administration, Rostow promoted his development model as part of U.S. foreign policy. Rostow's plan demonstrates a desire to impose American influence over communist Russia's development process in addition to helping lower-income nations in their development process. However, applying this Western-centric model to countries like India raises questions about its universality and ability to account for non-linear development patterns, especially in post-colonial and mixed economies. This paper will critically analyse Rostow's model and assess its ability to explain India's development trajectory.

LITERATURE REVIEW

1. Rostow's Stages of Economic Growth Model: A Foundational Framework

Rostow's *Stages of Economic Growth: A Non-Communist Manifesto* (1960) delineates five linear stages of economic development—Traditional Society, Preconditions for Take-Off, Take-Off, Drive to Maturity, and Age of High Mass Consumption. Rostow argued that economic development follows a universal, linear path and that all countries could achieve advanced stages by adopting similar policies and practices. According to Rostow, structural shifts, such as industrialization and capital accumulation, would drive societies towards self-sustained growth.

The model's appeal lay in its simplicity and progressive outlook, emphasising that economic advancement was within reach for all countries. Several scholars (Friedmann, 1966; Chenery & Syrquin, 1975) praised the model for its structured approach to economic transformation and its optimistic view of industrial progress. However, Rostow's stages largely reflect Western industrialization experiences, leading to critiques regarding its applicability to diverse socio-political and cultural contexts, particularly in post-colonial nations like India (Todaro & Smith, 2015).

2. Critiques of Rostow's Model: Universality and Cultural Biases

Several scholars have argued that Rostow's framework fails to account for the unique socio-economic and political contexts in developing nations. Frank (1966) and other dependency theorists criticised Rostow's model for its Eurocentric bias, arguing that it overlooked the lasting impacts of colonialism and external exploitation. These scholars contend that development in countries like India was hampered by historical dependencies on Western economies, which Rostow's model inadequately addresses.

Instead of a self-contained process of development, they argue that global systems of trade and colonial legacies deeply influenced post-colonial economies, complicating their trajectories in ways not accounted for by Rostow's linear approach.

In the context of India, Banerjee and Iyer (2005) illustrate how historical land-tenure systems under colonial rule created lasting economic inequalities and regional disparities. These structural legacies hindered the linear progression Rostow's model assumes, as socio-political factors heavily influenced economic trajectories. Similarly, Kohli (2004) highlights the role of state institutions in shaping India's economic path, emphasising that the state's active role in guiding economic development diverges from the laissez-faire market-driven growth Rostow envisioned.

3. India's Development and State Intervention: The Planned Economy Era

In the years following independence, India pursued a socialist-inspired, state-led approach to development, aiming to address both economic and social inequities. India's Five-Year Plans, beginning in 1951, focused on building heavy industries, infrastructure, and self-sufficiency in agriculture through state intervention (**Bhagwati & Desai, 1970**). This approach contrasts sharply with Rostow's preconditions for take-off, which emphasise the role of private investment and market dynamics.

A significant body of literature argues that India's planned economy was essential for establishing the foundation for industrialization and infrastructure. **Panagariya (2008)** points out that although the public sector-driven model faced inefficiencies, it created the necessary groundwork for the eventual liberalisation and take-off in the 1990s. Scholars such as **Bardhan (1984)** also emphasise that India's unique economic conditions, such as its vast rural population and income inequalities, required an active role for the state in redistributing resources and investing in public goods—a necessity overlooked by Rostow's framework.

4. India's Economic Liberalisation and the Take-Off Stage

India's economic reforms in 1991 marked a critical shift towards a market-driven model, which many scholars view as the nation's true "take-off" phase (**Basu, 2008; Kohli, 2006**). Liberalisation policies lifted restrictions on trade, invited foreign investment, and reduced the state's role in industries, accelerating growth and global integration. India's growth trajectory since the 1990s has been characterised by rapid industrialization, particularly in the IT and service sectors, aligning partially with Rostow's "take-off" stage.

However, despite this economic transformation, **Mukherji (2008)** argues that India's liberalisation process was a state-led initiative aimed at managing an economic crisis, rather than a purely organic shift to a market economy. This highlights a deviation from Rostow's model, which assumes take-off as a natural progression driven by private enterprise and investment. Furthermore, as **Jha (2018)** notes, India's growth has been concentrated in certain sectors and regions, resulting in significant disparities in wealth distribution, regional development, and access to opportunities— a complexity Rostow's framework does not address.

5. Modernization Theory vs. Dependency Theory: Competing Views on Development

Rostow's model is part of a larger modernization theory tradition, which asserts that economic development is a universal, linear process that all nations can achieve by emulating advanced economies. This perspective has been challenged by dependency theorists like **Frank (1966) and Cardoso and Faletto (1979)**, who argue that development cannot be separated from the global context. In India's case, dependency theory explains how colonial exploitation, coupled with global economic pressures, affected post-independence development patterns.

For instance, the agricultural stagnation of the 1960s and India's subsequent dependence on Western food aid illustrate how external factors influenced India's economic trajectory. Scholars such as Tomlinson (1993) argue that India's post-colonial development reflects a response to external constraints, rather than an endogenous evolution through Rostow's stages. India's Green Revolution, which transformed agricultural productivity in the late 1960s, exemplifies how foreign technology and aid, combined with state intervention, shaped its economic progress—underscoring the significance of international dynamics absent in Rostow's framework.

6. Alternative Theories: Amartya Sen's Capabilities Approach

Recognizing the limitations of traditional growth models, **Sen (1999)** proposed the *Capabilities Approach*, emphasising human welfare, freedom, and equality as essential components of development. Sen argues that economic growth alone does not guarantee human development, as disparities in access to resources and opportunities can impede meaningful progress. The *Capabilities Approach* has been widely applied in evaluating India's development, with scholars like **Dreze and Sen (2013)** highlighting the need for policies that prioritise education, healthcare, and social welfare.

India's persistently high levels of poverty and income inequality underscore the value of the *Capabilities Approach*, particularly in assessing progress beyond GDP growth. Sen's theory critiques Rostow's narrow focus on economic growth, instead advocating for a broader understanding of development that includes social and human capital. This perspective has become particularly relevant in the Indian context, where economic growth has not always translated into equitable improvements in quality of life (**Harriss, 2010**).

7. Current Debates: Can Rostow's Model Explain Contemporary India?

Recent studies have explored whether Rostow's stages hold relevance in the context of India's recent economic trajectory. Basu and Maertens (2007) argue that while Rostow's framework provides a broad outline, it fails to capture India's uneven development, wherein urban areas and the service sector have experienced rapid growth, while rural regions lag. Similarly, **Chatterjee (2017)** points out that the growing income disparities and regional inequalities reveal structural deficiencies in India's economy, challenging the notion of a linear progression to "high mass consumption."

In contemporary debates, there is growing consensus that India's economic development cannot be fully understood through Rostow's framework. The *Capabilities Approach* and models that emphasise inclusive growth are increasingly seen as more appropriate for analysing development in a country with India's complex socio-economic landscape. Scholars now argue for more nuanced frameworks that incorporate the interplay of social, political, and economic dimensions in explaining development.

ASSUMPTIONS OF THE MODEL

1. Linear Economic Progress

Rostow's theory assumes that economic progress of all nations can be fitted into a linear system and that all countries progress through a fixed sequence of developmental stages in the same order. Each society starts from a traditional stage and moves toward a modern, high-consumption economy. Development is seen as a unidirectional, linear process, and countries cannot skip stages. Societies must go through each stage to achieve maturity.

2. Mass consumption

Rostow assumes that all countries have the same end goal of high mass consumption. This reflects a Western-style consumption-driven economy and assumes that all societies will eventually aspire to similar levels and patterns of consumerism. Social, environmental, or cultural goals are secondary or irrelevant in this model.

3. Uniform Pathway for All Nations

Rostow's model is based on the historical experience of Western nations, particularly Britain and the United States, and assumes that other countries will follow a similar path to development. This assumption implies that the developmental processes that worked in Europe and North America are universally applicable to countries with different historical, cultural, and social contexts.

4. SIMILAR PRIMARY FOUNDATIONS

The Rostow model fabricates the assumption that all states outset with the similar primary foundations, for instance the same structure, climates, population sizes, and natural resources etc. It does not account for the growth of developing states that were colonised.

5. Savings and Investment as Key Drivers of Growth

Rostow emphasises the importance of high savings and investment rates, especially in the "Take-Off" stage. This investment fuels infrastructure, industrialization, and technology that allow societies to progress to the next stage

OVERVIEW OF THE ROSTOW MODEL

Stage 1: The Traditional Society:

A limited production function and subsistence farming are characteristics of this stage. Food production employs at least 75% of the labor force in these societies, and a large percentage of income above the minimum level of consumption is spent on low-productivity or non-productive expenses, such as wars, religious and other monuments, lavish living for landowners, and beggar-thy-neighbor competition for land or the occasional waste of surplus funds on lavish weddings or funerals. Further, there is limited technology not due to lack of inventiveness and innovations, some of high productivity, but due to lack of a systematic understanding of the physical environment capable of making invention a more or less regular current flow, rather than a stock of ad hoc achievements inherited from the past. Societies in this stage tend to have a rigid social hierarchy and limited economic mobility.

Stage 2: The Preconditions for Take-off:

This stage involves the development of infrastructure, commercialization of agriculture, and a growing industrial sector. It is characterised by the emergence of modern science and technology, as well as the expansion of markets and trade. The development of a more dynamic economic system lays the foundation for the "take-off" stage. Technically, according to Rostow, the preconditions for sustained industrialization have generally required radical change in three non-industrial sectors. In his paper he outlined, "First, a build-up of social overhead capital, notably in transport. This accumulation was required not just to enable the development of a profitable national market and the productive exploitation of natural resources, but also to enable the effective governance of the national government. The second is a revolution in agricultural technology

Both a general increase in population and a disproportionate increase in urban populations were typically the results of the mechanisms operating during the preconditions. Generally speaking, higher agricultural productivity has been a prerequisite for keeping the modernization process from being slowed down. Third, an increase in imports funded by capital imports whenever feasible as well as more effective production and marketing of certain natural resources.

In order to maintain the level of real income while the social overhead capital of the lengthy gestation period was being created, as well as to enable the less developed region or country to increase the supply of the equipment and industrial raw materials it could not then supply itself, such increased access to foreign exchange was necessary. Rostow also emphasizes that these technological advancements necessitated earlier or concurrent changes in the non-economic aspects of traditional society, such as the agricultural community's willingness to adopt new methods and adapt to the opportunities presented by expanded commercial markets, the existence and freedom of operation of a new group of industrial entrepreneurs, and—above all—a national government that could assume some direct responsibility for the development of social overhead capital (including its financing), an appropriate trade policy, and, frequently, the spread of new agricultural and industrial techniques.

Rostow further states the Role of Nationalism in driving modernization as a sense of nationalism motivates societies to break away from traditional structures and embrace industrialization. However, While nationalism can be a powerful force for modernization, it can also hinder economic development. New national governments may prioritise political goals over economic development, delaying the transition to the take-off stage. Thus, it's important for nations to strike a balance between nationalistic aspirations and the practical economic tasks required for modernization.

Stage 3: The Take Off:

The take-off stage is characterised by rapid growth in a limited group of sectors where modern industrial techniques are applied. The implementation of contemporary industrial procedures is a self-sustaining process rather than an abortive one, which sets the take-off apart from previous industrial booms. Historically, leading sectors in take-off have included textiles, railroads, agriculture, and military production. The take-off is distinguished from earlier industrial surges by its self-sustaining nature, requiring a sustained investment rate of at least 10%. The take-off often involves a social, political, and cultural shift, with a definitive victory of those who advocate for modernization. The role of leadership is crucial during this stage, with effective governments playing a key role in creating the necessary conditions for sustained industrial growth.

Stage 4: Drive to maturity:

This stage is defined as the period when a society has effectively applied the range of (then) modern technology to the bulk of its resources. It requires the ability to absorb new technology and put it to productive use". This stage is characterised by trained people, the capital to invest, supportive social institutions and attitudes. During the drive to maturity the industrial process is differentiated, with new leading sectors gathering momentum to supplant the older leading sectors of the take-off, where deceleration has increasingly slowed the pace of expansion.

The drive to maturity is characterised by technological innovation and the application of modern technology to a wider range of economic activities. Leading sectors during this stage include steel, chemicals, electricity, and machine tools. However, the concept of technological maturity is not without its complexities. Rostow argues that, although income per head-and usually consumption per head-will rise in the drive to maturity, it is evident that there is no fixed connection between technological maturity and any particular level of real consumption per head. The population-resource balance and the income distribution policies of the society will be the main determinants of how these variables develop after takeoff. Furthermore, while growth by definition increases per capita income, it does not always result in a level of per capita income that is consistent between countries or even within areas within countries.

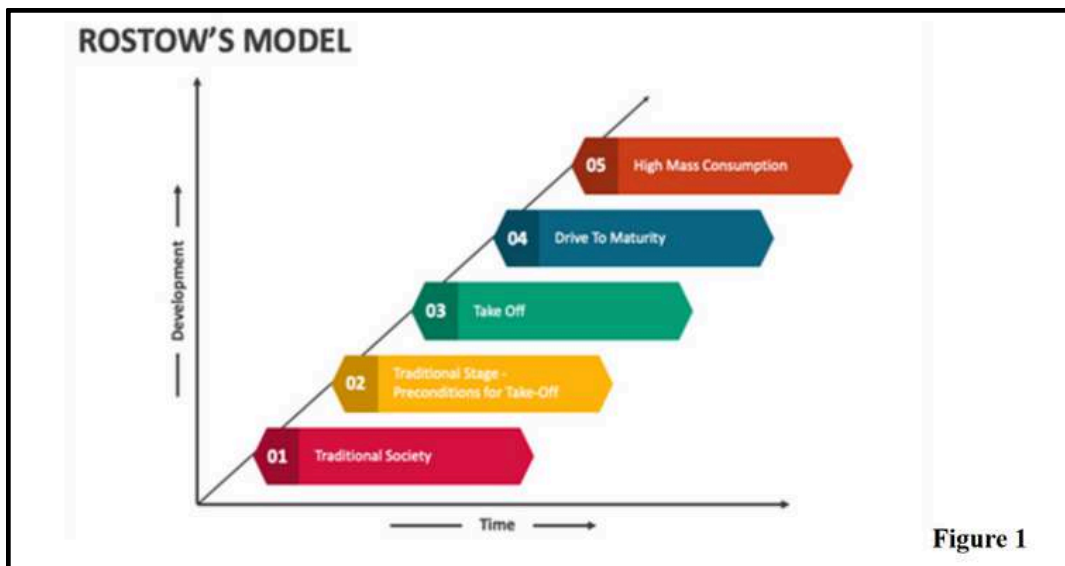
There are, and probably will be, technologically advanced cultures that are, in a sense, both wealthy and impoverished. During this stage, the economy sees a shift in the structure of the workforce, with a decline in agricultural labour and a rise in semi-skilled and white-collar workers. The new working class become more organised and demand better working conditions and social welfare. The nature of industrial leadership also changes, with a shift towards more professional and bureaucratic management.

Stage 5: The age of high mass consumption:

At the time of writing, Rostow believed that Western countries, most notably the United States, occupied this last "developed" stage. Here, a country's economy flourishes in a capitalist system, characterised by mass production and consumerism.

Rostow argues that in the transition to a mature economy, societies faced three main choices: prioritising social welfare and security, promoting mass private consumption, or seeking global power. In the early 20th century, these choices shaped different development paths in Western nations.

Taking the case of the US, he wrote that after minor social reforms and a brief interest in global power, the United States focused heavily on mass consumption in the 1920s, driven by suburbanization, automobile expansion, and household consumer goods. This led to growth in sectors like housing, automobiles, and household gadgets, alongside infrastructure and commercial development.



RELEVANCE OF THE MODEL IN THE INDIAN CONTEXT

India's economic journey since independence does not align entirely with Rostow's model. Key stages and growth patterns, influenced by both endogenous and exogenous factors, reveal the challenges of fitting India's development into Rostow's linear framework.

1. TRADITIONAL SOCIETY:

Pre-independence India fit well into Rostow's "traditional society" stage, as agriculture dominated the economy. However, significant variations existed in India's agricultural practices, caste-based social structures, and political fragmentation, which Rostow's model does not adequately capture.

2. PRECONDITIONS FOR TAKE-OFF (1947-1980S):

Post-independence, India implemented a planned economic model. The government's focus on heavy industries and five-year plans reflects an effort to build the infrastructure and social capital required for economic development. This period saw significant investments in the public sector, setting the foundation for industrialization. This stage involved significant state intervention and protectionism.

3. Take-Off (1991 Economic Reforms):

India's economic liberalisation in 1991 marked a critical turning point. With economic reforms that liberalised trade, invited foreign direct investment (FDI), and deregulated industries, India transitioned toward rapid industrial growth, urbanisation, and technological advancement. While this aligns with Rostow's "take-off" stage, it was driven largely by external pressures and globalisation rather than a purely endogenous transition.

4. Drive to Maturity (2000s):

By the 2000s, India had diversified its industrial and service sectors, especially in information technology, telecommunications, and pharmaceuticals. Economic growth became relatively self-sustaining, supported by a burgeoning middle class and increased domestic consumption. However, widespread poverty and unequal income distribution contradict the smooth progression implied by Rostow's stages.

5. Age of High Mass Consumption (Emerging, but not Fully Realised):

While India's economy has advanced significantly, reaching the final stage remains challenging. Issues such as income inequality, regional disparities, and environmental concerns highlight complexities that Rostow's model does not address. Consumption levels have risen, but the benefits are not uniformly distributed, reflecting structural inequalities.

IN WHICH STAGE OF THE MODEL IS INDIA AT PRESENT? AN EMPIRICAL ANALYSIS

India is currently viewed as being in the "drive to maturity" or possibly transitioning toward the "age of high mass consumption" stage in Rostow's model of economic growth. This fact is substantiated by Rostow himself commenting on India's current position in an interview with India today. The following is an excerpt from the article,

Rostow: Optimistic message

The Indian economy has taken off. That definitive, if somewhat unexpected, judgement comes from Walt Whitman Rostow, who has been a class-room name since the 1950s, when he first put forward his take-off theory of economic growth - "take-off" being the crucial transition stage between a stagnant, tradition-bound economy and a mature, developed one.

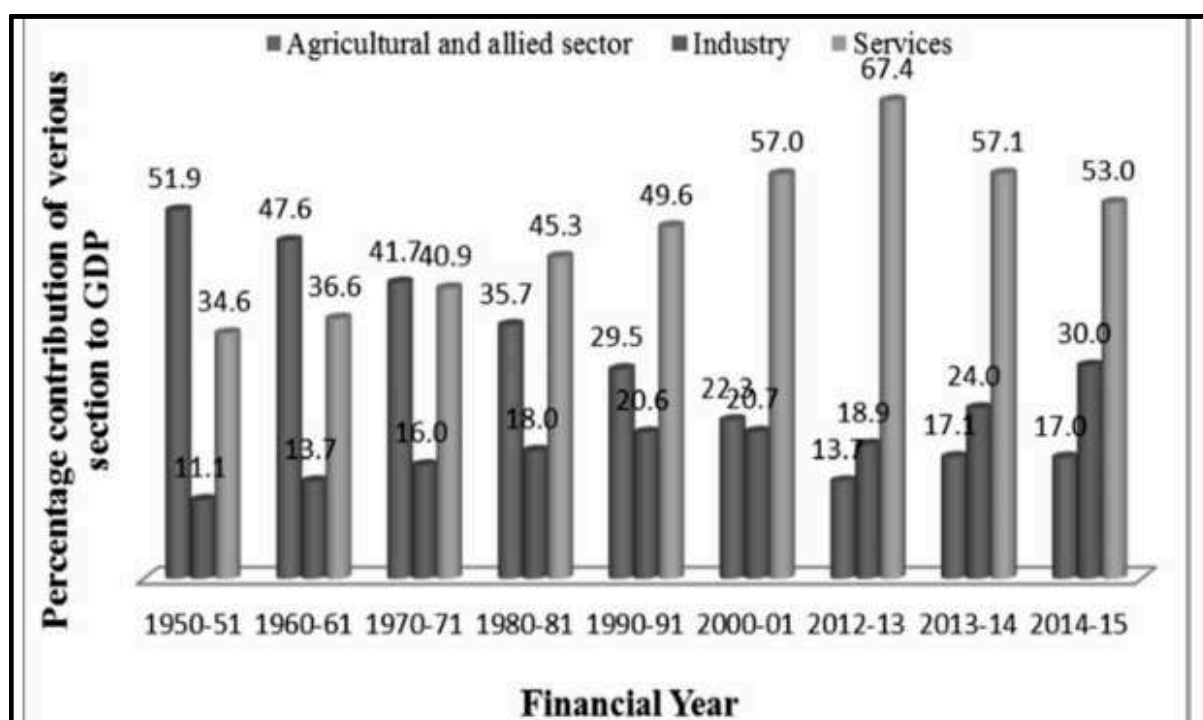
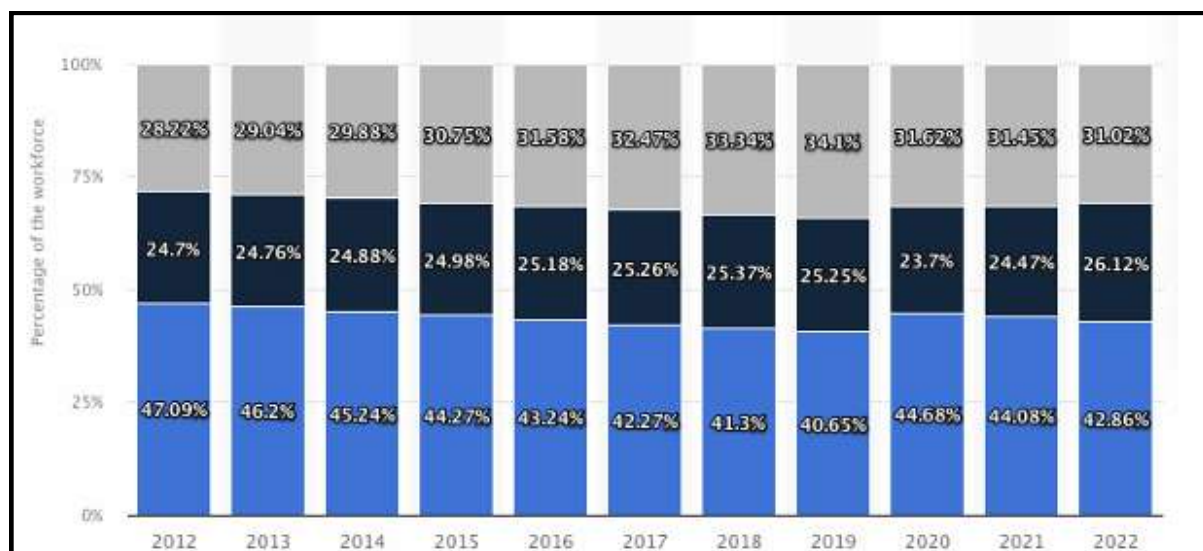
Interviewed in Delhi last fortnight, Rostow went on to say that India's economy is now in the post take-off stage - a "drive to technological maturity" which, going by his theory, will culminate after another three or four decades in a stage of high mass consumption.

An excerpt from the article, 'Indian economy is now in the post take-of stage: Walt Whitman Rostow', published in India Today

This positioning is further evidenced by several key economic trends and data.

1. INDUSTRIAL GROWTH AND ECONOMIC DIVERSIFICATION:

India has seen significant industrial development and diversification over the past few decades. With a burgeoning technology sector, substantial manufacturing capabilities, and the rise of digital industries, the economy has moved beyond the early stages of growth characterised by agriculture. India's industrial output and export services, especially in technology and pharmaceuticals, underscore this maturation process.



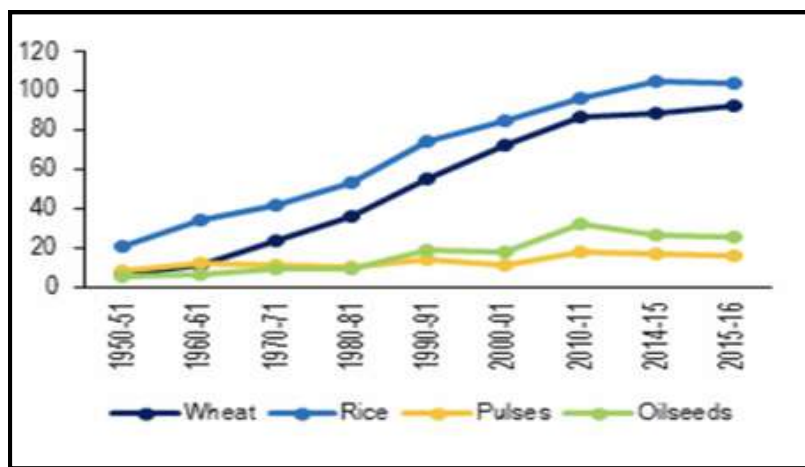


Figure 4 , Agricultural production (million tonnes)

Source: Ministry of Agriculture; PRS

From figure 2 and 3, we observe that the percentage of workforce employed and contribution to GDP has fallen in the agricultural sector while it has seen a rise in the industrial (characterised by high productivity) and service sector, which are associated with usage of modern technology. Furthermore Figure 4 depicts that total production of food grains increased from 51 million tonnes in 1950-51 to 252 million tonnes in 2015-16 which can be attributed to the green revolution and the usage of modern agricultural technology it brought with it. Thus this empirical analysis substantiates our conclusion of India being in the phase of ‘Drive to Maturity’.

2. RISING GDP AND INCOME LEVELS:

India is projected to become the world’s third-largest economy by the end of this decade, surpassing economies like Germany and Japan. This growth trajectory aligns with Rostow’s “drive to maturity” stage, where nations experience high sustained growth, enabling greater income levels and purchasing power among the population. India's nominal GDP reached approximately \$3.75 trillion, with continuous growth expected due to robust consumption and investment patterns.

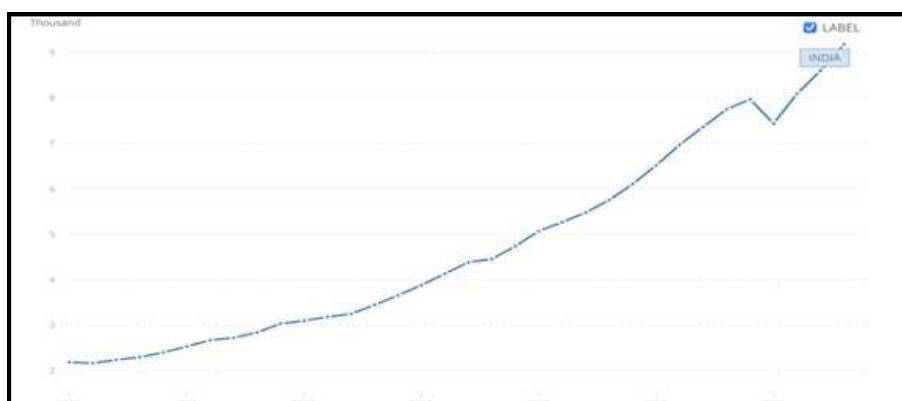


Figure 5, GDP per capita PPP, (Constant 2021 international \$)- India

Source: World Bank national accounts data, and OECD National Accounts

Figure 5 depicts a rising income per capita adjusted for purchasing power parity since the initiation of the economic reforms which indicates an increasing standard of living as predicted by Rostow in the stage of “Drive to maturity”.

3. CONSUMERISM AND URBANIZATION:

India is witnessing increased urbanisation and a shift toward consumer-driven growth, particularly in sectors like real estate, automotive, and electronics. The expansion of suburban housing, car ownership, and the consumer electronics market reflects an economy moving toward the “age of high mass consumption.” The growth of these sectors is similar to patterns seen in Western economies as they entered this stage.

4. SOCIAL INFRASTRUCTURE AND WELFARE:

In recent years, India has invested heavily in social infrastructure and welfare programs, such as affordable housing initiatives and expanded healthcare access through schemes like Ayushman Bharat. This accords with the phase of ‘Drive to maturity’ as, as put by Rostow, “The new working class become more organised and demand better working conditions and social welfare”, in this period. While these investments indicate elements of social security seen in mature economies, India’s high population and ongoing challenges in poverty reduction and employment diversification suggest it is still solidifying its position in the latter part of the "drive to maturity" stage.

India’s trajectory demonstrates significant economic maturity while showing signs of consumer-led growth typical of the later stages in Rostow’s model. However, challenges in infrastructure, income disparity, and rural-urban inequality mean there is still progress to be made before fully reaching the "age of high mass consumption."

Policy suggestions

As India is in the “Drive to Maturity” Stage, there should be more emphasis in private institutions. The government is unable to address most of the issues at this time. So what ought India to do? We are aware that social and environmental issues lead to a variety of externalities, both positive and negative. India ought to give the private sector more autonomy since political power is currently diminished. Externalities cease to be a market failure when private property rights are well specified, according to Coase (1960). The market will run smoothly on its own. Excessive intervention by India during this phase is detrimental to long-term growth and economic freedom. A dictatorship will result in a decline in both local and foreign direct investment.

Meanwhile, we can observe that certain private sectors are performing admirably. A growing number of private organizations are involved in the production of energy. More significantly, the efficiency of the private education industry has increased. As a percentage of GDP and GNP, government spending on education has decreased over time, but enrollment and literacy rates have risen. Businesses will have greater faith in India and their investments there once improved private property rights (commercial laws) are established. "Diversity" is also significant. For India to remain sustainable, more diverse industries need to be developed. India's research and educational effectiveness provide her the ability to successfully build new businesses.

High-technology exports are increasing rapidly, but the cost of R&D remains high.. If the government can further make good use of private education and R&D, it can create more diversity by developing different sectors. The imbalance between industries can then be addressed.

On the other hand, with an increasing demand for energy, promoting renewable energy (biomass energy) is preferable because it is environmentally friendly and can fulfil the increasing energy demand. The government might also spend more on water access, sanitation, and transportation, which are lacking in rural areas, to address the regional disparity. There should be minimal private involvement in these ventures. Improving these infrastructures would help the government balance infrastructure development across regions and create positive externalities that will entice people to return to rural areas.

LIMITATIONS OF ROSTOW'S MODEL IN EXPLAINING INDIA'S DEVELOPMENT

1. NON-LINEARITY OF DEVELOPMENT:

India's development has been non-linear, with multiple setbacks and accelerations. Economic progress in India has been influenced by factors such as colonial history, global economic shifts, and domestic policy changes, which do not fit neatly into Rostow's linear framework.

2. Role of the State:

Rostow's model assumes that industrial take-off is primarily driven by private capital and market forces. In India, however, state-led planning and intervention have played crucial roles, particularly in the pre-liberalization era, challenging the assumption that market dynamics alone drive development.

3. Social and Cultural Factors:

India's caste system, cultural diversity, and regional disparities have shaped economic and social progress in ways that Rostow's model does not account for. Rostow's framework overlooks these non-economic factors that have substantial impacts on economic development in India.

4. Impact of Globalization:

India's integration into the global economy has influenced its economic trajectory significantly, especially during the liberalisation phase. Rostow's model, developed in a post-World War II context, did not anticipate the transformative impact of globalisation on developing economies.

CRITICISM FACED BY THIS MODEL OF ECONOMIC GROWTH

Rostow's model still sheds light on a successful path to economic development for some countries. However, there are many criticisms of his model. Although Rostow depicts faith in a capitalist system, his preference for a western model as the sole route to progress has drawn criticism from academics. Critics have pointed out that not all nations progress in this linear form; some skip steps or follow alternate paths.

Rostow's theory can be classified as "top-down," or one that emphasises a trickle-down modernization effect from urban industry and western influence to develop a country as a whole. Later theorists have challenged this approach, emphasising a "bottom-up" development paradigm, in which countries become self-sufficient through local efforts, and urban industry is not necessary.

Additionally, Rostow ignores the variety of goals held by each civilization and the various metrics of development, assuming that all nations share a common aim to develop in a manner that leads to high mass consumption. For instance, Singapore has one of the greatest income gaps in the world despite being one of the most economically successful nations. Lastly, Rostow ignores location and circumstance, two of the most important geographical principles. Rostow makes the assumption that all nations, regardless of their size, geography, or natural resources, have an equal chance to flourish.

CONCLUSION

W.W. Rostow's Stages of Economic Growth model, while influential, has limitations in fully explaining India's complex development trajectory. Its linear progression and Western-centric assumptions do not fully capture India's unique socio-economic and political context. India's development has been shaped by a combination of factors including state intervention, globalisation, and domestic social and cultural factors, which deviate from Rostow's market-driven and self-sustaining model.

While India has made significant strides in its economic development, placing it in the Drive to Maturity stage of Rostow's model, challenges such as poverty, inequality, and infrastructure deficits remain. These issues highlight the need for a more nuanced understanding of development, beyond the simplistic stages proposed by Rostow. Alternative frameworks, such as Amartya Sen's Capabilities Approach, offer a more comprehensive perspective that considers human development, social justice, and well-being alongside economic growth.

In conclusion, while Rostow's model provides a historical perspective, it is insufficient to fully explain India's complex development trajectory. A more comprehensive understanding requires considering a broader range of factors, including institutional, social, cultural, and global economic forces. India's experience demonstrates the need for tailored development strategies that address specific national contexts and challenges.

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REVIEW OF ANEMIA ANALYSIS CONCERNING HOUSEHOLD CONSUMPTION EXPENDITURE PATTERN ACROSS INDIA

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ABSTRACT

This paper analysed the food consumption pattern of households and mapped it with the iron deficiency and anaemia prevalent across the country. It is being observed that production and consumption of wheat and rice have increased significantly while consumption of coarse cereals which are more nutritious has declined over time. To gain further insight into the prevalence of anaemia in India, we investigated the effect of different food consumption patterns and iron intake in the body. Our detailed study on HCES: 2022-23, provides us with the insights that the food consumption pattern of households followed across the states has not been uniform, the cereal consumption is primarily concentrated in the southern, eastern, and northeastern states; yet the mix of cereal intake is not diverse, ranging with rice and wheat predominating over coarse grains. In the southern, eastern and north-eastern states, the consumption of vegetables, fruits (fresh) and fruits(dry) is relatively higher than in the rest of the areas of the country. After deriving these crucial insights from the survey, we interlinked these conclusions to the reports detailing the prevalence of anaemia across India, based on the “NFHS-4” & “NFHS-5” data, which highlights the severity of the condition across the country. The main reason for this situation can be explained by the less intake of necessary nutrients required to prevent the condition.

KEYWORDS

cereals, coarse grains, fruits and vegetables, anaemia, iron deficiency, heme and non-heme food items, nutrient composition

INTRODUCTION

Diet composition has undergone several changes across decades, with the changing world scenarios humans have been also changing their dietary patterns over the years. The simple diet plate has transformed into a more complex and diverse but less nutritious one, the simple yet healthy plate to a complex but less healthy one. These changes in dietary patterns have led to a declining state of health across the globe, the situation is more severe in developing countries due to several reasons.

This review majorly focuses on the Indian scenario. India suffers from several chronic health situations like anaemia, diabetes, malnutrition, stunting etc. This text will majorly focus on the anaemic prevalence in the country with reference to the HCES 2022-23, which provides comprehensive information regarding the consumption expenditure pattern in India with multiple classifications like food, non-food, state-wise, rural-urban, etc. The food consumption expenditure data is further classified into several broad groups of food items with a percentage breakup of all India's rural and urban, it also provides state-wise rural and urban expenditure classification across several broad food categories.

This state-wise classification helps to get a picture of the diverse consumption patterns being followed across India. The current food consumption pattern shows a decline in the consumption of cereals and a steady increase in the consumption of processed food items over the decades.

Changes have also been observed in the composition of cereal consumption, decline has been marked in the consumption of coarse grains like millet, sorghum (bajra) etc. over the years, the current consumption of cereals is majorly dominated by rice and wheat. There has been a rise in interest in increasing coarse grain consumption for their higher nutritive value as compared to other cereal grains like rice and wheat etc., we know that the consumption of fruits and vegetables are very essential for the human body for their rich content of micronutrients i.e. vitamins and minerals like folate, vitamin C, vitamin B6 etc.

However, the observation of HCES 2022-23 shows that across states the diet plate is not balanced, either the state's consumption is inclined more towards cereal or fruits and vegetables, therefore indicating towards poor diet patterns across India. This can be associated with India performing poorly in chronic health situations like diabetes, anaemia, etc.

According to the POSHAN Abhiyaan Monitoring Third Progress Report, India carries the largest global burden of anaemia- in terms of numbers, it is highly prevalent in adolescents and women especially pregnant and lactating women.

The World Health Organization (WHO) defines anaemia as a condition in which the number of red blood cells or the haemoglobin concentration within them is less than normal. Several causes are contributing towards anaemia, the most common is the deficiency of iron but deficiency in other micronutrients like vitamin A, folate, vitamin B12 and riboflavin can also lead to anaemia. These deficiencies in nutrients are caused by several factors like inadequate diet with nutrients deficiency, gynaecological and obstetric conditions, etc.

Iron deficiency anaemia is most common in India, but other types of anaemia are also prevalent in the country. The situation can be improved by increasing the iron and other micronutrients intake, this can be achieved by understanding dietary patterns prevalent across the country. This review paper delves into understanding this relation by mapping the consumption patterns to the anaemic situations across states in India by analysing the HCES 2022-23 to derive the current consumption trend with the anaemic prevalence reports.

METHODOLOGY

Advances in Iron and Cereal Consumption Pattern\

The study has been conducted to analyse the consumption pattern and its nutritional impact at the household level by analysing the Household Consumption Expenditure Survey 2022-23 and mapping it to the reports of anaemic prevalence across India. The Household Consumption Expenditure Survey is designed to collect information on consumption of goods and services by the households. Except a few inaccessible settlements in the islands of Andaman and Nicobar, the entirety of the Indian Union was examined by the survey. Information for the study came from 6,115 metropolitan blocks and 8,723 villages across the whole country. Including 2,61,746 households, distributed between 1,06,732 in urban areas and 1,55,014 in rural areas. The HCES: 2022-23 has diversified and included more items, the number of items in the basket has increased to 405 from 347 in HCES: 2011-12 (NSS 68th round).

During this survey, the consumption basket of items was splatted into three major categories, namely, (i) Food items, (ii) Consumables and Services items, and (iii) Durable goods in HCES: 2022-23. As a result, three different questionnaires were prepared encompassing all three categories—Questionnaire: FDQ, Questionnaire: CSQ, and Questionnaire: DGQ—were created and distributed in three consecutive monthly visits to the chosen families

To eliminate any bias caused by the adoption of a specific questionnaire sequencing, all six potential sequences of the three questionnaires have been used in the survey. In the HCES: 2022-23 report, the reference period of the survey for consumption of various groups is listed below:

Our study has used average monthly consumption expenditure for all the states and union territories with imputation from HCES: 2022-23 for further analysis of this paper. We have analysed and used the average consumption of different food items per person, broken down by urban/rural areas, states, of monthly per capita expenditure (MPCE) and have used the food items classified into different categories such as cereals, cereal substitutes, gram, pulse and pulse products, sugar, salt, milk and milk products, vegetables, fresh (fruits), fruits (dry), egg fish and meat, edible oils, spices, and beverages and processed foods to analyse their contribution to overall nutrient consumption

Category	Items Groups	Reference Period
I	Edible oil ;egg, fish & meat; milk and milk products; vegetables; fruits; spices; beverages and processed foods; pan, tobacco & intoxicants	Last 7 days
II	All other food items; fuel and light; miscellaneous goods and services including medical (non hospitalization) and rents	Last 30 days
III	Clothing; bedding; footwear; education; medical (hospitalization); durable goods	Last 365 days

Relating Anaemia Prevalence to Iron and Other Micronutrient Consumption

The paper has reviewed the iron deficiency and consequently anaemia prevalence at the state level with dietary, demographic, and household characteristics for:

- (i) Adolescent girls aged 15-19 years who are anaemic (%), and
- (ii) Pregnant women aged 15-49 years who are anaemic (<11.0 g/dl) (%). The data used for the study is taken from HCES: 2022-23 consumption data and NFHS4 and NFHS5 for health survey.

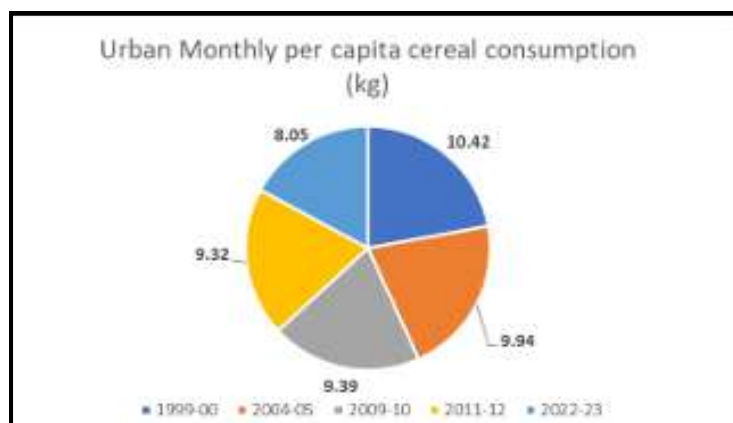
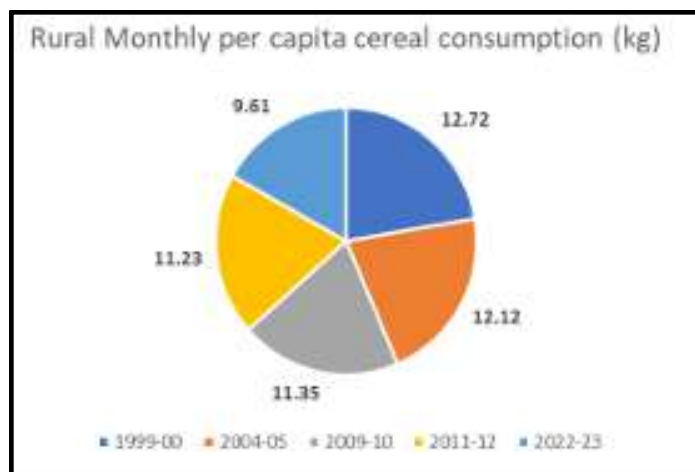
Our paper has mapped the HCES: 2022-23 food consumption expenditure to the nutrient composition to derive the nutrient intake patterns prevalent across the country

The data for iron deficiency and anaemia prevalence has been extracted from Anaemia Mukht Bharat Report released in February 2022, and the National Health Family Survey (NFHS- 5 and NFHS-4) which was published in 2019- 21 and 2015-16 respectively. The National Health Family Survey is responsible for conducting surveys at a large scale and plays a crucial role in overseeing the health sector's performance across the nation. In 2018, the Government of India launched the Anaemia Mukht Bharat (AMB) strategy with the target of reducing anaemia in the vulnerable age groups such as women, children and adolescents in a life cycle, providing preventive and curative mechanisms through a 6X6X6 strategy including six target beneficiaries, six interventions and six institutional mechanisms for all stakeholders to implement the strategy. With the help of data published in the report, the survey has discussed anaemia prevalence in the country mapping with the consumption pattern observed in the region

RESULTS

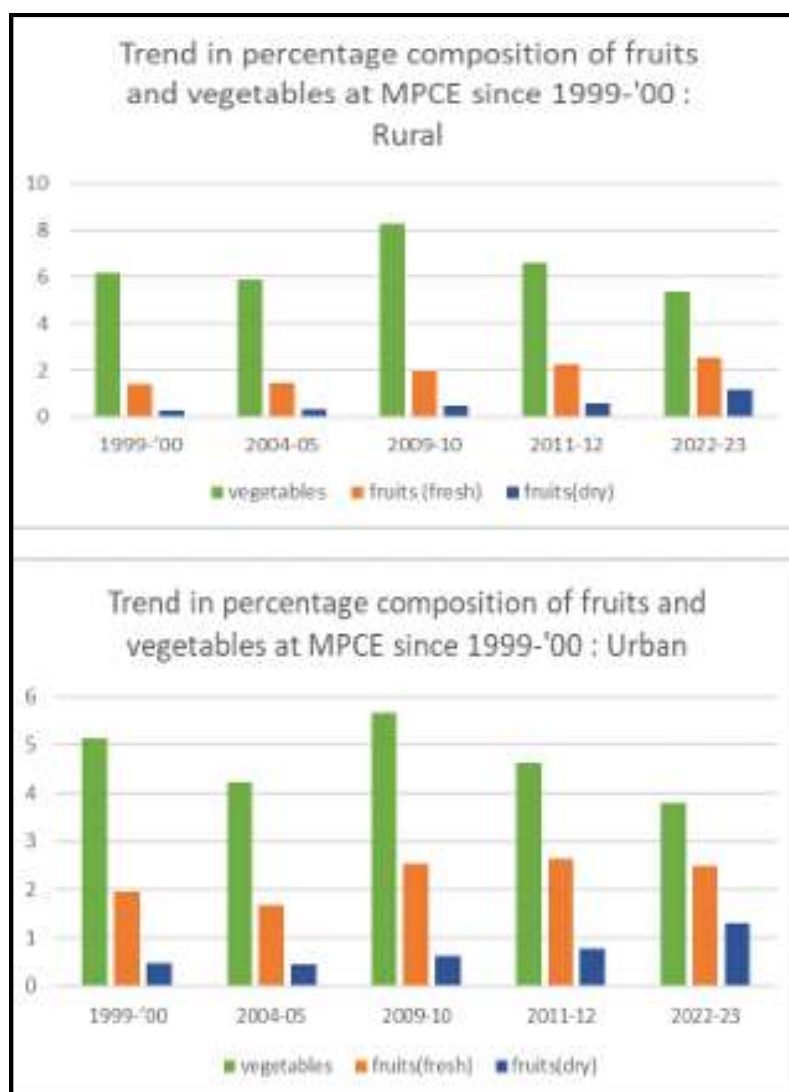
Trends in Food Expenditures Pattern:

At the national level, cereal consumption has declined over time: the per capita monthly cereal consumption (kg) in rural areas in 1999-'00 was 12.72, has declined to 11.23 in 2011-12, and has dropped even further to 9.61 in 2022-23, a similar situation was observed in urban areas, the per capita monthly cereal consumption (kg) of 10.42 in 1999-'00, has decreased to 9.32 in 2011-12, and further to 8.05 in 2022-23 according to the latest HCES report.



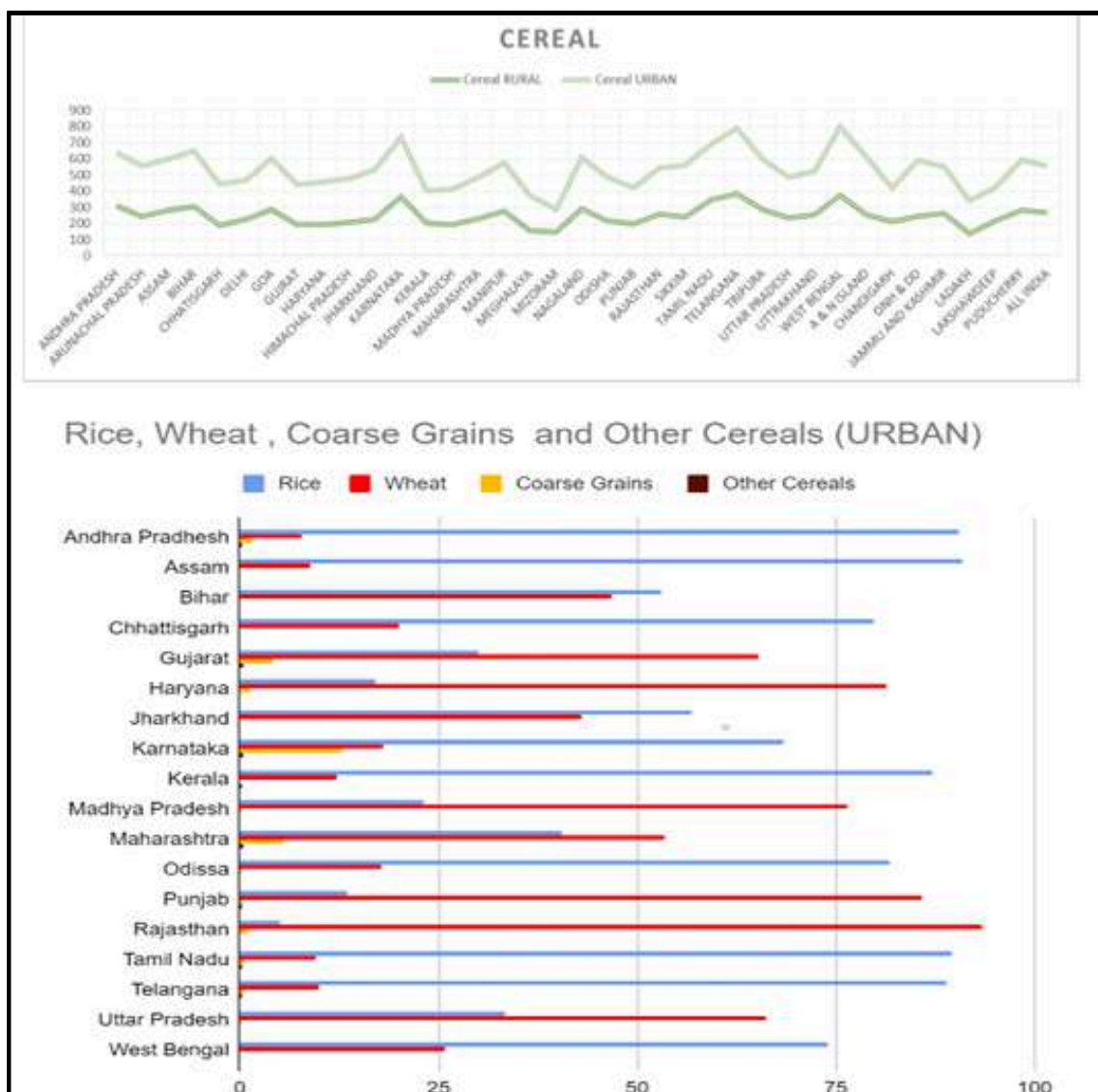
A similar situation has been observed in fruits and vegetables. The vegetable consumption in rural areas has been fluctuating over time. It was at its peak in 2009-10 and has been declining over the coming years. For the urban areas, vegetable consumption has declined over time. The share (%) in per capita monthly expenditure on vegetables has fallen from 5.13 in 1999-'00 to 3.8 in 2022-23. Although vegetable consumption shows a downward trend in both the rural and urban areas, the fruit (fresh) consumption pattern in the rural and urban diaspora has not been the same over the years.

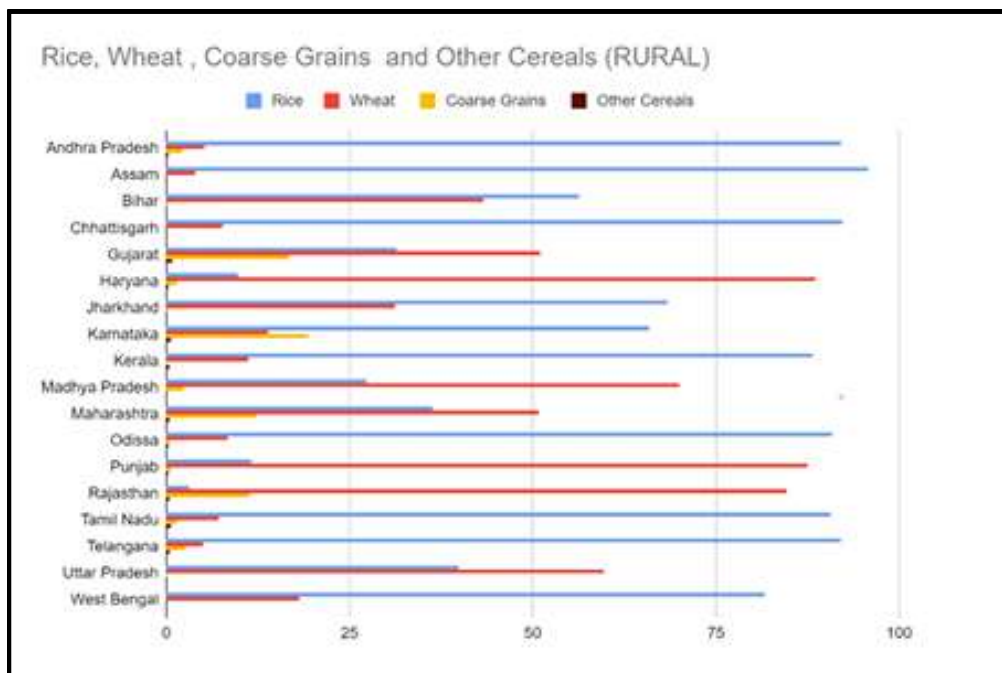
The rural areas have overall shown a stagnant behaviour over the years, with a slight increase in consumption expenditure share (%) from 2.25 in 2011-12 to 2.54 in 2022-23 but the urban areas have recorded a positive consumption behaviour but the growth rate is minimal, the percentage share in expenditure has increased from 1.95 in 1990-'00 to 2.5 in 2022-23. The share (%) of fruits (dry) in the monthly consumption expenditure in rural areas has shown an almost stagnant growth with negligible growth while the urban areas give a similar picture but have showcased a gently higher increase for the years, from 0.78 in 2011-12 to 1.31 in 2022-23, which is relatively more than the period previous to this with negligible growth.



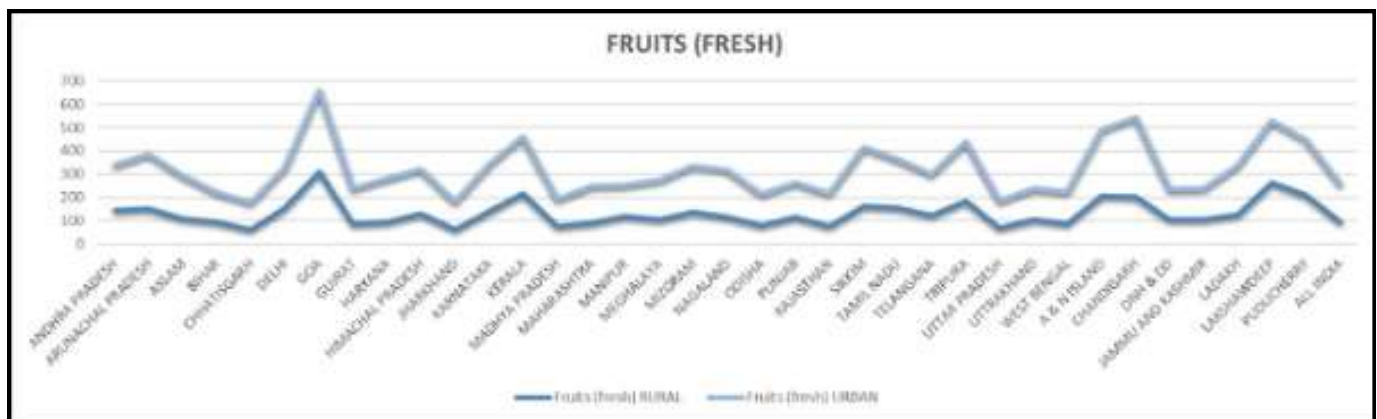
After reviewing the overall trend in the country, we have reviewed the situation for these food categories across states in India for the year 2022-23. The HCES 2022-23 provides a state-wise (%) share of consumption expenditure across these food categories.

The data shows that the consumption pattern is not uniform, the cereal consumption is majorly concentrated in the southern, east, and northeastern states but the composition of cereal intake is not diversified, the cereal consumption is mainly dominated by rice and wheat rather than the coarse grains like millets which have higher health benefits i.e. have relatively higher nutritive values than the generally consumed rice and wheat. For the cereal category, in the rural diaspora, Telangana tops the list followed by West Bengal, Karnataka etc., while the bottom 3 places are held by Meghalaya, Mizoram and Ladakh respectively. In the urban diaspora, West Bengal, Telangana, and Karnataka make up the top 3 while the bottom 3 are accounted for by Ladakh, Kerala and Mizoram respectively in terms of value of per capita expenditure in 30 days.

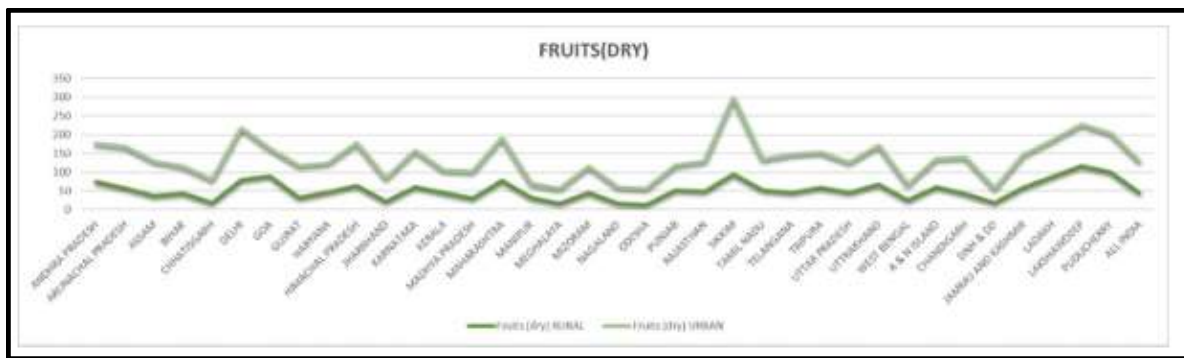




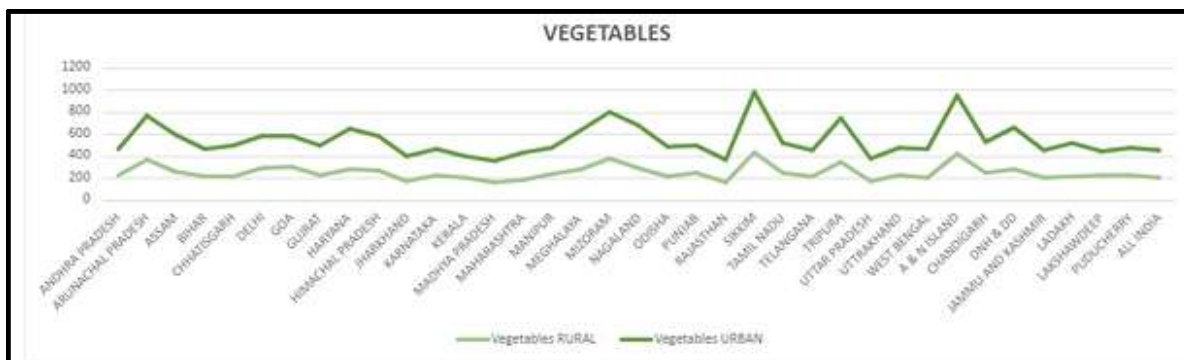
In the fruits (fresh) categories the list is topped by Goa in rural areas followed by Lakshadweep and Kerala for rural areas and Uttar Pradesh, Chhattisgarh, and Jharkhand account for the bottom 3 respectively while for the urban areas the Goa, Chandigarh, and Andaman & Nicobar Islands make up the top 3 respectively and Chhattisgarh, Madhya Pradesh and Uttar Pradesh make up the bottom 3 respectively.



For the fruits (dry) category, Lakshadweep, Puducherry, and Sikkim make up the top 3 in rural areas while Sikkim, Delhi, and Maharashtra for the urban areas. The bottom 3 places are occupied by Meghalaya, Nagaland, and Odisha for the rural areas respectively and Meghalaya, Mizoram, and Daman & Diu & Dadra & Nagar Haveli for urban areas.

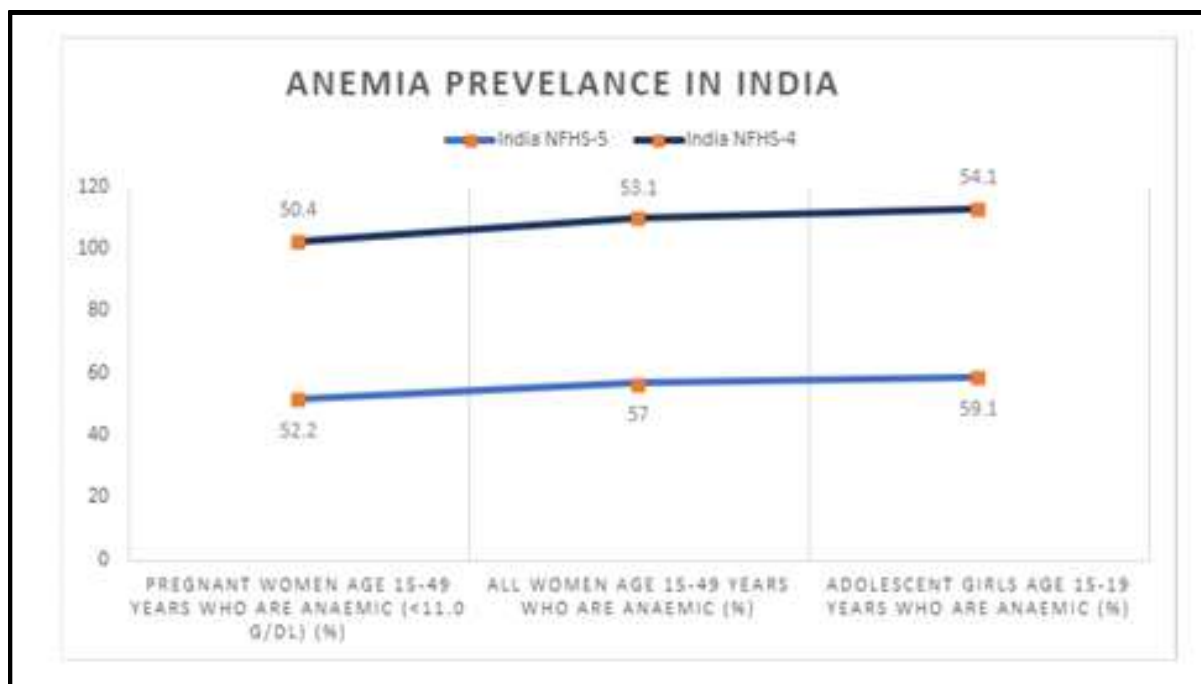


For the vegetable category, Sikkim, Andaman & Nicobar Islands, and Mizoram account for the top 3 in terms of consumption value for both rural and urban areas while the bottom 3 are taken up by Jharkhand, Madhya Pradesh and Rajasthan for the rural areas and Uttar Pradesh, Kerala, and Madhya Pradesh for the urban areas respectively.



TRENDS IN ANAEMIA PREVALENCE ACROSS INDIA:

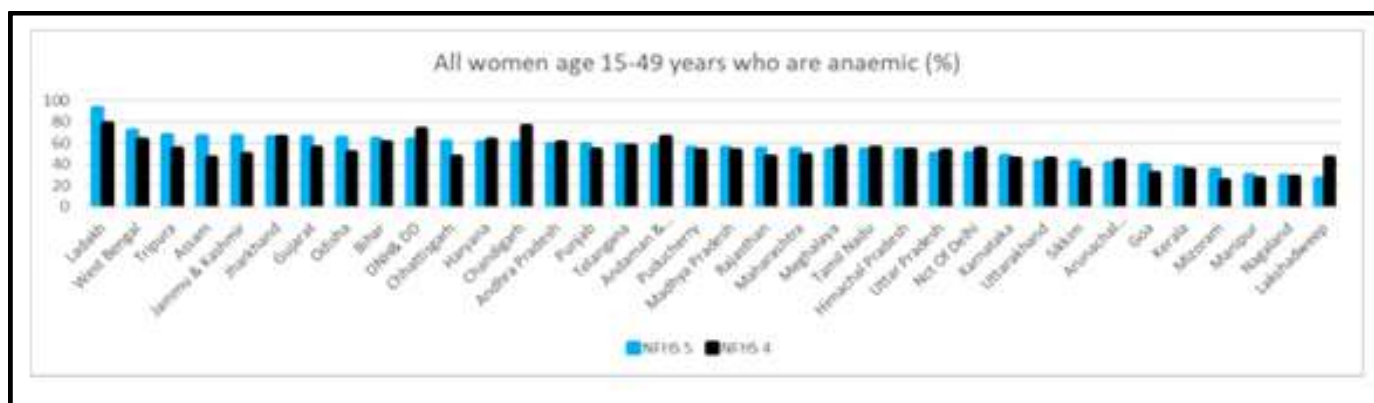
Iron deficiency has significantly increased in the country since 2003-04 and has seen a sharp rise in recent years. As per the Anaemia Mukt Bharat published in 2022, consolidating information from NFHS 4 and 5 (National Health Family Survey) to provide the current situation of anaemia prevalent across the country, it can be observed that 57% of all women and 52.2% of pregnant women aged between 15-49 years were found anaemic, while the share for adolescent girls aged between 15-19 years was found to be 59.1%. From this information, it can be inferred that in all these categories, the share of anaemia is more than 50% which showcases the urgency of the situation and the requirement of targeted intervention in this area.



After reviewing the overall trend in the country, we analysed the situation across respective states, for the whole women category aged between 15-49 years old, it has been observed that Ladakh has recorded that 92.4% of women are anaemic according to the NFHS-5 (2019-21) followed by West Bengal, Tripura, and Assam at 71.4, 67.2, and 65.9 per cent respectively. Lakshadweep has been marked with significant improvement for the last few years, the share has declined from 46% in NFHS-4 in 2015-16 to 25.8% in NFHS-5 in 2019-21.

It has been noticed that in general, the proportion of women aged between 15-49 who were found to be anaemic has significantly increased from the time period of 2015-16 to 2019-21. It can be observed that there has been a significant change in the percentage share of anaemic prevalence across states, the change has been mostly recorded in double-digits including both the positive and negative growth in relation to data found in NFHS 4 and 5.

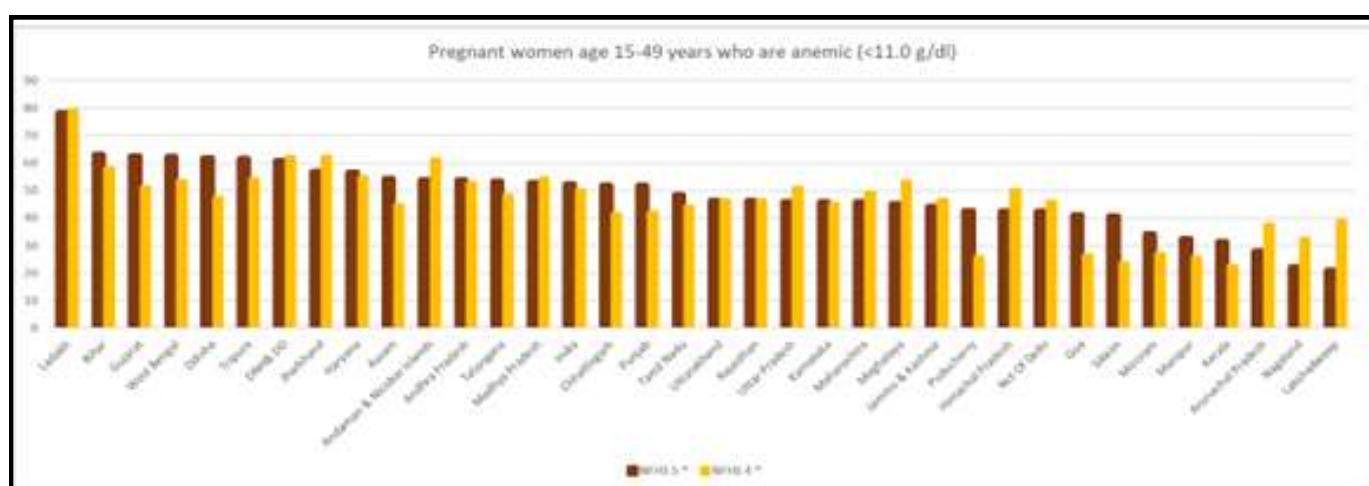
In between the short time span of the two surveys, some states such as Odisha, Jammu and Kashmir, Gujarat etc. have witnessed an increase by more than 10% in the proportion of women who were anaemic while states like Chandigarh, Andaman and Nicobar Island and Dadra and Nagar Haveli & Daman and Diu has seen a decline in anaemia of about 10-12%. Although there has been significant proportionate change in the share of anaemia cases across states in India, the anaemia percentage share is still very high across many states. The states that have the lowest proportion of anaemia prevalence among women in the country are Lakshadweep, Nagaland, and Manipur accounting for 25.8, 28.9 and 29.4 per cent respectively.



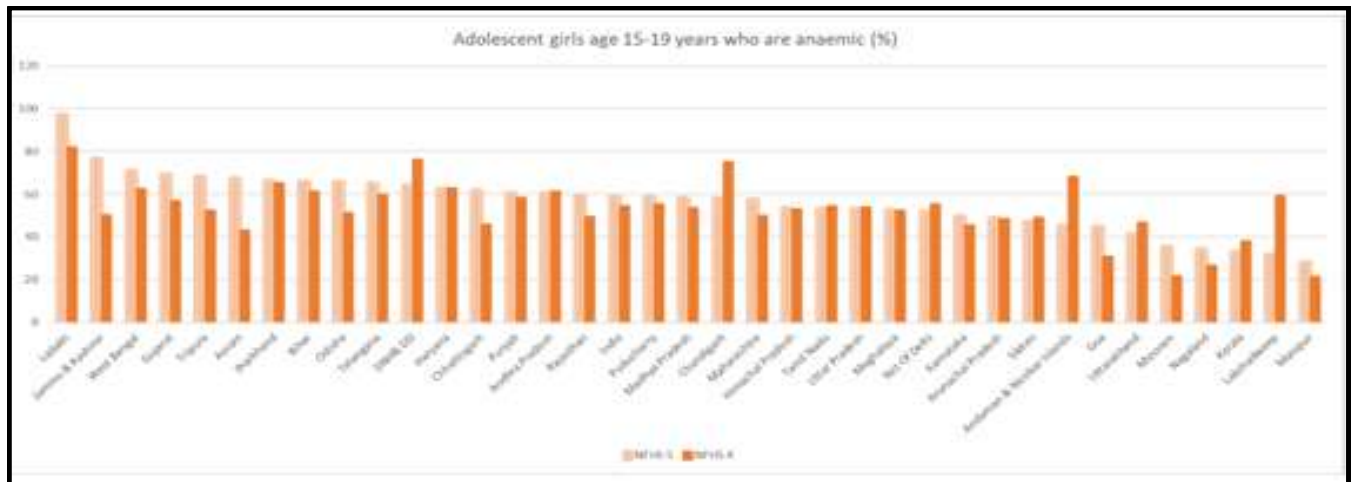
Likewise, the paper has discussed the analysis of pregnant women aged between 15-49 years who are anaemic across the country. It has been recorded that Ladakh showcases the worst performance in the country

accounting for 78.1%, followed by Bihar and Gujarat at 63.1% and 62.6% respectively. In contrast to the less favourable results in some regions, several southern, eastern, and northeastern states have shown better outcomes. Lakshadweep, for instance, has the lowest anaemia rate in the country, with only 20.9% of pregnant women aged 15-49 being affected.

Additionally, Arunachal Pradesh and Nagaland have also performed well, with anaemia rates among pregnant women at 27.9% and 22.2%, respectively. It is surprising to note that Odisha has observed a sharp spike in anaemia among lactating women from 47.6% in 2015-16 to 63.1% in 2019-21, reflecting the urgent intervention required by the government officials to understand the intricacies of the situation. This is not the case just with Odisha but can be observed for many eastern and north-eastern states that they have observed a sharp increase in anaemic prevalence from 2015-16 to 2019-21.



n the adolescent girls aged 15-19 years and are anaemic, the highest proportion is contributed by Ladakh (96.9%) followed by Jammu and Kashmir, West Bengal, and Gujarat respectively at 76.2%, 70.8% and 69% respectively. The states which have the lowest proportion of adolescent girls who are anaemic are Kerala, Lakshadweep, and Manipur accounting for 32.5%, 31.4% and 27.9% respectively.



ANAEMIA AND DIET:

Anaemia can be described as a condition marked with low red blood cells or haemoglobin concentration in the blood to levels generally required to carry oxygen throughout the human body. Although there are several factors that contribute towards this condition, one of the major factors contributing towards anaemia is the inadequate diet substantiated with low nutritive values or nutrient deficient diet can significantly lead towards this situation.

Iron deficiency is one of the reasons but the deficiency of other micronutrients like vitamin B12, riboflavin etc also leads to anaemia, and these deficiencies generally occur due to poor dietary patterns and habits followed by humans.

The major source of iron in nature meant for human composition is found to be in animal-based food items like beef, liver, seafood etc. The relative share of iron per 100g of food consumption has been observed to be higher in animal-based food items as compared to plant-based food items as per nutritive composition reports, therefore people having a plant-based or vegan-oriented diet require higher intake than people having an animal-based diet.

The consumption accounts for only one part of the picture, the relative absorption of iron and other micronutrients in the blood after intake is also an important key to the entire situation. According to reports, foods rich in this nutrition can be broadly classified into two major categories i.e. Heme iron-rich foods and Non-Heme iron-rich foods.

The heme iron-rich foods, majorly animal-based, are those iron rich food types which after being consumed can be relatively absorbed easily in the blood as compared to the non-heme rich food types i.e. heme iron has higher bioavailability and is absorbed more readily than non-heme iron.

A diet predominantly rich in non-heme iron-rich food, majorly plant-based, needs to be substantiated with items that can facilitate easier absorption of iron in the blood. Reports suggest that the intake of micronutrients like Ascorbic Acid, vitamin C etc facilitates iron absorption in the blood. These micronutrients are majorly found in fruits, especially in citrus fruits; therefore, consumption of fruits can help increase the iron absorption in the blood, and micronutrients like vitamin C can also potentially counteract the inhibitory ability of phytic acid that reduces the iron absorption in the blood.

These nutrient deficiencies can be countered by taking iron and related supplements to meet the nutritional requirements of a diet.

Diet refers to the combination of food consumed by individuals. A healthy and balanced diet means consuming a wide variety of foods in the right proportion to maintain the well-being of the body. A balanced diet contains an adequate amount of all the nutrients required by the body to grow, remain healthy and disease-free. The daily recommended dietary allowance for an individual of different age groups for iron is mentioned below:

Life-Stage Group	Iron (mg/d)	Life-Stage Group	Iron (mg/d)	Life-Stage Group	Iron (mg/d)	Life-Stage Group	Iron (mg/d)	Life-Stage Group	Iron (mg/d)	Life-Stage Group	Iron (mg/d)
Infants		Children		Males		Females		Pregnancy		Lactation	
0-6 mo	0.27*	1-3 y	7	9-13 y	8	9-13 y	8	14-18 y	27	14-18 y	10
7-12 mo	11	4-8 y	10	14-18 y	11	14-18 y	15	19-30 y	27	19-30 y	9
				19-30 y	8	19-30 y	18	31-50 y	27	31-50 y	9
				31-50 y	8	31-50 y	18				
				51-70 y	8	51-70 y	8				
				> 70 y	8	> 70 y	8				

This table has been extracted from (taken from the DRI reports, see www.nap.edu), presents Recommended Dietary Allowances (RDAs) in bold type and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). The table showcases that women aged 14-50 years and pregnant women aged 14-50 years require the highest iron intake in their body. On the contrary, it has been observed from NFHS-5 and NFHS-4 that more than 50% of all women aged 15-49 whether they are adolescent girls, pregnant or lactating women suffer from anaemia again highlighting the urgent intervention required by government officials.

The source of iron intake in the diet is diverse across the country, some states acquire it majorly through animal sources and some through plants but the proportion of states attaining heme iron found in animal sources is less. In India the greater proportion of population intakes plant based food items substantiating the fact that India accounts for the largest share of vegetarians population across the world and some reports suggest that India also has the lowest meat consumption rate in the world and after doing a closer review to understand the reason of non-uniform distribution of anaemia across states (as mentioned in the earlier section) and its relation to the consumption pattern being followed across India, we have come across the fact that the states such as Telangana, West Bengal and some northern states, which are highly anaemic, mostly does their iron intake from cereal consumption specifically wheat and rice which are even poorer sources of iron as compared other coarse grains, they also have minimal fruits consumptions which further adds to already poor situation in these states, whereas states such as Kerala, Goa, Chandigarh, Sikkim and Tripura which are relatively better off in terms of anaemia prevalence, primarily consume fruits (fresh) and less cereals to meet their requirements.

It has been recorded that the people in the country generally have a non-heme diet compared to the heme foods. Meat-based heme iron has a much higher absorption (up to 35%) when compared to plant-based non-heme iron (2– 10%). Moreover, meat can also enhance the absorption of non-heme iron. However, in Indian diets, up to 95% of the total daily iron intake is through non-heme iron. The main dietary iron sources in a vegetarian diet are legumes, dried beans, cereals primarily millets, soybean, nuts, dried fruits, and green leafy vegetables. Cereals are also known to have phytates or phytic acid which are natural inhibitors of iron absorption further adding to the already poor picture. Even though vegetarian diets may contain iron amounts comparable to omnivorous diets, the bioavailability of plant-based iron is impacted due to the presence of intrinsic factors that hinder absorption. The world is currently capturing the trend of veganism across different nations.

According to the National Cancer Institute, a vegan is “a person who does not eat any food that comes from animals, including meat, eggs, and dairy products.” It is shown in previous research that iron consumption in vegans and vegetarians is lower than people who consume meat however, it is a well known fact that Vitamin C has an attribute of increasing iron absorption and thus can be helpful in increasing the iron absorption rate in the blood of these individuals. The sharp rise in the vegan population and decline in meat and other non-vegetarian, pose a challenge to the Indian Economy as it further can reduce the iron absorption rate among the individuals and can lead to an increase in the anaemia prevalence in the country attributing women at a greater risk.

CONCLUSION:

The analysis of HCES: 2022-23 has surveyed over 8723 villages, covering 155,014 households in the rural sector and 6115 blocks covering 106,732 households in the urban sector. After reviewing the entire survey report, we observed considerable changes across both food and non-food consumption over the past few decades at both the state level and national level. Although there were significant changes in both sections, the expenditure on food consumption showed stark changes which led us to do a more detailed analysis of this area. Our analysis showcased that there has been a continuous downturn in the consumption of cereals, over the decades, further delving into this area it was observed that the varieties of cereal being consumed have diminished over time, the current trend shows that a major portion of cereal diet is composed of rice and wheat rather than coarse grains which are health effective for the human body. This observation led us to link the food consumption expenditure pattern to the poor state of health that prevails in the country. India's share in chronic health situations is very high, it suffers from very high malnutrition, it has one of the largest proportions of diabetic patients, and also has a huge prevalence of anaemia across the country etc. We directed our focus to mainly understand the relationship of anaemia with human food consumption or diet patterns, this objective was achieved through a detailed review of HCES 2022-23 substantiated with other anaemia, health, and nutrition-related reports.

At the national level, the consumption of wheat and rice has increased since the 1999-'00 period, whereas demand for coarse cereals has declined due to changing food patterns since the 1990s. Since the consumption of coarse cereals has decreased, this has led to a decline in the overall iron intake in cereals and as the people in the country primarily have a plant-based diet which are non-heme iron-rich items that have a low blood absorption issue and low bioavailability than animal sources, thus this study highlights the need to increase the consumption of those food items and supplements that would help complete the necessary micronutrient requirement needed for having a healthy human body. The intervention has become more necessary due to the growing trend of veganism across the world in recent years and adding the fact that India has one of the lowest meat consumption rates, all this has led to an increase in iron deficiency in the country leading to a high anaemic prevalence throughout and placing India at the 170th rank out of 180 listed countries for women's anaemia according to the Global Nutrition Assessment 2016. Thus, our study highlights the need to diversify food plate options at the household level across states to bring change in the source of iron and other necessary micronutrients like vitamin C, riboflavin etc. intake.

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THE IMPACT OF MICROFINANCE INSTITUTIONS ON POVERTY REDUCTION: A CASE STUDY OF INDIA

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ABSTRACT

Microfinance, a crucial tool for economic development, provides financial services to low-income clients who lack access to traditional banking. This study examines the role of Microfinance Institutions (MFIs) in poverty reduction in India, where a significant portion of the population lives below the poverty line. By offering credit, savings, insurance, and social intermediation services, MFIs have fostered financial inclusion and entrepreneurial activities among the poor. This research evaluates the effectiveness of microfinance in alleviating poverty by analyzing various dimensions such as income, employment, education, health, and social empowerment. The study identifies key challenges and successes within the sector and proposes policy measures to enhance the impact of microfinance programs. Through comprehensive analysis and actionable recommendations, this study aims to guide policymakers and stakeholders in optimizing the role of microfinance in addressing poverty and promoting socio-economic development in India

KEYWORDS

Microfinance, Poverty reduction, Financial inclusion, Economic development, Microfinance institutions (MFIs), Socio-economic development, Entrepreneurial activities, policy measures

INTRODUCTION

1.1 Background and significance of microfinance

Microfinance is an economic development approach that involves providing financial services, through institutions, to low-income clients, where the market fails to provide appropriate services. The services provided by the Microfinance Institutions (MFIs) include credit saving and insurance services. Many microfinance institutions also provide social intermediation services such as training and education, organizational support, health and skills in line with their development objectives.

In India, where a significant portion of the population lives below the poverty line, microfinance has emerged as a critical intervention to address financial exclusion. The country's microfinance sector has experienced substantial growth, contributing to socio-economic development by enabling financial inclusion and fostering entrepreneurial activities among the poor. This study examines the impact of microfinance institutions (MFIs) on poverty reduction in India, highlighting the successes and challenges faced by the sector.

1.2 Objectives and scope of the study

In light of the growing importance of microfinance in India's socio-economic landscape, it becomes imperative to evaluate its effectiveness in poverty alleviation. First, the study aims to examine poverty levels from various perspectives, considering different variables such as income, employment, education, health, and social empowerment. By analyzing these dimensions, the study seeks to provide a comprehensive understanding of how microfinance impacts different aspects of poverty.

Secondly, the study intends to suggest policy measures to improve the effectiveness of microfinance programs. Through a detailed examination of existing practices, challenges, and successes, the study will identify key areas for policy intervention. These recommendations will aim to enhance the reach and impact of microfinance institutions, ensuring that they better serve the needs of the economically disadvantaged and contribute more effectively to poverty reduction.

By addressing these objectives, the study aspires to provide valuable insights and actionable recommendations that can guide policymakers, practitioners, and stakeholders in optimizing the role of microfinance in poverty alleviation.

1.3 Overview of the microfinance sector in India

The microfinance sector in India is diverse, comprising a range of institutions including Non-Governmental Organizations (NGOs), Self-Help Groups (SHGs), Non-Banking Financial Companies (NBFCs), and cooperative societies. Each of these entities plays a crucial role in delivering microfinance services to underserved populations, offering financial products that include small loans, savings accounts, insurance, and other essential financial services.

The evolution of microfinance in India can be traced back to the establishment of the SHG-Bank Linkage Program (SBLP) by the National Bank for Agriculture and Rural Development (NABARD) in the early 1990s. This program aimed to link informal groups of poor individuals with formal financial institutions, thereby facilitating access to credit and other financial services. Over the years, the microfinance sector has expanded significantly, driven by the efforts of pioneering organizations such as SKS Microfinance, Bandhan Bank, and Grameen Koota.

Despite its growth and the significant impact it has had on financial inclusion, the sector faces several challenges. These include regulatory hurdles, the over-indebtedness of borrowers, the need for sustainable funding sources, and operational disruptions caused by external shocks like the COVID-19 pandemic. These challenges underscore the need for a comprehensive evaluation of the sector's effectiveness in poverty alleviation and the identification of areas for improvement.

THEORETICAL FRAMEWORK OF MICROFINANCE AND POVERTY REDUCTION

2.1 Review of global and regional studies on microfinance impact

Microfinance operates within several theoretical frameworks that underscore its potential to alleviate poverty. The financial inclusion theory posits that providing access to financial services empowers low-income individuals to invest in income-generating activities, thereby improving their economic well-being. This theory is supported by global and regional studies, such as those in India where initiatives like the SHG-Bank Linkage Program have successfully linked marginalized groups with formal financial institutions, facilitating credit access and economic growth.

2.2 Critical perspectives and debates on the effectiveness of microfinance

Global and regional studies provide varying perspectives on the impact of microfinance on poverty reduction. Empirical evidence from diverse contexts, including South Asia and sub-Saharan Africa, indicates that microfinance interventions have positively influenced income generation, asset accumulation, and household welfare. For instance, studies in Bangladesh have shown that microfinance has led to increased business investments and improved living standards among borrowers.

However, the effectiveness of microfinance in poverty alleviation has also been subject to critique. Research from India and Latin America highlights challenges such as over-indebtedness and limited long-term impact on poverty reduction. These studies suggest that while microfinance can provide immediate financial relief, sustainable poverty reduction requires complementary interventions addressing broader socio-economic barriers.

In summary, while global and regional studies affirm the potential of microfinance to empower individuals and communities economically, they also emphasize the need for nuanced approaches that account for local socio-economic contexts and challenges. Integrating these findings into policy frameworks can enhance the effectiveness of microfinance programs in achieving sustainable poverty reduction goals worldwide.

2.3 Methodology

To investigate the impact of microfinance on poverty reduction in India, this study employs a mixed-methods approach integrating qualitative and quantitative analyses. The research design involves a systematic review of global and regional studies to establish a theoretical framework linking microfinance interventions with poverty alleviation. Data collection methods include both qualitative interviews with stakeholders and beneficiaries, and quantitative analysis of demographic profiles and economic indicators.

Case studies are selected based on criteria that reflect diverse socio-economic contexts across India, ensuring a comprehensive representation of microfinance outcomes. Analytical techniques such as regression analysis and poverty indices calculation (Headcount Index, Poverty Gap Index) will be utilized to assess changes in income levels, employment generation, access to education and healthcare, and overall improvements in living standards. This methodological framework aims to provide robust insights into the effectiveness of microfinance in combating poverty, offering actionable recommendations for policy and practice.

HISTORY AND EVOLUTION OF MICROFINANCE INSTITUTIONS (MFIS)

The roots of microfinance can be traced back to the early 1800s, with theorists like Lysander Spooner[16] advocating for small credits to help entrepreneurs and farmers alleviate poverty. The modern concept of microfinance gained significant momentum in the 1970s, primarily due to Dr. Mohammad Yunus's efforts. Yunus, during his tenure as an economics professor at Chittagong University, began lending to poor women in Jobra, Bangladesh. This initiative eventually led to the establishment of Grameen Bank in 1983, which proved that providing financial services to the poor could be sustainable without subsidies. The success of Grameen Bank highlighted the reliability of poor borrowers and set the stage for similar initiatives worldwide.

In India, the concept of microfinance dates back to the establishment of Syndicate Bank in 1921, which focused on raising micro deposits and providing micro loans. However, it wasn't until the 1970s and 1980s, with the introduction of various poverty alleviation programs like the Integrated Rural Development Programme (IRDP), that microfinance began to take shape. Despite these early efforts, the sector faced significant challenges due to poor execution and widespread malpractices.

A major turning point for Indian microfinance came in the early 1990s with the introduction of the Self-Help Group (SHG) model, supported by the National Bank for Agriculture and Rural Development (NABARD). This model linked informal groups of women to banks, allowing them to access financial services, and the SHG-Bank Linkage Programme (SBLP) became one of the most successful microfinance initiatives in the world.

3.1 Key Players and Stakeholders in the Indian Microfinance Sector

The Indian microfinance sector is supported by various key players and stakeholders. NABARD has been instrumental in promoting the SHG-Bank Linkage Programme, which has become a cornerstone of the sector. The influence of Dr. Mohammad Yunus and the Grameen Bank model has also been significant. Numerous Microfinance Institutions (MFIs),

such as SKS Microfinance, Bandhan Bank, and Ujjivan Financial Services, operate in India, providing microloans to underserved populations. Self-Help Groups (SHGs) play a crucial role in facilitating access to credit for women in rural areas. Additionally, the Government of India has launched various schemes to support microfinance activities, and NGOs have been pivotal in mobilizing SHGs and providing financial literacy and training.

3.2 Regulatory Framework and Policy Environment

The regulatory framework for microfinance in India has evolved to create a structured and transparent environment. The Reserve Bank of India (RBI) regulates NBFC-MFIs (Non-Banking Financial Company-Microfinance Institutions) to ensure financial stability and protect borrowers' interests. Key regulatory developments include the RBI's guidelines on loan sizes, interest rates, and borrower indebtedness. Although the Microfinance Institutions (Development and Regulation) Bill, 2012, was not enacted, it aimed to provide a comprehensive regulatory framework for the sector. NABARD also plays a significant role in promoting and regulating SHGs, providing refinance support to banks. Industry associations like Sa-Dhan and Microfinance Institutions Network (MFIN) work towards standardizing practices, advocating for the sector, and ensuring client protection.

3.3 Socio-Economic Profile of Beneficiaries

Microfinance beneficiaries in India typically come from low-income, rural households. A significant proportion of clients are women, reflecting the sector's focus on empowering women and promoting gender equality. Most beneficiaries reside in rural areas with limited access to traditional banking services. These beneficiaries often belong to the bottom of the income pyramid and have limited access to formal financial services. Microfinance loans are commonly used for entrepreneurial activities such as small-scale farming, livestock rearing, and petty trade, enabling beneficiaries to improve their income and living standards. Access to microfinance has shown positive social impacts, including better education and healthcare for beneficiaries' families, improved food security, and enhanced social status for women.

DEMOGRAPHIC CHARACTERISTICS OF MICROFINANCE BENEFICIARIES

- **Economic Activities and Income Sources**

Microfinance beneficiaries in India typically engage in a range of small-scale economic activities, which serve as their primary sources of income. These activities include agriculture, animal husbandry, small retail shops, handicrafts, and various services such as tailoring, repair work, and food vending. Agriculture remains a predominant occupation, with many beneficiaries utilizing microloans to purchase seeds, fertilizers, and other inputs. Similarly, animal husbandry, including dairy farming and poultry, is a significant source of income. Retail trade and small businesses, such as local shops and stalls, also feature prominently among the economic activities of microfinance clients. These ventures require minimal initial investment and offer quick returns, making them suitable for low-income households. The diversification of income sources through microfinance loans helps beneficiaries reduce their dependence on a single livelihood, thereby enhancing their economic stability and resilience.

- **Education Levels and Household Composition**

The education levels among microfinance beneficiaries are generally lower than the national average, reflecting broader socio-economic challenges. Many beneficiaries have limited formal education, often not exceeding primary or secondary schooling. This demographic characteristic underscores the importance of integrating financial literacy and educational programs within microfinance initiatives. Such programs equip beneficiaries with essential skills for effective loan management and business operations, thereby enhancing the overall impact of microfinance.

Household composition among microfinance clients typically includes larger families with multiple dependents. This structure underscores the significant role of microfinance in supporting not just individual entrepreneurs but entire families. By providing financial resources to women, who make up a substantial portion of microfinance clients, these programs contribute to improved household welfare. Empowering women through microfinance has been associated with better educational outcomes for children, improved healthcare, and enhanced decision-making within the household. The economic empowerment of women leads to broader social benefits, reinforcing the importance of targeting women in microfinance programs.

- **Impact Assessment of Microfinance**

The impact of microfinance on beneficiaries encompasses several dimensions, including poverty alleviation, women's empowerment, financial inclusion, employment generation, community development, and improvements in education and healthcare. Microfinance has proven to be an effective tool for poverty alleviation by providing access to credit for income-generating activities.

Beneficiaries utilize loans to start or expand small businesses, leading to increased household income and asset accumulation. This access to financial services helps break the cycle of poverty and promotes economic mobility.

Women's empowerment is a significant outcome of microfinance. A large proportion of microfinance clients are women, and their participation in these programs has led to increased involvement in household and community decision-making. Empowering women through microfinance has had positive ripple effects, including better educational and health outcomes for their families. Financial inclusion is another critical impact of microfinance, as it brings the unbanked population into the formal financial system.

By offering financial services to those who previously lacked access, microfinance institutions (MFIs) enhance financial literacy and economic participation among marginalized communities.

Microfinance also contributes to employment generation by supporting small businesses and entrepreneurial ventures. These activities create local job opportunities, fostering economic development and reducing the need for migration to urban areas. Community development is promoted through the formation of Self-Help Groups (SHGs) facilitated by MFIs. These groups provide mutual support, financial training, and collective bargaining power, further amplifying the impact of microfinance. Improved access to credit enables families to invest in education and healthcare, leading to better long-term outcomes for future generations.

The continuous growth and success of microfinance in India highlight its critical role in addressing economic disparities and promoting inclusive growth. By focusing on the needs of the underserved and leveraging innovative financial tools, MFIs help build resilient and self-sufficient communities. These institutions must strive to reduce administrative costs, broaden their resource base, and maintain high performance standards to sustain and expand their impact.

CHANGES IN INCOME LEVELS AND ECONOMIC STABILITY

Microfinance has proven to be a powerful tool for improving income levels and economic stability, particularly among the underprivileged and underserved populations. The transformative impact of microfinance can be seen in various facets of life, including employment generation, entrepreneurship, access to education and healthcare, improved living standards, and housing conditions. Furthermore, an analysis of poverty indices provides a clear indication of the effectiveness of microfinance in alleviating poverty.

- **Employment Generation and Entrepreneurship**

One of the most significant impacts of microfinance is the generation of employment and promotion of entrepreneurship. Microfinance institutions (MFIs) provide small loans to individuals who are typically excluded from traditional banking systems. These loans enable individuals to start or expand small businesses, leading to job creation. For example, a woman in rural India might use a microloan to buy a sewing machine, allowing her to start a tailoring business. This not only provides her with a steady income but also creates job opportunities for others in her community. According to the World Bank, microfinance has led to the establishment of numerous microenterprises, which are critical for economic development in rural and semi-urban areas .

- **Access to Education and Healthcare**

Improved access to financial resources through microfinance has a direct impact on education and healthcare. With increased income, families can afford to invest in their children's education, paying for school fees, uniforms, and books. This investment is crucial as education is a key factor in breaking the cycle of poverty. A report by the National Council of Applied Economic Research (NCAER)^[17] indicates that families with access to microfinance report better educational outcomes for their children .

Healthcare access also improves significantly for microfinance beneficiaries. Increased financial stability allows families to afford medical treatments and preventive care that were previously beyond their reach. Beneficiaries can pay for health insurance, medications, and receive timely medical attention, which leads to better health outcomes and reduced vulnerability to health crises. This is supported by data from the Consultative Group to Assist the Poor (CGAP)^[18], which highlights that microfinance participants have improved health indicators compared to non-participants .

- **Improvement in Living Standards and Housing Conditions**

Microfinance has a profound impact on living standards and housing conditions. Increased income enables families to invest in better housing, including the construction of new homes or improvements to existing ones. These improvements often include the addition of sanitation facilities, access to clean water, and the use of durable building materials, all of which provide better shelter and improve overall living conditions.

The Microfinance Barometer report notes significant improvements in living conditions among microfinance beneficiaries. Better housing not only provides immediate benefits in terms of comfort and safety but also serves as a long-term asset that can be leveraged for future financial stability. Improved housing conditions also contribute to better health and educational outcomes, creating a positive feedback loop that enhances the overall quality of life .

- **Poverty Indices Analysis**

An analysis of poverty indices reveals that microfinance significantly contributes to poverty reduction. The introduction of microfinance services has led to measurable decreases in poverty levels among participants. Data from the World Bank suggests that households with access to microfinance services show higher levels of asset ownership and lower levels of food insecurity compared to those without access .

Microfinance helps to mitigate the vulnerabilities associated with poverty by providing a financial safety net. This allows poor households to better manage risks related to health emergencies or crop failures, which are common in rural areas. Additionally, financial literacy programs that often accompany microfinance initiatives help beneficiaries make informed decisions about savings, investments, and expenditures, thereby enhancing their economic resilience.

In conclusion, microfinance significantly improves income levels and economic stability through employment generation, entrepreneurship, access to education and healthcare, and improved living standards and housing conditions. These changes are reflected in the poverty indices, which show a clear reduction in poverty levels among microfinance beneficiaries. The transformative power of microfinance lies in its ability to provide the poor with the tools they need to improve their economic situations and overall quality of life.

Table: Demographic and Poverty Impact Information of Microfinance Beneficiaries in Delhi (2023)

Parameter	Before Loan	After Loan
Total Respondents	500	500
Gender Distribution	Female: 80%, Male: 20%	Female: 80%, Male: 20%
Age Distribution	18-24: 12%, 25-50: 65%, >50: 23%	18-24: 12%, 25-50: 65%, >50: 23%
Educational Attainment	Illiterate: 35%, Primary: 25%, Secondary: 30%, Higher: 10%	Illiterate: 35%, Primary: 25%, Secondary: 30%, Higher: 10%
Family Size Distribution	1-2 members: 10%, 3-5 members: 50%, >5 members: 40%	1-2 members: 10%, 3-5 members: 50%, >5 members: 40%
Occupational Distribution	Agriculture: 25%, Wager: 40%, Other: 25%, Unemployed: 10%	Daily Agriculture: 20%, Daily Wager: 35%, Other: 30%, Unemployed: 15%
Poverty Line (Monthly Income)	INR 5000	INR 5000
Headcount Index (Po)	60%	45%
Poverty Gap Index (PG)	25%	15%
Squared Poverty Gap Index (SPG)	15%	8%
Impact on Women's Empowerment	Limited economic participation and decision-making	Significant improvement in decision-making and economic participation
Microfinance Programs	Limited access	Loans, savings, skill training, entrepreneurship support
Average Loan Size	N/A	INR 15,000
Loan Repayment Rate	N/A	92%
Increase in Monthly Income Post-Microfinance	N/A	35% on average

CALCULATIONS AND COMPARATIVE ANALYSIS OF INDICES

Before microfinance intervention:

Given data

- Total respondents (N)= 500
- Poverty line (z)= INR 5000
- Headcount index (HCI) before intervention = 60%
- Poverty Gap index(PGI) before intervention = 25%
- Squared Poverty Gap index (SPGI) before intervention= 15%

HEADCOUNT INDEX (HCI):

HCI	q/N
HCI	0.60 (OR 60%)
Since HCI = 0.60 and N=500	$q = \text{HCI} \times N = 0.60 \times 500 = 300$

So, 300 respondents are below the poverty line.

POVERTY GAP INDEX (PGI)

PGI	$1/N(Z-Y_i/Z)$
GIVEN PGI	25%
PGI	0.25

SQUARED POVERTY GAP INDEX (SPGI)

SPGI	$1/N(Z-Y_i/Z)^2$
GIVEN SPGI	15%
SPGI	0.15

After microfinance intervention:

Given data

- Headcount ratio (HCI) after intervention = 45% A
- Poverty Gap ratio (PGI) after intervention = 15%
- Squared Poverty Gap index (SPGI) after intervention= 8%
- Average increase in monthly income post-incidence= 35%

HEADCOUNT INDEX (HCI):

HCI	q/N
HCI	0.45 (OR 45%)
Since HCI = 0.45 and N=500	$q = \text{HCI} \times N = 0.45 \times 500 = 225$

So, 225 respondents are below the poverty line.

POVERTY GAP INDEX (PGI):

PGI	$1/N(Z - Y_i/Z)$
GIVEN PGI	15%
PGI	0.15

SQUARED POVERTY GAP INDEX (SPGI):

SPGI	$1/N(Z - Y_i/Z)^2$
GIVEN SPGI	8%
SPGI	0.08

Summary of Indices Before and After Microfinance Intervention

Index headcount index (HCI)	Before intervention	After intervention
Headcount index (HCI)	60%	45%
APoverty gap index (PGI)	25%	15%
Squared Poverty Gap Index (SPGI)	15%	8%

Interpretation:

Headcount Index (HCI): There is a significant reduction in the proportion of the population living below the poverty line from 60% to 45%, indicating fewer people are now living in poverty.

Poverty Gap Index (PGI): The average income shortfall from the poverty line has decreased from 25% to 15%, showing an improvement in the financial condition of the poor.

Squared Poverty Gap Index (SPGI): The severity and inequality of poverty have also reduced from 15% to 8%, reflecting a decrease in poverty severity and inequality among the respondents.

These calculations and comparative analysis highlight the effectiveness of microfinance programs in alleviating poverty and improving economic conditions for the beneficiaries. The reduction in poverty indices and the increase in monthly income demonstrate the positive impact of microfinance in promoting financial inclusion and economic empowerment, particularly among women.

DETAILED DESCRIPTION OF THE CASE STUDY: BANDHAN BANK

7.1 Background and Context of the Case Study Area

Bandhan Bank originated as a microfinance institution in 2001 in West Bengal, focusing on providing small loans to women entrepreneurs from economically disadvantaged backgrounds. Over the years, it has expanded its operations across India, becoming a full-fledged bank in 2015 while retaining its focus on microfinance. Bandhan Bank operates with a mission to promote financial inclusion and empower marginalized communities through access to financial services.

7.2 Impact of Microfinance on Poverty Reduction in the Case Study Area

According to Bandhan Bank's Annual Report 2023[19], their microfinance operations have significantly contributed to poverty reduction by empowering over 2 million women borrowers across India. The bank's approach emphasizes not only financial support but also capacity-building and skill development among borrowers, which has led to enhanced income-generating activities and improved livelihoods. For instance, a study conducted by the bank in rural areas of West Bengal indicated that 78% of borrowers reported an increase in household income within the first year of accessing microfinance services.

7.3 Success Stories and Testimonials from Beneficiaries

Beneficiaries of Bandhan Bank's microfinance programs often share compelling success stories. For example, Mrs. Sunita Devi from Bihar, a beneficiary of Bandhan Bank's microfinance, expanded her small tailoring business with a loan and now employs three other women from her village. Such testimonials highlight the transformative impact of microfinance in enabling entrepreneurship and socio-economic empowerment at the grassroots level.

7.4 Challenges and Limitations

Despite its successes, Bandhan Bank faces several challenges in its microfinance operations. The rapid growth in loan portfolios has led to concerns about over-indebtedness among borrowers, prompting the bank to adopt stricter credit assessment measures. Moreover, regulatory changes and fluctuations in interest rates pose operational challenges that affect the bank's ability to sustainably serve its client base.

Bandhan Bank's case study underscores the potential of microfinance to uplift marginalized communities and reduce poverty through targeted financial interventions. However, it also illustrates the complexities and challenges involved in scaling microfinance operations sustainably. By addressing these challenges and building on its successes, Bandhan Bank continues to be a pivotal player in advancing financial inclusion and poverty alleviation efforts across India.

OPERATIONAL CHALLENGES FACED BY MFI'S IN INDIA

The operational landscape of microfinance institutions (MFIs) in India is marked by several profound challenges that affect their ability to serve marginalized communities effectively. Chief among these challenges is the issue of over-indebtedness. MFIs, which provide loans without collateral, often face the dilemma of borrowers taking multiple loans from different sources, leading to a cycle of debt that strains their financial stability. This phenomenon underscores the critical need for robust risk management frameworks within MFIs to assess borrower creditworthiness effectively and mitigate the risks of default.

Additionally, the prevalence of higher interest rates charged by MFIs compared to traditional banks exacerbates financial stress among borrowers. Despite regulatory adjustments allowing for higher interest rates, this disparity contributes significantly to borrower indebtedness, particularly in rural areas where access to alternative financial services is limited. The dependence of MFIs on commercial banks for funding further compounds this issue, as it restricts their financial flexibility and subjects them to the often higher interest rates and shorter loan tenures prevalent in the banking sector.

Moreover, inadequate investment validation poses another significant operational challenge. MFIs often struggle to obtain reliable market data and conduct comprehensive valuations due to the nascent nature of the markets they operate in. This limitation hampers their ability to make informed investment decisions, which are crucial for sustaining growth and ensuring long-term financial health. A critical factor contributing to the challenges faced by MFIs is the lack of financial awareness among the target population. Many rural communities remain unaware of the financial services offered by MFIs, compounded by low levels of financial literacy. This lack of awareness not only impedes access to credit for those who need it but also contributes to widespread financial exclusion, perpetuating cycles of poverty and economic marginalization.

Furthermore, regulatory frameworks designed primarily for traditional banking institutions often do not adequately address the unique operational dynamics of MFIs. The regulatory environment's unpredictability and sometimes conflicting requirements create additional challenges for MFIs, hindering their ability to innovate and adapt their service offerings to better meet the needs of their clients. In addressing these operational challenges, MFIs in India would benefit from enhanced risk management practices, diversified funding sources beyond commercial banks, and targeted financial literacy initiatives. Advocating for regulatory reforms that recognize the distinct role and operational requirements of MFIs could also create a more supportive regulatory environment conducive to sustainable growth and impact in the microfinance sector. Ultimately, addressing these challenges requires a holistic approach that combines regulatory advocacy, strategic partnerships, and innovative solutions tailored to the unique needs of India's microfinance landscape.

POLICY IMPLICATIONS AND RECOMMENDATIONS

- **Policy Measures to Enhance the Effectiveness of Microfinance**

To amplify the impact of microfinance on poverty reduction, several policy measures can be implemented. Firstly, there should be a concerted effort to strengthen the regulatory framework governing microfinance institutions (MFIs). This includes establishing clear guidelines for interest rates, loan repayment schedules, and customer protection mechanisms to prevent over-indebtedness. Regulatory bodies like the Reserve Bank of India (RBI) can play a crucial role in ensuring that MFIs operate within a transparent and accountable framework, thereby enhancing their credibility and effectiveness.

Additionally, fostering an enabling environment for technological innovation is vital. Digital financial services can significantly improve the outreach and efficiency of MFIs by reducing operational costs and expanding access to remote and underserved areas. Policies that promote the adoption of mobile banking, digital payments, and fintech solutions will be instrumental in achieving these goals.

- **Recommendations for Improving MFI Operations and Outreach**

Improving the operations and outreach of MFIs requires a multi-faceted approach. One key recommendation is to invest in capacity-building programs for MFI staff and borrowers. Training programs focused on financial literacy, business management, and digital skills can empower both employees and clients, leading to better financial decisions and business outcomes.

Moreover, MFIs should adopt more flexible and client-centric product offerings. Customizing financial products to meet the diverse needs of clients, such as offering longer repayment periods or lower interest rates for certain groups, can enhance client satisfaction and repayment rates. Emphasizing non-financial services, such as business development support and market linkages, can also help clients leverage financial services more effectively.

Expanding outreach requires strategic partnerships with local governments, NGOs, and other stakeholders. Collaborative efforts can help MFIs access new client segments and provide comprehensive support that addresses both financial and non-financial barriers to poverty alleviation

- **Strategies for Integrating Microfinance with Broader Poverty Alleviation Programs**

Integrating microfinance with broader poverty alleviation programs is essential for maximizing its impact. One effective strategy is to link microfinance initiatives with government welfare schemes. For example, combining microfinance with health insurance programs, agricultural subsidies, and education grants can provide a holistic support system for low-income households.

Another strategy is to promote community-based approaches that encourage collective action and peer support among borrowers. Self-Help Groups (SHGs) and Joint Liability Groups (JLGs)^[20] have proven effective in fostering mutual accountability and social cohesion, which can enhance the sustainability of microfinance programs.

Finally, robust monitoring and evaluation frameworks should be established to assess the impact of microfinance initiatives continuously. Using data-driven insights to refine and adapt programs ensures that they remain relevant and effective in addressing the evolving needs of the target population.

By implementing these policy measures, recommendations, and strategies, stakeholders can enhance the effectiveness of microfinance as a tool for poverty reduction. The case study of Bandhan Bank exemplifies the potential of microfinance to transform lives, while also highlighting the need for ongoing innovation and collaboration to address existing challenges. Policymakers, practitioners, and researchers must work together to create an ecosystem where microfinance can thrive and contribute significantly to sustainable development and poverty alleviation in India.

CONCLUSION

Microfinance has effectively reduced poverty in Delhi, cutting the Headcount Index from 60% to 45%, the Poverty Gap Index from 25% to 15%, and the Squared Poverty Gap Index from 15% to 8%. These outcomes highlight the positive impact of microfinance on improving the financial conditions of the poor and enhancing women's economic participation. However, challenges such as an inadequate regulatory framework and low financial literacy levels persist. Addressing these issues through regulatory reforms, improved risk management, diversified funding, and targeted financial literacy initiatives is essential. Strengthening the regulatory framework and promoting digital financial services can further expand the reach and effectiveness of microfinance, contributing to sustainable poverty reduction in India.

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BEYOND BRICKS AND MORTAR: THE ECONOMIC BLUEPRINT OF HOUSING AFFORDABILITY

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ABSTRACT-

This research examines factors influencing housing affordability across different countries, focusing on annual wages and unemployment rates. By constructing a regression model, the study analyzes the quantitative impact of these factors on the housing affordability index. Statistical measures such as R-squared, F-statistic, and ANOVA are used to assess the model's reliability and the relationships between explanatory variables and housing affordability. The findings provide insights into the mechanisms affecting affordability and offer a foundation for further research on this critical social issue.

KEYWORDS-

Housing affordability, annual wages, unemployment rate, regression model, statistical analysis

JEL CLASSIFICATION CODES-

R31, J31, E24

INTRODUCTION

Housing remains one of the most pressing social issues, fulfilling a fundamental human need alongside food and clothing. For millennials, homeownership is a top priority, as secure and affordable housing drives socioeconomic outcomes like poverty alleviation and economic prosperity. The public sector plays a key role in housing markets, influencing decisions on location, target populations, and development. Economic factors such as unemployment, wage levels, and housing supply significantly impact affordability. Despite growing demand since the industrial revolution, rising prices and limited supply hinder homeownership, especially for lower-income groups.

The Housing Affordability Index (HAI) measures housing accessibility, shaped by unemployment rates and average annual wages. High unemployment reduces household incomes, worsening affordability, while low unemployment boosts wage growth and stability. Similarly, higher wages enhance financial capacity, easing housing costs. In 2019, global uncertainties, including geopolitical tensions and trade disputes, further influenced housing markets, creating varied regional trajectories.

This study examines housing affordability across 50 countries in 2019, focusing on unemployment, wages, and policy interventions. It aims to provide insights for sustainable and inclusive housing markets, addressing gaps in demand and supply. In India, reforms by the National Housing Board have shown gradual progress, yet challenges persist in balancing market dynamics.

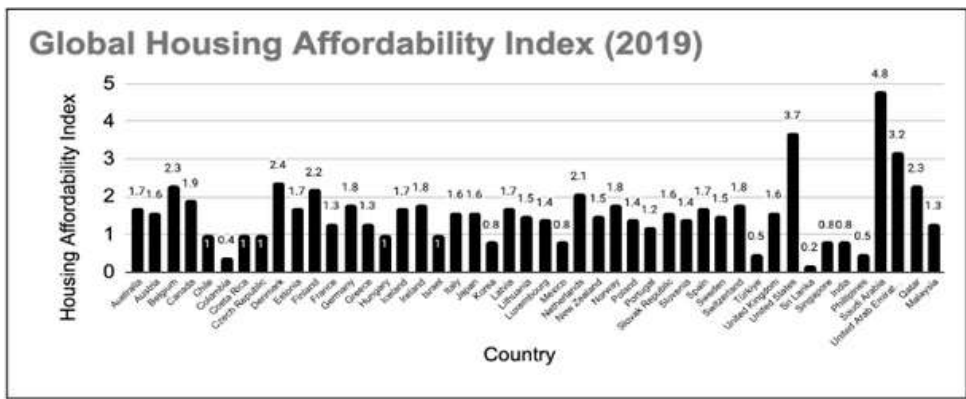


Figure A1: Bar Graph Representation of Table 10.1 (Appendix)

Source: Global Housing Affordability Index (2019)

1.1 Housing Affordability Index

The Housing Affordability Index measures whether a typical family can afford a mortgage on a median-priced home based on current price and income data. A value of 100 means a median-income family can qualify for a mortgage with a 20% down payment. Values >100 indicate more than enough income, while values 100< suggest insufficient income. The index dropped significantly in June 2022 due to rising housing prices, inflation, and interest rates.

1.2 Unemployment rate

The unemployment rate measures the percentage of unemployed individuals in the labor force, calculated as $\text{Unemployed Individuals} / \text{Total Labor Force} \times 100$. The ILO projects that low-income countries in Africa and the Arab region will not return to pre-pandemic unemployment levels in 2023. For instance, North Africa's unemployment rate is expected to rise to 11.2%, compared to 10.9% in 2019. The COVID-19 pandemic caused significant shifts in global labor productivity, with output per worker dropping by 0.6% in 2020, but productivity per hour increased by 4.9%, as lower-productivity sectors and workers were more affected.

1.3 Average Annual Wages

Average annual salary means the wages paid to full-time employees as regular, overtime, vacation, sick, premium overtime, or gain share (bonus). It does not include any payroll taxes paid by the employee or employer nor does it include any retirement or health/life insurance contributions by the employee or employer.

LITERATURE REVIEW

Lee and Ralston (2007) examine housing affordability, focusing on factors like house prices, income distribution, and borrowing costs, while addressing regional disparities and government policy roles. They advocate for targeted interventions, such as land use reforms and affordable housing programs. Their study contributes to discussions on equitable housing access and sustainable market practices.

Hsieh and Moretti (2019) highlight how housing affordability constraints in high-productivity cities lead to spatial misallocation, increasing unemployment and suppressing wages. Restrictive land-use regulations inflate housing costs and deter migration, exacerbating regional income disparities. They call for housing policy reforms to improve affordability and economic efficiency.

Maclennan (2014) explores the global implications of housing affordability, emphasizing its social consequences and the relationship between housing policies, market dynamics, and socio-economic disparities. The study provides insights into policy interventions addressing housing crises.

Piyush Tiwari and Jyoti Parikh (1996) find that housing demand in India is more responsive to price changes than income, as demand is inelastic with respect to income and elastic with respect to price.

Jaya G. Prabhu Parrikar In her study links macroeconomic variables with the House Price Index, noting that high house prices in India are unsustainable in the long run and could threaten financial stability due to the large share of housing loans in total bank lending.

HYPOTHESIS MODELS

Based on the literature review, housing affordability index (HAI 2019) is the dependent variable, average household wages and rate of unemployment are the independent variables chosen for the study.

3.1 Hypothesis Model 1: Relation Between HAI & Average Household Wages

Priori Statement: It is hypothesized that higher average household wages positively correlate with improved housing affordability, as increased incomes enhance purchasing power and ease access to housing. Consequently, higher wages are expected to reduce the income proportion spent on housing, improving the affordability index.

Testing Slope Coefficients:- Null Hypothesis - $H_0 : \beta_2 = 0$ Average Household Wages $\beta_2=0$ i.e. there is no statistically significant relationship between Average household wages and housing affordability index. Alternative Hypothesis - $H_a : \beta_2 > 0$ There is a positive relationship between Average household wages and housing affordability index.	Testing Intercept Coefficients:- Null Hypothesis - $H_0 : \beta_1 = 0$ Average Household Wages $\beta_1=0$ i.e. there is no statistically significant relationship between Average household wages and housing affordability index. Alternative Hypothesis - $H_a : \beta_1 > 0$ There is a positive relationship between Average household wages and housing affordability index.
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Table A1: Hypothesis Model 1

3.2 Hypothesis Model 2: Relation Between HAI & Unemployment Rate

Priori Statement: The relationship between unemployment and housing affordability is hypothesized to be inversely proportional, where higher unemployment reduces household incomes and impairs housing affordability. Prolonged unemployment depletes savings and assets, further weakening financial stability and making it difficult for individuals to secure housing. Additionally, high unemployment rates discourage homeownership and increase rental demand, exacerbating affordability challenges.

Testing Slope Coefficients:- Null Hypothesis - $H_0 : \beta_2 = 0$ Unemployment Rate $\beta_2=0$ i.e. there is no statistically significant relationship between the rate of unemployment in 2019 and its corresponding housing affordability index. Alternative Hypothesis - $H_a : \beta_2 < 0$ There is a negative relationship between the rate of unemployment and housing affordability index.	Testing Intercept Coefficients:-A Null Hypothesis - $H_0 : \beta_1 = 0$ Intercept Coefficient $\beta_1=0$ i.e. there is no statistically significant relationship between Intercept coefficient and the dependent variable. Alternative Hypothesis - $H_a : \beta_1 > 0$ Intercept Coefficient holds significance and thus impacts the value of the dependent variable.
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Table A2: Hypothesis Model 2S

3.3 Hypothesis Model 3: Multivariable Linear Regression

Null Hypothesis - $H_0: \rho = 0$ The null hypothesis ($H_0: \rho = 0$) posits no correlation between the variables, where ρ represents the population correlation coefficient. Rejecting the null hypothesis suggests a significant correlation between the variables, while failing to reject it indicates insufficient evidence to confirm any correlation.
Alternative Hypothesis - $H_a: \rho > 0$ The alternative hypothesis ($H_a: \rho > 0$) suggests a positive correlation between the independent and dependent variables. Here, ρ represents the correlation coefficient, indicating the strength and direction of the relationship. If $\rho > 0$, it implies that as one variable increases, the other is expected to increase as well.

Table A3: Hypothesis Model 3

RESEARCH METHODOLOGY

The literature review identified Average Household Wages and the unemployment rate as key explanatory variables for the regression analysis. Data from the OECD was used, and summary statistics were calculated for the variables and housing affordability index (HAI). Hypothesis testing and multiple R-squared were applied to build the model. After computing the regression equation in RStudio, CLRM assumptions were verified to ensure model validity.

4.1 Classical Linear Regression Model (CLRM) Assumptions

4.1.1 Linearity Assumption

The linearity assumption in CLRM states that the relationship between the independent variables and the dependent variable is linear. This means that the change in the dependent variable for a one-unit change in the independent variable is constant. If this assumption is violated, it suggests that the model may be misspecified, and the estimated coefficients may be biased.

4.1.2 Normality Assumption of Residuals

This assumption states that the residuals (the differences between observed and predicted values) are normally distributed. It's based on the Central Limit Theorem, which suggests that the sampling distribution of the regression coefficients tends to be normal for large samples. Departure from normality could lead to inefficient estimates and affect the validity of statistical tests.

4.1.3 Homoscedasticity Assumption

Homoscedasticity means that the variance of the residuals is constant across all levels of the independent variables. In other words, the spread of the residuals should be the same along the regression line. Violation of this assumption (heteroscedasticity) may lead to biased and inefficient estimators, affecting the precision of the coefficients.

4.1.4 Independence Assumption

The independence assumption states that the errors (residuals) are independent of each other. In other words, knowing the value of one residual should not provide any information about the value of another residual. Violation of this assumption (autocorrelation) can lead to biased and inconsistent estimates of the coefficients and standard errors.

4.1.5 Multicollinearity

Multicollinearity occurs when two or more independent variables in a multiple regression model are highly correlated with each other. It can inflate the standard errors of the regression coefficients, making them unstable and difficult to interpret. High multicollinearity can make it challenging to identify the individual effects of each independent variable on the dependent variable.

TESTING CLRM ASSUMPTIONS FOR MODEL 2

6.1 Test for Normality

A QQ plot is a scatterplot created by plotting two sets of quantiles against each other. On this plot, normally distributed data appears as a roughly straight line. Figure A6 clearly shows that quantile points on the QQ plot almost lie on the theoretical normal line.

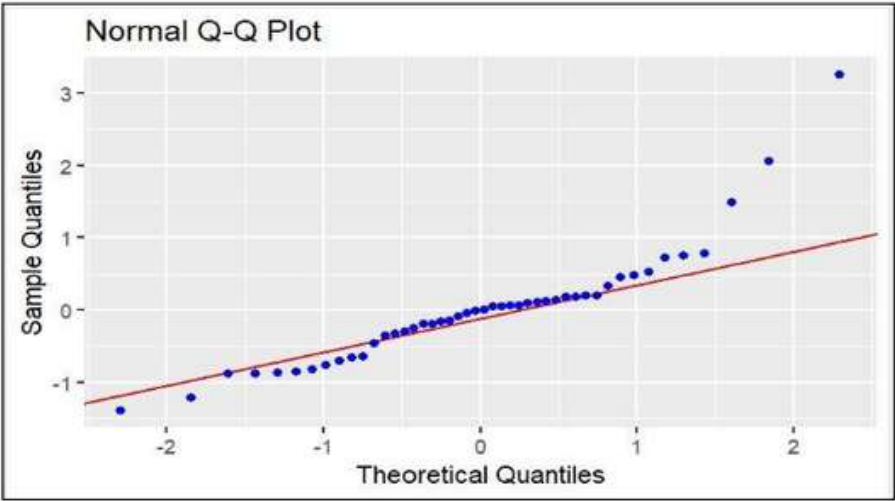


Figure A6: Normal QQ Plot

```
> ols_test_normality(model3)
```

Test	Statistic	pvalue
Shapiro-Wilk	0.8678	1e-04
Kolmogorov-Smirnov	0.1874	0.0691
Cramer-von Mises	6.2633	0.0000
Anderson-Darling	1.4977	6e-04

Figure A7: OLS Normality Test Result

Normality tests on the unemployment rate suggest a deviation from normality. The Shapiro-Wilk test produced a statistic of 0.8678 with a p-value of 1e-04, indicating a significant departure. The Cramer-von Mises test also showed a high statistic of 6.2633 with a p-value of 0.0000. While the Kolmogorov-Smirnov and Anderson-Darling tests show less evidence against normality, the strong results from Shapiro-Wilk and Cramer-von Mises suggest the data likely do not follow a normal distribution.

6.2 Jarque Bera Test

The Jarque-Bera test conducted on the residuals indicates a departure from normality. With a test statistic of X-squared = 62.696 and 2 degrees of freedom, the test result strongly rejects the null hypothesis of normality. The extremely low p-value of 2.431e-14 provides compelling evidence against the assumption of normal distribution for the residuals, suggesting significant skewness and kurtosis in the data. Thus, based on this test, it can be concluded that the residuals do not follow a normal distribution.

```
> jarque.bera.test(residuals)

      Jarque Bera Test

data:  residuals
X-squared = 62.696, df = 2, p-value = 2.431e-14
```

Figure A8: Jarque Bera Test Result

6.3 Heteroscedasticity

The studentized Breusch-Pagan test shows no significant evidence of heteroscedasticity in the regression model. With a test statistic of 0.097405 and a p-value of 0.755, there is insufficient evidence to reject the null hypothesis of homoscedasticity. This suggests that the variance of errors remains constant across different values of the "Unemployment Rate," indicating that the assumption of homoscedasticity is likely met.

```
> bptest(model3)

      studentized Breusch-Pagan test

data:  model3
BP = 0.097405, df = 1, p-value = 0.755
```

Figure A9: Breusch-Pagan Test Result

TESTING CLRM ASSUMPTIONS FOR MODEL 3

7.1 Test for Normality

A QQ plot compares two sets of quantiles, with normally distributed data appearing as a straight line. Figure A10 shows that the quantile points closely align with the normal line. Testing normality involves visual methods like histograms and QQ plots, alongside tests like Shapiro-Wilk and Kolmogorov-Smirnov. A significant p-value indicates a departure from normality, but sample size and data shape should also be considered. If data fail normality tests, alternative methods like transformations or non-parametric analyses can be used.

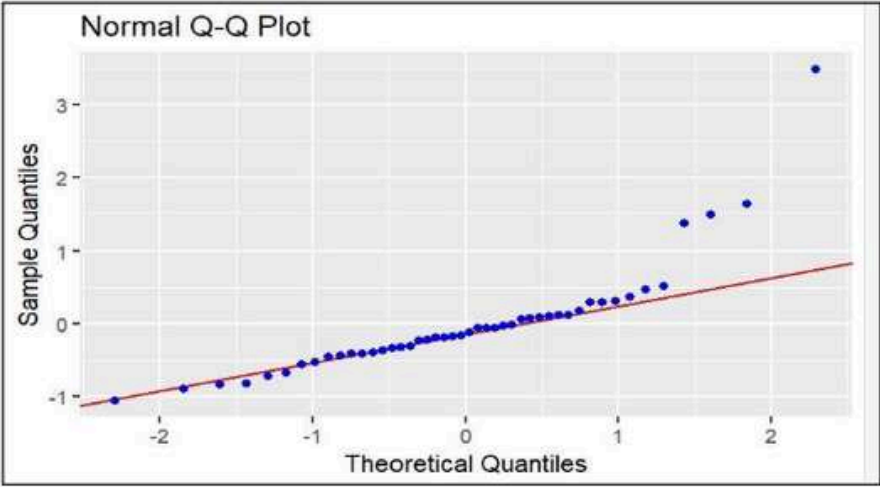


Figure A10: Normal QQ Plot

```
> ols_test_normality(model1)
```

Test	Statistic	pvalue
Shapiro-Wilk	0.7738	0.0000
Kolmogorov-Smirnov	0.2	0.0434
Cramer-von Mises	7.7698	0.0000
Anderson-Darling	2.7205	0.0000

Figure A11: OLS Normality Test Result

The normality tests on model 3 show significant deviations from normality. The Shapiro-Wilk test (statistic = 0.7738, p-value = 0.0000) & the Cramer- Mises test (statistic = 7.7698, p-value = 0.0000) provide strong evidence against normality. Although the Kolmogorov-Smirnov and Anderson-Darling tests show less evidence against normality, the results from Shapiro-Wilk and Cramer-von Mises suggest the variables do not follow a normal distribution.

7.2 Jarque Bera Test

The Jarque-Bera test conducted on the residuals strongly rejects the null hypothesis of normality. With a test statistic (X-squared) of 179.66 and 2 degrees of freedom, the extremely low p-value ($< 2.2e-16$) provides overwhelming evidence against the assumption of normal distribution for the residuals. This indicates significant skewness and kurtosis in the data. Thus, based on this test, it can be concluded that the residuals do not follow a normal distribution.

```
> jarque.bera.test(residuals)

      Jarque Bera Test

data:  residuals
X-squared = 179.66, df = 2, p-value < 2.2e-16
```

Figure A12: *Jarque Bera Test Result*

7.3 Heteroscedasticity

The studentized Breusch-Pagan test shows no significant evidence of heteroscedasticity, with a test statistic of 0.64116, 2 degrees of freedom, and a p-value of 0.7257. This suggests that the variance of errors remains constant across variable values, supporting the assumption of homoscedasticity in the regression model involving wages and unemployment rate.

```
> bptest(model2)

      studentized Breusch-Pagan test

data:  model2
BP = 0.64116, df = 2, p-value = 0.7257
```

Figure A13: *Breusch-Pagan Test Result*

7.4 Test for Multicollinearity

The test of multicollinearity conducted on the variables "Average Household Wages" and "Unemployment Rate" suggests that there is no significant multicollinearity issue between these two variables.

```
> ols_vif_tol(model2)

      Variables Tolerance      VIF
1 Average_Household_Wages  0.986275 1.013916
2      Unemployment_Rate  0.986275 1.013916
> |
```

Figure A14: *OLS Multicollinearity Test Result*

Observation 1: Tolerance measures the variance in a predictor variable not explained by other predictors. Both variables have a tolerance value of 0.986275, indicating 98.63% of their variance is unique, suggesting low multicollinearity.

Observation 2: The Variance Inflation Factor (VIF) shows how multicollinearity inflated regression coefficients. Both variables have a VIF of 1.013916, indicating little multicollinearity.

Since both tolerance values and VIFs are close to 1, there is no significant multicollinearity between "Average Household Wages" and "Unemployment Rate." The high tolerance values indicate unique variance for each variable, and the low VIFs suggest no inflation in regression coefficients. Therefore, multicollinearity is not a concern in the regression model.

HYPTHESIS CALCULATIONS & ANALYSIS

8.1 Hypothesis Model 1: Relation Between HAI & Average Household Wages

$$Y_i = \beta_1 + \beta_2 X_i \quad (1)$$

Where,

Y_i = Dependent Variable

X_i = Independent Variable

β_1 = Intercept Regression Coefficient

β_2 = Slope Regression Coefficient

```
Call:
lm(formula = B1$Housing.Affordability.Index ~ B1$Average.Household.Wages)

Residuals:
    Min       1Q   Median       3Q      Max
-1.0482 -0.4060 -0.1377  0.1153  3.4811

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   8.711e-01  2.885e-01   3.019  0.00421 **
B1$Average.Household.Wages 1.618e-05  6.138e-06   2.636  0.01156 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7732 on 44 degrees of freedom
Multiple R-squared:  0.1363,    Adjusted R-squared:  0.1167
F-statistic: 6.946 on 1 and 44 DF,  p-value: 0.01156
```

Figure A15: Values Obtained from Regression Analysis

$$Y_i = 8.711e-01 + 1.618e-05 X_i \quad (2)$$

$$1 = 8.711e-01 \text{ or } 0.8711 \quad (3)$$

$$2 = 1.618e-05 \text{ or } 0.00001618 \quad (4)$$

8.1.1 Hypothesis Testing of Slope Coefficient

Null Hypothesis: $H_0 : \beta_2 = 0$

Alternative Hypothesis: $H_a : \beta_2 > 0$

Deriving Calculated T Value:-

$$\begin{aligned} \text{Test Statistics: } T &= 2 - \beta_2 / \text{se}(2) \quad (5) \\ &= 1.618e-05 - 0 / 6.138e-06 \\ &= 0.00001618 / 0.000006138 \\ &= 2.636 \end{aligned}$$

Deriving Tabulated T value:-

Significance level: 0.01

Degrees of Freedom: as given that $n=46$, then $n-1 = 45$

Tabulated T: $t_{0.01, 45} = 2.4121$ (6)

In conclusion, the hypothesis testing of the slope coefficient indicates that the independent variable, average household income, does indeed have a significant impact on the dependent variable, the housing affordability index. The calculated T-value (2.636) surpasses the tabulated T-value (2.4121), leading to the rejection of the null hypothesis. This suggests a positive relationship between average household income and housing affordability, implying that as household income increases, housing affordability also improves. This finding underscores the importance of income levels in determining housing affordability, highlighting the potential implications for policy-making and socioeconomic interventions aimed at addressing housing accessibility issues.

8.1.2 Hypothesis Testing of Intercept Coefficient

Null Hypothesis: $H_0 : \beta_1 = 0$

Alternative Hypothesis: $H_a : \beta_1 > 0$

Deriving Calculated T Value:-

$$\begin{aligned} \text{Test Statistics: } T &= 1 - \beta_1 / \text{se}(1) & (7) \\ &= 8.711e-01 - 0/2.885e-01 \\ &= 0.8711/0.2885 \\ &= 3.019 \end{aligned}$$

Deriving Tabulated T Value:-

Significance Level: 0.001

Degrees of Freedom: as given that $n=46$, then $n-1 = 45$

Tabulated T: $t_{0.001, 45} = 3.2815$ (8)

The hypothesis testing of the intercept coefficient indicates its insignificance to the housing affordability index, as the calculated T-value (3.019) is below the tabulated T-value (3.2815). This suggests the model has limitations in explaining the intercept's relationship with the outcome, and further research with additional variables could improve its explanatory power.

8.2 Hypothesis Model 2: Relation Between HAI & Unemployment Rate

$$Y_i = \beta_1 + \beta_2 X_i \quad (9)$$

Where,

Y_i = Dependent Variable

X_i = Independent Variable

β_1 = Intercept Regression Coefficient

β_2 = Slope Regression Coefficient

```

Call:
lm(formula = B1$Housing.Affordability.Index ~ B1$Unemployment.Rate)

Residuals:
    Min       1Q   Median       3Q      Max
-1.3911 -0.4364 -0.0042  0.1894  3.2573

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    1.82388    0.25458   7.164 6.57e-09 ***
B1$Unemployment.Rate -0.04986    0.04392  -1.135   0.262
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8201 on 44 degrees of freedom
Multiple R-squared:  0.02846,    Adjusted R-squared:  0.006375
F-statistic: 1.289 on 1 and 44 DF,  p-value: 0.2624

```

Figure A16: *Values Obtained from Regression Analysis*

$$Y_i = 1.82388 - 0.04986X_i \quad (10)$$

$$1 = 1.82388$$

$$2 = 0.04986$$

8.2.1 Hypothesis Testing of Slope Coefficient

Null Hypothesis: $H_0 : \beta_2 = 0$

Alternative Hypothesis: $H_a : \beta_2 < 0$

Deriving Calculated T Value:-

$$\begin{aligned}
 \text{Test Statistics: } T &= \frac{2 - \beta_2}{\text{se}(2)} \quad (11) \\
 &= \frac{-0.04968 - 0}{0.04392} \\
 &= \frac{-0.04968}{0.04392} \\
 &= -1.135
 \end{aligned}$$

Deriving Tabulated T value:-

Significance level: 0.1

Degrees of Freedom: as given that $n=46$, then $n-1 = 45$

$$\text{Tabulated T: } t_{0.1, 45} = -1.3 \quad (12)$$

In conclusion, the hypothesis testing of the slope coefficient suggests that the intercept lacks significance concerning the housing affordability index. The calculated T-value (-1.135) is below the tabulated T-value (-1.3), leading to the null hypothesis being retained.

This insignificance highlights a limitation of the model. While economic theories suggest an inverse relationship between unemployment and housing affordability, our analysis did not yield a significant result. Possible reasons include dataset errors, despite reputable sources, a small sample size of 46 observations, and the model's inability to capture complexities of other economies. Further exploration and refinement are needed to improve the model's predictive accuracy and better understand the factors influencing housing affordability.

8.2.2 Hypothesis Testing of Intercept Coefficient

Null Hypothesis: $H_0 : \beta_1 = 0$

Alternative Hypothesis: $H_a : \beta_1 > 0$

Deriving Calculated T Value:-

$$\begin{aligned} \text{Test Statistics: } T &= 1 - \beta_1 / \text{se}(1) & (13) \\ &= 1.82388 - 0 / 0.25458 \\ &= 1.82388 / 0.25458 \\ &= 7.164 \end{aligned}$$

Deriving Tabulated T value:-

Significance level - 0

In conclusion, hypothesis testing shows that the intercept significantly influences the dependent variable, as the calculated T-value (7.164) exceeds the tabulated value at all significance levels. Thus, the null hypothesis is rejected, confirming the intercept's meaningful role in predicting the dependent variable. This finding underscores the importance of including the intercept term in regression analysis to better understand relationships between independent and dependent variables.

8.3 Multivariable Regression Analysis

$$Y_i = \beta_1 + \beta_2 X_1 + \beta_3 X_2 \quad (14)$$

Where,

Y_i = Dependent Variable

X_i = Independent Variable

β_1 = Intercept Coefficient

β_2 = Average Household Income

β_3 = Unemployment Rate

```
Call:
lm(formula = B1$Housing.Affordability.Index ~ B1$Average.Household.Wages +
    B1$Unemployment.Rate)

Residuals:
    Min       1Q   Median       3Q      Max
-1.1121 -0.4031 -0.1383  0.2115  3.4913

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.091e+00  3.786e-01   2.881  0.00615 **
B1$Average.Household.Wages  1.552e-05  6.194e-06   2.506  0.01606 *
B1$Unemployment.Rate    -3.759e-02  4.179e-02  -0.900  0.37339
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7749 on 43 degrees of freedom
Multiple R-squared:  0.1523,    Adjusted R-squared:  0.1129
F-statistic: 3.863 on 2 and 43 DF,  p-value: 0.02866
```

Figure A17: *Values Obtained from Regression Analysis*

$$Y_i = 1.091e+00 + 1.552e-05X_1 - 3.759e-02X_2 \quad (15)$$

$$2 = 1.552e-05$$

$$3 = 3.759e-02$$

$$R^2 = 0.1523 \quad K = 3$$

8.3.1 Testing significance of the entire model or Goodness of Fit

Null Hypothesis: $H_0 : \rho = 0$

Alternative Hypothesis: $H_a : \rho > 0$

Deriving Calculated F-Value:-

$$F = [(R^2/k - 1)] / [(1-R^2)/(n-k)] = (ESS/df) / (RSS/df) \quad (16)$$

$$F = [(0.1523/(3 - 1))] / [(1 - 0.1523)/(46-3)]$$

$$F = [0.1523/2] / [0.8477/43]$$

$$F = 0.07615 / 0.0197$$

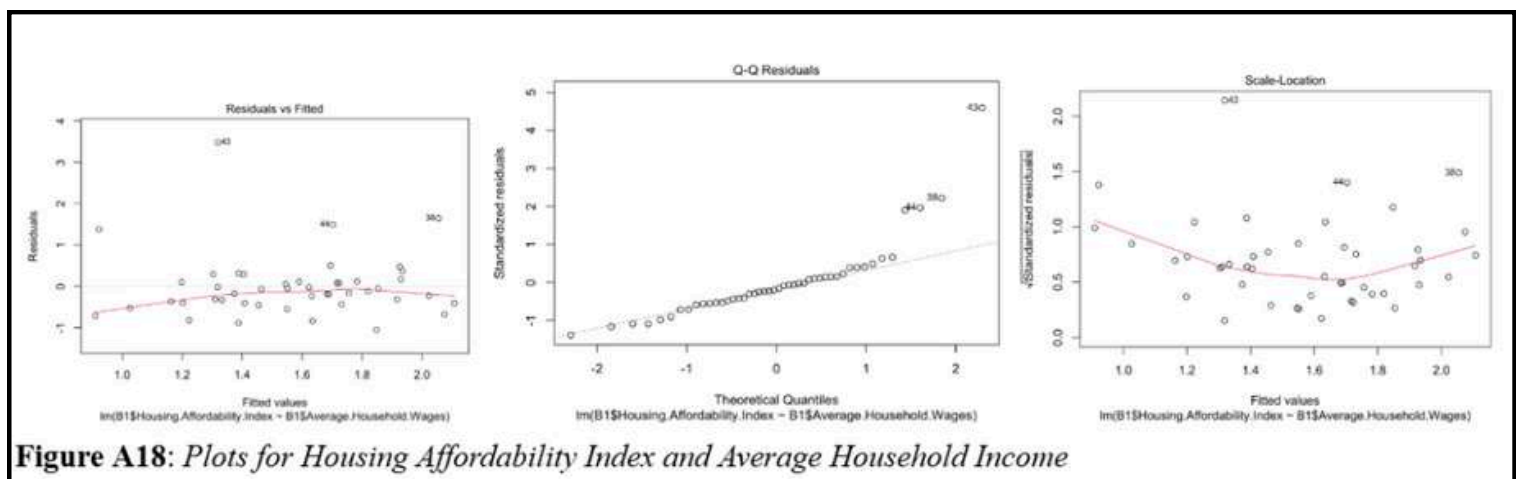
$$F = 3.863$$

Deriving Tabulated F-Value:-

$$F_{0.05, 2, 43} = 3.2144$$

In conclusion, the multivariable testing shows the model is statistically significant at the 5% level, with the F-value (3.863) exceeding the tabulated F-value (3.2144). This leads to rejecting the null hypothesis and accepting the alternative hypothesis, indicating a positive relationship between the predictor variables and the response variable. While the model offers valuable insights into the relationship between variables X_1 , X_2 , and the outcome variable Y_i , its explanatory power is limited, as reflected by the low R-squared value (0.1523). This suggests that other unaccounted factors may influence the outcome.

GRAPHICAL REPRESENTATION



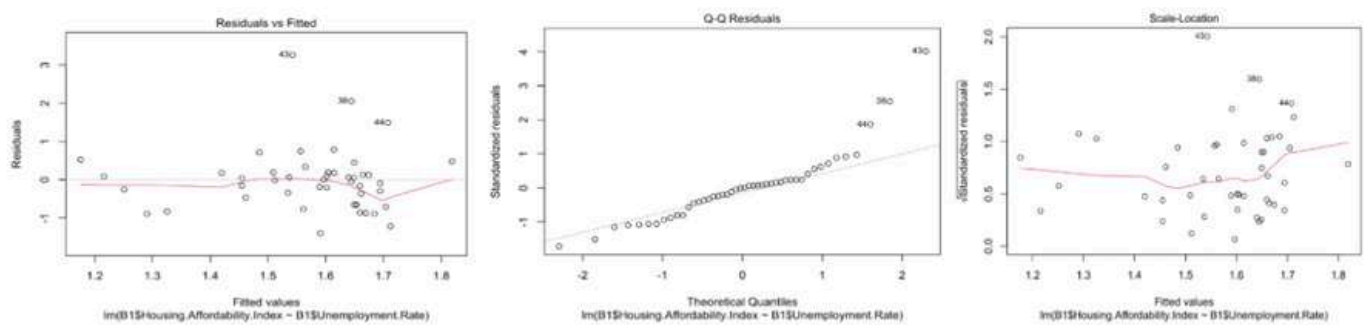


Figure A19: Plots for Housing Affordability Index and Rate of Unemployment

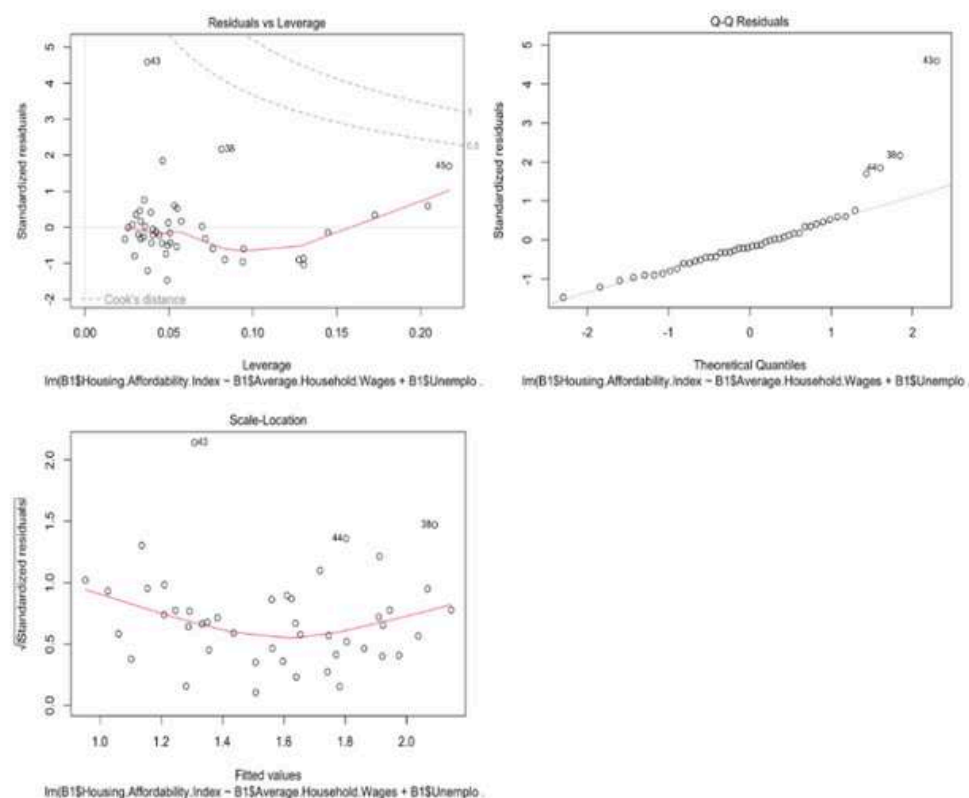


Figure A20: Plots for Multivariable Regression Analysis

8.5 Analysis of Variance (ANOVA) Table

The Analysis of Variance table is a statistical tool used to partition the total variance observed in a dataset into different sources of variation, allowing for the assessment of the significance of each source. It is commonly used in the context of regression analysis to evaluate the contribution of each independent variable (predictor) in explaining the variability in the dependent variable (response)

Table A4: ANOVA Table

Source	Sum Sq	Df	Mean Sq	F	Pr(>F)
Regression	4.247	2	2.123	3.863	0.02866**
Residual	34.943	43	0.813		
Total	39.19	45			

(**) signifies $p < 0.05$

The p-value for the regression term (0.02866) is less than 0.05, indicating a statistically significant relationship between the independent variables (Average Household Wages and Unemployment Rate) and the dependent variable (Housing Affordability Index). However, the adjusted R-squared (0.1129) is relatively low, suggesting that the model explains only a small portion of the total variance in the Housing Affordability Index.

8.6 Interpretation of the Analysis

Based on the regression analysis conducted, here are the model interpretations:

The hypothesis testing for Model 1 indicates a significant positive relationship between average household wages and the housing affordability index, showing that higher household income improves affordability. However, the intercept coefficient is insignificant, suggesting no notable standalone impact on housing affordability. In Model 2, the unemployment rate does not show a significant relationship with the housing affordability index, and the intercept remains insignificant.

The multivariable regression analysis reveals a statistically significant association between average household income, unemployment rate, and housing affordability, though the model's explanatory power is limited. The adjusted R-squared value of 0.1129 indicates that the model explains approximately 11.29% of the variance in housing affordability, while the R-squared value is 0.1523, explaining about 15.23% of the variance.

The p-value of 0.02866 from the ANOVA test confirms the statistical significance of the overall regression at the 5% level. However, the relatively low adjusted R-squared value suggests that other unaccounted factors may influence housing affordability.

In conclusion, while the model provides insights, its limited explanatory power underscores the need for further refinement and research to better understand the complex factors affecting housing affordability.

8.7 Limitations of the Model

Research papers exploring relationships between variables are often associated with certain limitations:-

8.7.1 Establishing causality

This is a fundamental challenge in many studies. While correlation between variables can be identified, establishing a cause-and-effect relationship is often difficult. For example, if a study finds a correlation between unemployment rates and HA, it's challenging to definitively say that unemployment causes HA without considering other potential factors.

8.7.2 Demographic Trends

Changes in population demographics, such as ageing populations or shifts in household composition, can affect housing demand and affordability. For example, areas experiencing an influx of younger residents may see increased demand for rental properties, affecting affordability for both renters and homeowners.

8.7.3 Cross-sectional data

Our data is Cross-sectional data which captures data at a single point in time, making it challenging to capture changes over time or seasonal variations. For instance, HA might fluctuate throughout the year due changes in law enforcement practices. One approach to mitigate this limitation is to combine cross-sectional data with other study designs, such as longitudinal or panel studies. Additionally, statistical techniques like time-series analysis can help identify trends and seasonal patterns in the data.

8.7.4 Regional variations

Factors such as cultural differences, urbanisation, or local policies can influence the relationship between variables differently across regions. For example, the impact of annual wages on HA might vary between urban and rural areas. Addressing regional variations requires careful consideration of contextual factors and possibly conducting separate analyses for different regions.

CONCLUSION

This study examined the impact of average household wages and unemployment rates on housing affordability using a linear regression model. The findings revealed a statistically significant relationship between the variables ($p = 0.02866$), though the effect size, indicated by the F-statistic (3.863), suggests a marginal level of significance. The adjusted R-squared value (0.1129) indicates the model explains only a small portion of the Housing Affordability Index variance, implying other factors likely play a more substantial role.

Future research could explore variables such as interest rates, housing supply, and property taxes, along with their interactions with wages and unemployment. Deeper analysis of these interactions could offer more comprehensive insights. This study provides a preliminary understanding of key factors affecting housing affordability and highlights the need for more robust models to better predict changes in this vital issue.

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RELEVANCE OF THE SIGNALING THEORY ON SHARE BUYBACKS IN THE INDIAN CONTEXT

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ABSTRACT-

Since, the introduction of share buybacks in India in the year 1999, they have traditionally been considered as a method of reducing outstanding stock and thereby increasing the stock price of the company. The signaling effect means that repurchases are a sign of positive prospects in the future. This paper aims to measure whether share repurchases hold their signaling strength in the context of the Indian Capital Markets. It also attempts to test Eugene Fama's Efficient Market Hypothesis – the belief that the market price reflects all the available information about the asset, hence there is no scope for abnormal gains/losses.

KEYWORDS-

Share buybacks, Event Study, Signaling, t-test for dependent samples, Efficient Markets Hypothesis

JEL CLASSIFICATION CODES-

G14, G32, G35, D82

INTRODUCTION

Shares represent ownership in an organization. Over capitalization can be resolved in two manners – retaining the funds or by returning the cash to the shareholders as buybacks/dividends. According to the Companies Act 2013, the companies may utilize their excess reserves, securities premium reserve or the proceeds from the issue of shares/securities.

Share buybacks involve the deployment of excess cash by the companies in purchasing their shares from the public. Motives behind buybacks also include a steady increase in financial performance measurements like the Earning Per Share (EPS) and Price to Earnings ratio, reduce the stake of the of other companies, increasing the underlying share value and reducing excess liquidity. By reducing the supply of shares, the nominal prices of the shares would rise. This concept is more prevalent in developed countries wherein buybacks are considered to be equivalent to dividends. Whenever the organization buys back some shares, it is considered as a signal that the shares are undervalued and would appreciate in the short term. The theory of information content and the signaling hypothesis was developed by Ross (1977) and Bhattacharya (1979).

Positive signaling can be interpreted in three terms. Firstly, the shares are undervalued. Secondly, the management is confident that the firm would not be requiring cash in the future. Thirdly, it shows that the management does not see any future investment opportunities. However, it is also a sign that management is not investing in uncertain investments.

Many researchers like Nohel and Tarhan (1998) Peyer and Vermaelen (2005) support the free cash flow hypothesis and argue that repurchase decisions are considered to be investment decisions that affect the capital structure, ownership and payout decisions of the firm. Share buybacks decrease the equity and increase the debt component that affects the behavior of the management and bring in force the Agency theory.

Agency effect in terms of share repurchases refers to the conflict of interest that the management faces when there is excess cash and few investment opportunities.

The management is met with the dilemma of either catering to the needs of the shareholders (distributing the excess cash to the shareholders) or fulfilling their own pursuits (reinvesting the cash into low return investment opportunities)

LITERATURE REVIEW

Paul Asquith and P Mullins (1986) in their research paper ‘Signalling with Dividends, Share Repurchases and Equity Issues talk about the capital markets’ reaction to cash flow related to equity share capital and managerial decisions. The authors studied the relationship between the announcement day of the dividend/stock buybacks and share prices. The authors highlight how share repurchases avoid the cost of the premium which is usually paid on tender offers. The writers emphasize that the benefits of employing share repurchase overweighs the costs. Additionally, their research constituted of equity share issues and how it can be interpreted as a negative signal by the market.

Theo Vermaelen(1981), in his revolutionary paper- Common Stock Repurchases and Market Signalling: An Empirical Study talks about the pricing behaviour of securities of the firms that bought back their own shares. The author concluded that the share price of the companies which used share buyback techniques an increase in their share prices. The author studied the 60 day returns of various companies that employed share buybacks, he then concluded that firms that bought their own shares back saw an abnormally increase their earning per share (EPS) and a permanent increase in their stock prices.

Josef Lakonishok and Theo Vermaelen (1990) in their research paper - Anomalous Price Behavior around Repurchase Tender Offers discuss the inconsistent prices of shares around the time of repurchase of shares. The authors write that by announcing share repurchases, the company was able to generate abnormal returns of 9% on average. They also mention that the pattern is different in large and small sized organisations.

Clifford P. Stephens and Michael S. Weisbach (1998), in their research paper- Actual Share Reacquisitions in Open-Market Repurchase Programs, talk about the strategy that the organisations employ of repurchasing shares depending on the degree of undervaluation of share prices. In addition, the authors argued that repurchases are positively related to levels of cash flows. The authors also empirically studied the various factors that affect the buybacks keeping in mind the flexibility that is inherent in the repurchase programmes.

Robert J. Shiller in his research titled 'From Efficient Markets theory to Behavioral Finance', published in the Journal of Economic Perspectives (Winter, 2003), challenges, the pervasiveness of the efficient markets theory - the belief that assets are priced in the market at their intrinsic value determined basis the discounted value of future returns - and points to the inexplicability of disruptive variances in stock prices to challenge any form of market defined efficiency. He introduces behavioural finance with the feedback theory - the prices of assets are reactionary and a function of the price fluctuations and sentiment in the market. He points to the self correcting nature of this theory in creating and bursting stock market bubbles. He encourages modern day study on finance to incorporate the notions of behavioural finance to account for the variances that might seem inexplicable by the efficient markets hypothesis.

In the September 1991 issue of the Journal of Finance, Robert Comment and Gregg A. Jarrell, analysed, in 'The Relative Signalling Power of Dutch-Auction and Fixed-Price Self-Tender Offers and Open-Market Share Repurchases', relative signalling strength - investors and market analysts' perception that the given stock is undervalued through Dutch auction self-tender offers (a book building process in which assets are priced basis the bids that come in), open market operations and fixed price tender systems. Their sample yielded results in support of the positively sloped supply curve of stocks and a price increase in the post announcement period. It also highlighted the moral hazard in situations in which the price of stocks rises disparately high, if insider wealth is also at stake or if the firm has experienced negative returns in the recent past.

Shaveta Gupta, Neha Kalra, Rajesh Bagga (2014) in their research paper “ Do buybacks still hold their signaling strength? : Empirical evidence of the Indian Capital Market” analyzed the data of 58 companies to determine the presence of abnormal profits as a result of the event. The studies measured the share prices of the company since the announcement of the buyback and post the event only to find statistically insignificant results for the same.

OBJECTIVES OF THE STUDY

The primary objective of the present research paper is to make a detailed analysis of the signaling effect and share buybacks in India. The objectives of the study are as follows:

- Study whether the Indian companies induce the signaling effect whilst making a public announcement of buybacks.
- Analysis of pre-buyback and the post-buyback share price of companies from diverse industries

MOTIVATION OF THE STUDY

- In India till 1998, share buybacks were prohibited but the Companies (Amendment) Act 1999 introduced Section 77A, 77AA and 77B in the Companies Act, 1956 permitting companies to buy-back their own shares and other securities.
- Since then, buyback of shares has been used widely as a means of financial restructuring.
- There was enough empirical evidence about the pervasiveness of the signalling effect induced by buybacks in Western Capitalist societies wherein the concept of share buybacks was introduced much earlier.
- Since limited literature was available on the signaling effect of share buybacks, we wanted to conduct an empirical study of the same in the Indian context among a diverse set of companies.

HYPOTHESIS OF THE STUDY

Different researchers have proven that there is a relationship between positive signaling and share buybacks in developed nations and western liberal capitalist democracies. Studies have proved that abnormal profits follow positive signaling but for a short period. Some researchers have concluded that stock buybacks are signaling devices and the markets anticipate the information and accommodate the same into prices of the shares. Others believe that the returns post the announcements are positively linked with the size of the repurchase and the stock price movements.

Our study revolves around the testing whether the share repurchases hold their signaling strength in Indian stock markets. So our hypotheses are:

H0: There is no significant difference between the share price immediately before and after the buyback announcement i.e. there is no signaling effect

H1: There is significant difference between the share price immediately before and after the buyback announcement i.e. there is signaling effect

If there is no difference between the variables it may be interpreted that the repurchase decision is in sync with the free cash flow and/or the undervaluation hypothesis. Another reason could be due to the vested interest of the manager which might not be in line with the interests of the shareholders.

Undervaluation hypothesis is the belief that the market price of the share is lower than the intrinsic valuation and that a behavioural inducement technique like buybacks will signal to the market a positive cash flow situation and strong financials of the company with an intent to push up its valuation

Alternatively, an acceptance of H0 would indicate that the semi-efficient form of market efficiency holds – the market trades on and incorporates all the publicly available information about the asset.

DATA & RESEARCH METHODOLOGY

In an attempt to test Eugene Fama's Efficient Market Hypothesis (1970) – stating that the market's the researchers took a representative sample of five diverse companies listed with the Securities and Exchange Board of India (SEBI), which had initiated share repurchases between November 2018 – June 2019.

The Securities and Exchange Board of India proposed two methods of share repurchase –

1. Tender Offer – A 'Letter of Offer' is circulated amongst the shareholders proposing a buyback at a fixed price
2. Open Market Operations –
 - Stock Market – Shares are traded at the market prices/market price may be used as a benchmark, however a price ceiling for maximum purchase price is set
 - Book building – Shareholders participate in a bidding process, with the prices being dictated by the bid price

For the purpose of our research, we sample companies that repurchased shares through Open Market Operations.

For an analysis of the signalling effect, the researchers drew up data from the website of the Securities and Exchange Board of India (SEBI). The incipient point of the research was the date of public announcement of repurchase/buy back of shares, information regarding the

same was collected from – www.sebi.gov.in. Of the list of 52 companies that had executed and announced a buyback between November 2018 and June 2019, 5 from divergent industries were selected – Wipro Limited, Monte Carlo Fashions Limited, Bosch Limited, Oil and Natural Gas Corporation, Tata Investment Corporation Limited.

Furthermore, a 70-day closing price data of the companies' stock was taken. 60-day trailing price estimate and the 10-day price data of the share post the public announcement of the buyback was taken. Average returns of the stock over a 60-day period before the announcement of the public announcement of the buyback were calculated and taken as the comparison point for executing an event study. All the above-mentioned data was collected from www.Moneycontrol.com.

- **Event Study Methodology**

It is a method used to study the firm-centred and economy-wide events' implications on the value of the firm. It tests the efficient market hypothesis by measuring the changes in stock price in response to an unanticipated event. For the purpose of this study, the event date has been taken as the date of public announcement and has been assigned a numeric value of 0. The intent of the event study is to analyse the propensity of stocks showing abnormal returns at the time of the announcement date/immediately before or after the announcement date. The days following the announcement of the repurchase are numbered from 1 to 10 in ascending order. We then calculate the daily average returns.

Daily average returns = $(P_n - P_{n-1} / P_{n-1}) \times 100$

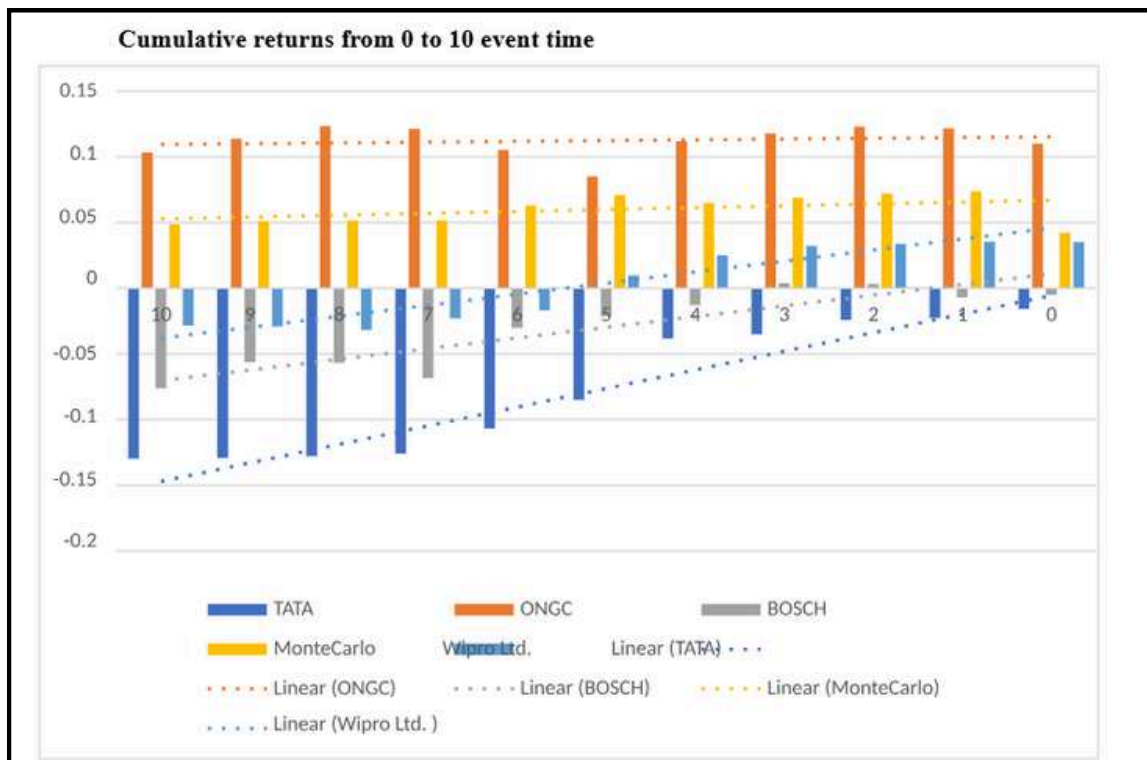
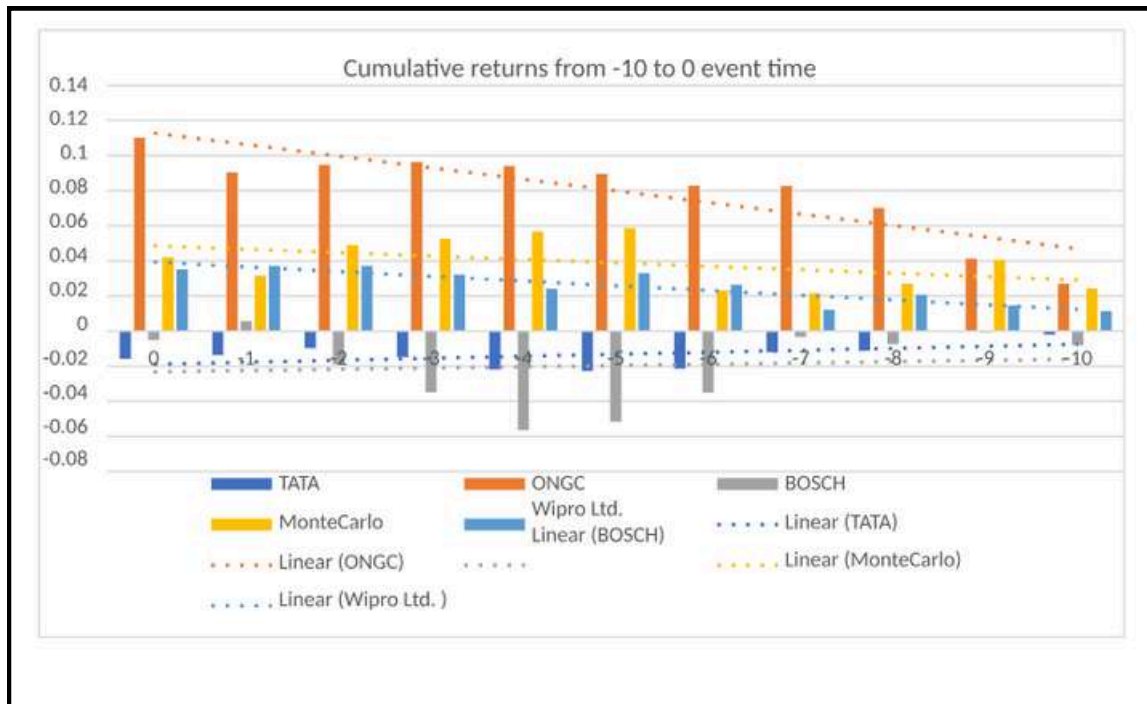
Penultimate step is to calculate the Abnormal returns ($R_i - AR$). Final step is to calculate the cumulative per day 20-day Abnormal returns from a period of -10 to 10.

- **T-Test**

The dependent sample t-test is a statistical procedure used to determine whether the mean difference between two sets of observations is zero. In a paired sample t-test, each subject or entity is measured twice, resulting in pairs of observations. The paired sample t test/Wilcoxon signed rank test can be used to do a pre and post announcement comparative study of the share price to study the signalling effect. A two tailed t test at 10% level of significance was carried out, on a 10-day pre-announcement sample of return on the share and a 10-day post-announcement sample of return on the share.

- **Standard Deviation and Linear Trendline analysis**

The cumulative standard deviation of returns starting from – 10th time period to 0th time period was calculated and compared with the cumulative standard deviation of returns from the 0th time period to the 10th time period. The cumulative returns for both segments were plotted on separate graphs to do a preliminary trend line analysis, supplementing the variability analysis.



INFERENCE & DATA ANALYSIS

A research conducted by Lamba (2000), successfully tested the signalling effect of 150 shares of different companies listed on the US stock market. They concluded that, business managers indulge in share buybacks when they perceive –

- The company to be undervalued
- Have excess cash flow that cannot be reinvested
- Exhaustion in opportunities for organic growth, to pursue organic growth through enhanced market capitalisation

Table 1: Company-wise analysis of the variation and trendline basis event study of share price and returns

COMPANY NAME	STANDARD DEVIATION		Standard Deviation Inference	LINEAR TRENDLINE	
	-10 to 0	0 to 10		-10 to 0	0 to 10
Tata Investment Corporation Limited	0.0074	0.0491	Strong signalling effect	Downward sloping with flatter slope	Downward sloping with steeper slope
Oil and Natural Gas Corporation	0.0245	0.0115	Weak signalling effect	Upward sloping with steeper slope	Downward sloping with flatter slope
Bosch Limited	0.0215	0.0296	Medium signalling effect	Downward sloping with flatter slope	Downward sloping with steeper slope
Monte Carlo Fashions Limited	0.0141	0.0111	Weak signalling effect	Upward sloping with steeper slope	Downward sloping with flatter slope
Wipro Limited	0.0099	0.0294	Strong signalling effect	Upwards sloping with flatter slope	Downwards sloping with steeper slope

Tables 2 and 3 together present a cumulative 20 day pre and post repurchase announcement of the cumulative return on the stock of the five companies. The Annexure is inclusive of, 70-day share price data which forms the basis for the event study and the calculation of individual daily returns.

Whilst an analysis of the trend on the daily returns of shares and volatility of prices post the repurchase announcement doesn't give conclusive evidence of the signalling effect, it does, however, help us in establishing two things –

1. It is not necessary that the announcement of share buybacks at a premium has a positive effect on the share price and thereby valuation of the firm – in our sample mostly the share price post the announcement shows a negative signalling effect

Possible Reasons –

- An underlying suspicion in the strength of the intrinsic valuation of the company
- Mature market company – investors cognizant of limited growth potential
- Preference of steady income in the form of dividend over share repurchase through market, tenders or book building
- Indian regulatory context – firms undertaking consolidation, amalgams and mergers cannot initiate the process of buybacks until the existing processes are complete and have to seek a waiver from SEBI to that extent

2. The greater variability over the period post the announcement is indicative, however, of more exuberant market activity

3. T – test results –

Company	T-calculated values	Statistical Significance at $\alpha=0.05$
Tata Investment Corporation Limited (Finance)	0.03036	The results are statistically significant and the presence of the signalling effect stands confirmed
Oil and Natural Gas Corporation (Utilities)	0.07504	The results are not statistically significant
Bosch Limited (Home Appliances and Technology)	0.27817	The results are not statistically significant
Monte Carlo Fashions Limited (FMCG)	0.65738	The results are not statistically significant
Wipro Limited (Technology and Software)	0.03371	The results are statistically significant and the presence of the signalling effect stands confirmed

The t test reveals that in the diverse sample of medium capitalisation companies on whose stocks the event study was conducted, which belong to diverse industries – finance, gas and utilities, home appliances and technology, FMCG, technology and software – on an average are not indicative of a significant signalling effect post the announcement of share buybacks.

Possible Reasons –

- Lack of trust in company managers to solicit solid investment opportunities
- Buybacks financed through highly levered firms – by debt financing – to support inorganic growth
- Buybacks proposed through tenders at fixed price, and not the market price diminishes the ability to profit from capital gains
- Bad reputation of the company –
- Buybacks come at the cost of wage/payment hikes for employees
- More often than not, owners of the company, with large shareholdings, sell stock at the time of buybacks for huge capital gains signalling Insider Trading
- Susceptible to tumultuous macroeconomic conditions

LIMITATIONS OF THE STUDY

- This study is not oriented towards studying the long term and normalization effects on the share price, rather to study the immediate effect of buyback announcements in order to single out the signaling effect
- The study fails to accommodate for the invariability of the turbulence in stock market over the November 2018 – June 2019 period
- This study fails to take into consideration a more recent time period 2019-2020 owing to the disruptions caused by COVID-19
- The study fails to accommodate the conclusive effect of the new tax regime on buybacks launched by the Government of India in July 2019

FURTHER SCOPE OF THE STUDY

- Comprehensive analysis of the signalling effect in buybacks announced through fixed price tenders and the book building process, and not just open market operations
- Using other telling parameters for pre-test and post test comparison eg. EPS, Price to Earnings ratio, pre and post the announcement of buybacks
- Relative increase/decrease in wealth of insiders/company owners owing to share buybacks and evaluating that as a potential moral hazard
- Larger sample size of companies bifurcated on the basis of market capitalisation and industries

CONCLUSION

It was stipulated that share buybacks are a way to remediate the undervaluation of companies and that the signalling effect of buybacks is mostly positive, which raises the share price of the company and thereby its market capitalisation. In our study, there was no evidence to underscore this. The signalling effect theory seems refuted by the persistent trend of prices being more or less similar to the pre-buyback prices. In fact, it was found that on the diverse sample of the companies on which the test was conducted, share buybacks resulted in the prices of the shares falling to levels further below the pre-buyback period. This could, however be a peculiarity of the Indian Capital markets and is telling of investors' tendencies to rely on past-price trends as a benchmark for purchase/sale decisions with regard to a particular stock. It was also observed that the semi-strong form of market efficiency is upheld and that, on an average, the market prices are representative of all the publically available information and is not prone to spikes and troughs owing to the financial tactics employed by company managers.

ANNEXURES

Table 2 – Cumulative returns on stock from -10 event time to 0 event time

Event Time	TATA	ONGC	BOSCH	MonteCarlo	Wipro Ltd.
0	-0.015781195	0.110138687	-0.00505	0.042141321	0.035143705
-1	-0.013646572	0.09037709	0.00577	0.031541365	0.037171377
-2	-0.009731612	0.094750526	-0.01894	0.0490223	0.037179416
-3	-0.014738731	0.096396207	-0.03488	0.052599933	0.032255871
-4	-0.021884764	0.094002391	-0.05639	0.056694562	0.024174021
-5	-0.022640507	0.089588599	-0.05163	0.058758037	0.033002
-6	-0.021293528	0.082803333	-0.03499	0.023232693	0.026440009
-7	-0.011921962	0.082770163	-0.00332	0.021503593	0.012226851
-8	-0.011252879	0.070176576	-0.00738	0.02697206	0.020660272
-9	-0.000150735	0.041281069	-0.00043	0.040661766	0.014629084
-10	-0.001979715	0.026919085	-0.00797	0.024406659	0.011364582
Standard Deviation	0.007435811	0.024938244	0.0215	0.014033235	0.009932304

Table 3 - Cumulative returns on stock from 0 event time to 10 event time

Event Time	TATA	ONGC	BOSCH	MonteCarlo	Wipro Ltd.
10	-0.129766125	0.103169853	-0.07625	0.048675436	-0.02844935
9	-0.129092315	0.113844299	-0.05629	0.050939564	-0.02906479
8	-0.127702033	0.123328644	-0.0567	0.051416831	-0.03180886
7	-0.125832802	0.121278711	-0.06835	0.051755458	-0.0227975
6	-0.106730572	0.105167203	-0.03004	0.063036872	-0.0167737
5	-0.084979952	0.084991728	-0.02124	0.070992518	0.009743425
4	-0.038208813	0.111735489	-0.01281	0.064977313	0.02503492
3	-0.03507693	0.117732396	0.003946	0.068778237	0.032243722
2	-0.024047796	0.122988096	0.00321	0.072025389	0.033603565
1	-0.022639772	0.12158324	-0.00704	0.073796013	0.035464913
0	-0.015781195	0.110138687	-0.00505	0.042141321	0.035143705
Standard Deviation	0.0491580859432	0.011486890824329	0.029648	0.011124508	0.029474433

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CLIMATE CHANGE AND ENERGY TRANSITIONS IN INDIA – ECONOMIC IMPLICATIONS, CHALLENGES AND THE WAY FORWARD

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ABSTRACT

India, with its emerging demand for energy and heavy reliance on fossil fuels. Being one of the biggest greenhouse gas emitters, India faces significant pressures to switch to a low-carbon energy system while maintaining economic growth and energy security. With an emphasis on the nation's potential for renewable energy, energy efficiency projects and international initiatives of moving toward a sustainable energy future, this article examines the relationship between climate change and energy transitions in India. The article also discusses key barriers and recommends policies required for accelerating the energy transition in context of India's unique development needs.

KEYWORDS

India, Energy Transition, Climate Change, Economy, Clean Energy, Policy Measures

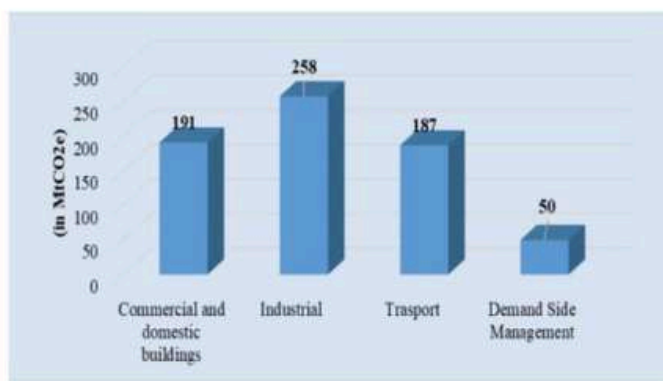
JEL CLASSIFICATION

Q2, Q4, Q5

INDIA'S ENERGY TRANSITIONS: A WAY TO MAKE UP FOR CLIMATE CHANGE

India hoards considerable renewable energy (RE) potential, particularly in solar and wind energy. According to the Ministry of New and Renewable Energy (MNRE, 2021), India has one of the largest renewable energy capacities in the world, with a target to achieve 500 GW of non-fossil fuel energy by 2030. Renewable energy resources are instrumental in mitigating climate change and reducing greenhouse gas emissions through reduction dependence of fossil fuels. This transition will lower the emissions associated with power generation and provide more sustainable alternatives for meeting growing energy needs. A shift from conventional energy resources to renewable ones will evidently result decarbonization of industries, transportation and heating sectors which rely on fossil fuels heavily. According to the Economic Survey (2024), India has committed to reducing the carbon intensity of its GDP by 45% by 2030 compared to 2005 levels, as part of its Intended Nationally Determined Contributions (INDCs) under the Paris Agreement (Fig. 1). The deployment of renewable energy is crucial to achieving these targets, particularly in the power sector, which is one of the largest sources of emissions.

Fig. 1: Target emission reductions to achieve the NDC commitment by 2030 (in MtCO₂e)



Source: Economic Survey, 2024 (Data provided by Ministry of Power, GOI)

ECONOMIC IMPLICATIONS OF ENERGY TRANSITION IN INDIA

Transitioning to renewable energy (RE) sources can enhance economic growth by attracting domestic and foreign investments, reducing dependence on imported coal and crude oil, improving trade balance. The costs of replacing fossil fuels by renewable energy are low, of the order of tens of billions per year (Heal, G. (2022)). Renewable energy sectors might prove as an avenue of job creation enhancing employment. However, on the other hand, it might have significant impact on workers in coal mines and thermal power plants. RE can significantly impact environmental and social costs as a shift to cleaner energy sources can reduce healthcare costs associated with air pollution and mitigate climate-related economic losses. Renewables can be instrumental in reducing India's exposure to global price volatility of fossil fuels and ensure energy security. However, increased reliance on fossil fuels can hint at declining government revenues since the government heavily on taxes from fossil fuels.

ROADBLOCKS TO ENERGY TRANSITIONS IN INDIA:

- Energy transmissions in India do not come without rampant hurdles along their way. While it paves a path forward to a clean and green future, it brings along significant challenges which can hamper the country's inclusive growth and relevant socio-economic factors.
- Inadequate grid capacities: With the increase in RE penetration, grid stability becomes a serious issue owing to poor transmission lines, outdated equipment, and limited capacity to absorb large-scale renewable energy inputs. Designed for centralized fossil fuel-based generation, the grid system is not suitable to handle intermittent renewable energy resources.
- Intermittency and Storage Challenges: The variable nature of RE requires large scale storage solutions. Recent studies indicate that by 2030, India would need 38 GW of four-hour battery storage and 9 GW of thermal balancing power projects for the cost-efficient and reliable integration of 450 GW of renewables. Since energy storage solutions (like batteries) remain expensive, and underdeveloped, complete energy transition remains a utopian affair.
- Land Acquisition Hurdles: Transition to renewable energy demands immense land requirements. Renewable projects often face challenges related to land acquisition. Densely populated regions might fall prey to land disputes, environmental concerns, and resistance from local communities. Land rights and compensation for displaced individuals are significant obstacles. Economic Survey, 2024 states that the future scenarios of an increase in energy demand to meet the higher standard of living need to be analyzed in the context of rapidly depleting land and water resources
- High Capital and Financing Costs: While the cost for clean energy has been reducing, setting up RE technologies such as panels, turbines and storage systems require high upfront investment costs, which might be difficult to cover for developing countries. Lack of supportive international actions for developing countries makes such a transition difficult (Civildaily (2022)).
- Climate and Geographical Challenges: While India is blessed with abundant solar and wind energy resources, the distribution of these resources is uneven across the country. Varied energy availability causes regional disparities across the nation. Extreme weather events, such as cyclones, droughts, and floods, can disrupt renewable energy generation, particularly in coastal and vulnerable areas.

INITIATIVES ADOPTED BY INDIA TO ENHANCE ENERGY TRANSITIONS:

As part of its efforts to mitigate climate change and achieve sustainable development, India has implemented a number of policies to support the energy transition, with a particular emphasis on increasing the use of renewable energy, enhancing energy efficiency, lowering greenhouse gas emissions, and conforming to international climate commitments.

The National Action Plan for Climate Change (NAPCC) was among the first initiatives launched in 2008, outlining eight missions which encouraged the promotion of renewable energy, energy efficiency, and sustainable agriculture. Under the National Mission for Enhanced Energy Efficiency (NMEEE), the Perform, Achieve and Trade (PAT) scheme was introduced to encourage energy-intensive industries to improve their energy efficiency, aimed at reducing overall energy consumption in the industrial sector.

Recent Initiatives adopted by the Government of India to enhance energy transitions are as follows:

- National Smart Grid Mission (NSGM) – Aim to transform the Indian power sector into a secure, adaptive, sustainable and digitally enabled ecosystem, facilitating usage of clean renewable energy
- Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA Scheme) – Launched in 2017, this scheme ensures electrification of all households in the country in rural as well as urban areas, enhancing usage of electricity largely.
- Green Energy Corridors – This initiative aims at seeks to balance the grid's traditional power plants with the electricity generated by renewable sources like solar and wind, strengthen the grid in states that are implementing it, removing some 20,000 MW of large-scale renewable electricity.

Some international initiatives adopted by India as per the Economic Survey (2024) are as follows:

- International Solar Alliance (ISA) – A joint initiative of India and France aims to unlock USD one trillion of investments in solar by 2030 by crowding in private sector investment through guarantees, buildings capacities and through measures to reduce the cost of technology adoption
- One World, One Sun, One Grid (OWOSOG) – A project by India and the UK interconnecting solar energy systems on a huge scale, with an aim of 2,600 GW of interconnection by 2050.
- Coalition for Disaster Resilient Infrastructure (CDRI) – Global partnership National Governments, UN agencies, multilateral development banks and financing mechanisms, the private sector, and academic and knowledge institutions. It aims at promoting new and existing infrastructure systems, against climate risks and supporting sustainable development.
- Infrastructure for Resilient Island States (IRIS) – A flagship initiative under CDRI led by India to achieve delivering resilient climate adaptation solutions to vulnerable and exposed countries.

- Leadership Group for Industry Transition (LeadIT) - Launched by the governments of India and Sweden in September 2019, this initiative realizes the importance of partnership between the Government and industry to achieve the goal of Net Zero.

MEASURES RECOMMENDED FOR A SMOOTHER ENERGY TRANSITION IN INDIA

- India can harness vast aquatic resources to develop large-scale floating solar projects, significantly boosting its RE capacity and addressing land scarcity issues.
- India can establish dedicated zones with streamlined regulations and incentives for RE manufacturing, boosting the economy, energy transition and assure a domestic supply chain for RE technologies.
- A 'Green Collar' initiative can be implemented to retrain coal sector workers for RE jobs, for instance, by establishing RE manufacturing hubs in coal-dependent regions.
- India's energy market can use blockchain technology to enable prosumers to sell excess energy directly to neighbors or the grid, increasing overall grid flexibility and accelerate distributed energy resource deployment.
- India can create Green Hydrogen Highways through a network of green hydrogen production and distribution centers along important transportation corridors, resulting in decarbonization of transportation sector.(Drishti IAS, 2024)
- Integrated waste management and energy production facilities, that is, Waste-to-Energy Circular Parks, turns waste management from a cost center to energy resource generator by using technologies like anaerobic digestion, gasification and pyrolysis.
- By collaborating with other countries, India can contribute to the solar photovoltaic (PV) industries, leveraging its strengths in specific segments (Drishti IAS, 2024).

CONCLUSION

India's transition to a sustainable energy future to fulfill its commitment of reducing climate change impacts. India has a number of obstacles to overcome such as requirement of significant expenditures in technologies and infrastructure. Also, India's heavy economic reliance on fossil fuels and coal is a significant challenge to achieve decarbonization goals.

Thus, India must come up with a comprehensive, inclusive and innovative policy framework to achieve its long terms climate goals. While India is making significant progress in RE capacity, there is a requirement for enhanced international co-operation, increased funding for clean energy technologies and a strengthened commitment to green financing.

By integrating renewable energy into the mainstream, fostering innovation in energy storage, and prioritizing energy efficiency, India can play a leading role in global efforts to combat climate change, while simultaneously ensuring sustainable development for its growing population.

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AN EMPIRICAL ANALYSIS: GDP AND DEFENCE EXPENDITURE IMPACT ON CRIME RATES IN INDIA

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ABSTRACT

This paper aims to provide a comprehensive analysis of the crime rate in India, which has seen a significant increase in 2022, as reported by the National Crime Records Bureau (NCRB), Ministry of Home Affairs, Government of India. The crime rate, which includes incidents of theft, burglary, assault, and other serious crimes, has risen by 8.7%. This alarming trend necessitates immediate attention and has become a focal point for policymakers, sociologists, and law enforcement agencies. The study delves into the impact of two deterrence variables on the crime rates in India from 1957 to 2022. These variables are the defence expenditure (expressed as a percentage of GDP) and the GDP at constant prices (in \$ billions). By investigating these complex elements, the paper aims to shed light on the dynamics of crime in India. It also seeks to propose potential interventions and strategies for effective crime prevention and law enforcement.

KEYWORDS

Crime rate in India, Increase in 2022, Deterrence variables, Defence expenditure, Dynamics of crime in India, Strategies for effective crime prevention and law enforcement

JEL CLASSIFICATION CODES

K4, E7,

LITERATURE REVIEW

There have been some previous works that have tried to analyze the relationship between the crime rate, defense expenditure by a country and GDP. These studies have provided support in favor of the hypothesis that Crime rate is dependent on defence expenditure and GDP growth rate.

In February 2000, Gupta, Mello and Sharan studied the defence expenditure and corruption for upto 120 countries. The results suggested that indeed corruption is associated with higher defence expenditure as a share of both GDP and government spending.

Moreover, in 2016, Dullah Muloka, Mori Kogidb, Jaratin Lilyc and Rozilee Asid studied The Relationship between Crime and Economic Growth in Malaysia and found that the impact of economic growth towards crime in the long run was found to be positive and statistically significant.

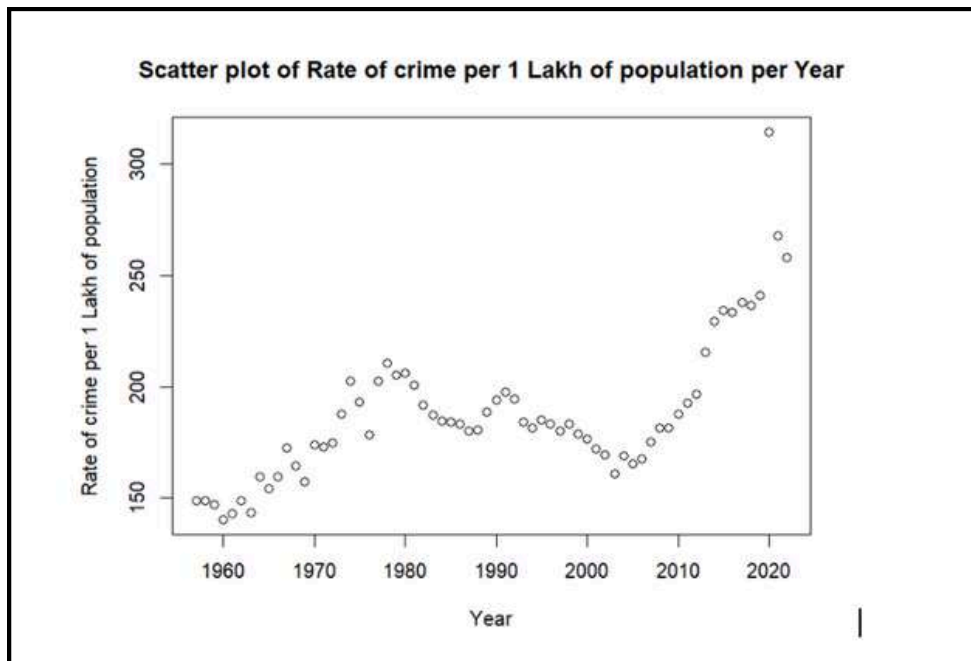
Northrup and Klaer have tried to study the relationship between Effects of GDP on Violent Crime and concluded that it cannot be denied that crime rates are not affected by growing GDP.

Various other studies have shown that countries with higher GDP and defense expenditure tend to have a higher crime rate. However, at the same time, they discovered that there is a diminishing marginal propensity to commit crime as the economy develops in a country.

INTRODUCTION

In the current global scenario, the focus on crime rates and their correlation with economic development has become a significant area of study. Since the advent of modern economies, nations have experienced substantial development, but this has often been accompanied by an increase in crime rates. Many countries have started to understand the socio-economic implications of high crime rates and have initiated measures to curb them. However, unlike developed countries that can manage to decrease crime rates through education or law enforcement, most developing countries argue that they still grapple with high crime rates as they seek economic development. There is a significant body of research on crime, and the economic factors that could be correlated to criminal activity, and the effects of crime on the economy. Unemployment, poverty, and education are widely touched upon subjects, but few studies have looked at GDP and Defence expenditure as an influencing factor in criminal activity within India. This paper tries to cover the relationship of crime rates in India with defence expenditure (in % of GDP) and GDP (at constant) (in \$ billions).

A crime, whether a misdemeanor or felony, is an act committed by an individual that violates the laws of a country or region Crime destroys the very fabric of a civilized society, halts the growth of a country, and instills fear among its citizens. While crime is inevitable in any society, it needs to be kept at a minimum level. However, this is not the case in India, where the crime rate is consistently rising. The increasing crime rates in India have drawn the national interest of policymakers and citizens, becoming a burning and challenging issue in Indian society.



Numerous factors can be cited to explain India's rising crime graph –

- Firstly, our law and enforcement mechanisms are not up to date. Contrary to the western societies where police is considered as friend of a common citizen, here the police are not trusted at all by the citizens, whenever a crime takes place.
- Increasing urbanization, socio-economic inequalities, skewed sex ratio especially in northern states, high population, greed, easy access to vulgar materials, peer pressure have created unintended consequences.
- Dearth of moral values in our society as people are becoming more individualized and more materialistic.

HYPOTHESIS

It is hypothesized that a country with a higher GDP and higher defense expenditure might have either a lower or higher crime rate. This assumption is based on the argument that more wealth could attract crime, which is often true for most developing countries. The relationship between these variables will be analyzed using regression models from the period 1957 to 2022. The dependent variable is the log of the Rate of Crime per 1 Lakh of population, and the independent variables are GDP (at constant prices) in billions of dollars and defense expenditure as a percentage of GDP. The a priori expectations for the regression of the rate of crime per 1 lakh of population on the independent variables - GDP (at constant prices) (in billions) and defense expenditure (in % of GDP) could be as follows:

Relationship between GDP and Rate of crime

According to economic theory, as economic growth and opportunity improve, crime should decrease. This is because the incentive to engage in illegal activity decreases as legal avenues of earning income become more fruitful. However, while higher GDP might suggest more wealth and potentially lower crime rates, it could also lead to greater income inequality, which might increase crime rates. There are documented cases where economic growth has led to higher crime rates. For instance, rapid urbanization and high unemployment rates are influential factors in increasing crime rates.

On the other hand, a real GDP growth might also indicate better law enforcement and social services, which could lead to a lower crime rate. In some cases, the initial reduction of crime among residents diminishes once economic activities begin to ramp up. Aggregate crime also increases during this period, which could be due to demographic changes or an increase in the number of bars and illegal markets.

Relationship between Defence expenditure and Rate of crime

The relationship between defence expenditure and crime rate is complex and not directly addressed in economic theory. However, there are several indirect connections that can be made:

1. **Economic Impact of Defence Expenditure:** Defence expenditure can have both positive and negative impacts on a country's economy. On one hand, it can stimulate economic growth by creating jobs and boosting industries related to defense. It can also indicate a more secure and orderly society, leading to a lower crime rate. On the other hand, high defence spending could mean more focus on national security and less on domestic law enforcement and can also reduce growth in the presence of corruption and rent-seeking behavior.
2. **Impact on Crime Rate:** The state of the economy can influence crime rates. For instance, economic downturns, unemployment, and income inequality are often associated with higher crime rates. Therefore, if defence expenditure negatively impacts the economy, it could indirectly lead to an increase in crime.
3. **Public Policy and Security Spending:** Public expenditure, including spending on security and law enforcement, can influence crime rates. If defence expenditure leads to a decrease in public spending on domestic security, it could potentially result in higher crime rates.
4. **Social and Political Factors:** Defence expenditure decisions are often influenced by political and economic circumstances. These decisions can have social implications, potentially leading to civil unrest or increased crime in certain situations.

The research objectives are twofold: Firstly, the study seeks to analyze, compare, and find variations in crime rates in India over this period. This time frame comparison will provide a historical perspective on how crime rates have evolved in India over the past few decades. Secondly, the study aims to evaluate the impact of defense expenditure (expressed as a percentage of GDP) and GDP (at constant prices) on the overall crime rate in India. This variable analysis will help understand how changes in economic conditions and defense spending influence crime rates. These objectives will guide the research process and help in understanding the complex dynamics between GDP, defense spending, and crime rates.

It's important to note that these are just expectations, and the actual relationship can only be determined through a detailed statistical analysis. While this study focuses on these specific variables, crime rates can be influenced by many other factors not included in this model. Therefore, the findings should be interpreted within this context.

CLRM ASSUMPTIONS

Simple linear regression and multiple linear regression using the ordinary least squares method under the Classical Linear Regression Model will be considered for the analysis. The regression will be performed using the R statistical software. To depict the relationships between the crime rate, GDP, and defense expenditure, these models will provide insights into how changes in GDP and defense expenditure impact the crime rate in India.

Assumption 1: Linearity in parameters

The model will follow the assumption that there is linearity in parameters, as below.

$$Y = \beta_1 + \beta_1 X_2 + \beta_2 X_3 + \dots + \beta_k X_k + u_i$$

Assumption 2: Random Sampling

Since the data were collected from the World Bank, Ministry of Statistics and Programme Implementation and National Crime Records Bureau (Ministry of Home Affairs), all of them are collected as a random sample from the world, achieving the assumption.

Assumption 3: No perfect collinearity

It is found that the correlation coefficient of -0.2296521 between the explanatory variables does not indicate multicollinearity between the explanatory variables- GDP (in constant US) (in \$ billions) and Defence expenditure (in % of GDP). This correlation coefficient figure suggests a weak negative relationship between the explanatory variables, but it does not indicate multicollinearity. Multicollinearity is typically a concern when the correlation is above 0.8 or below -0.8.

Assumption 4: Zero conditional mean

It is true that there will be many variable factors that will affect the variables. However, for those multiple linear regression used in this paper, it is assumed to have zero conditional mean to the residuals – meaning that $E[u|x_i] = 0$ for all $i = 1, 2, \dots, n$. Further determination can be done by the omitted variable bias δ_i for all slopes from the variables. If the bias value is positive, then there will be an overestimation, vice versa.

Assumption 5: Homoskedasticity

Similar to the assumption 4, for the multiple linear regression, it is assumed that the expected variance of residual u is constant to any given dependent variables, meaning that $V(u|x_i) = \sigma^2$ for all $i = 1, 2, \dots, n$. At the end of every model, the residual and fitted value graph for all variables is illustrated. One can see that the spread of residual is equidistantly

METHODOLOGY

DATA

This study aims to identify the relationship between GDP, defense expenditure, and the crime rate in India. The time-series data for this analysis spans from 1957 to 2022. The data for the variables - GDP and defense expenditure - were sourced from the World Bank’s World Development Indicators, which provides data for the last 68 years. The crime rate data, expressed per 100,000 population, was gathered from the National Crime Records Bureau, Ministry of Home Affairs, Government of India. The study focuses solely on India, and the selected time frame ensures a comprehensive dataset with no missing values. The dependent variable in this study is the natural logarithm of the crime rate per 100,000 population, representing the extent of crime in the country. The independent variables are the Gross Domestic Product at constant prices (in billions) and the defense expenditure as a percentage of GDP. Please note that the data spans 66 years, as the crime rate data is only available for this duration.

VARIABLES

For period: 1957-2022 (66 observations)

All details related to variables are given as below:

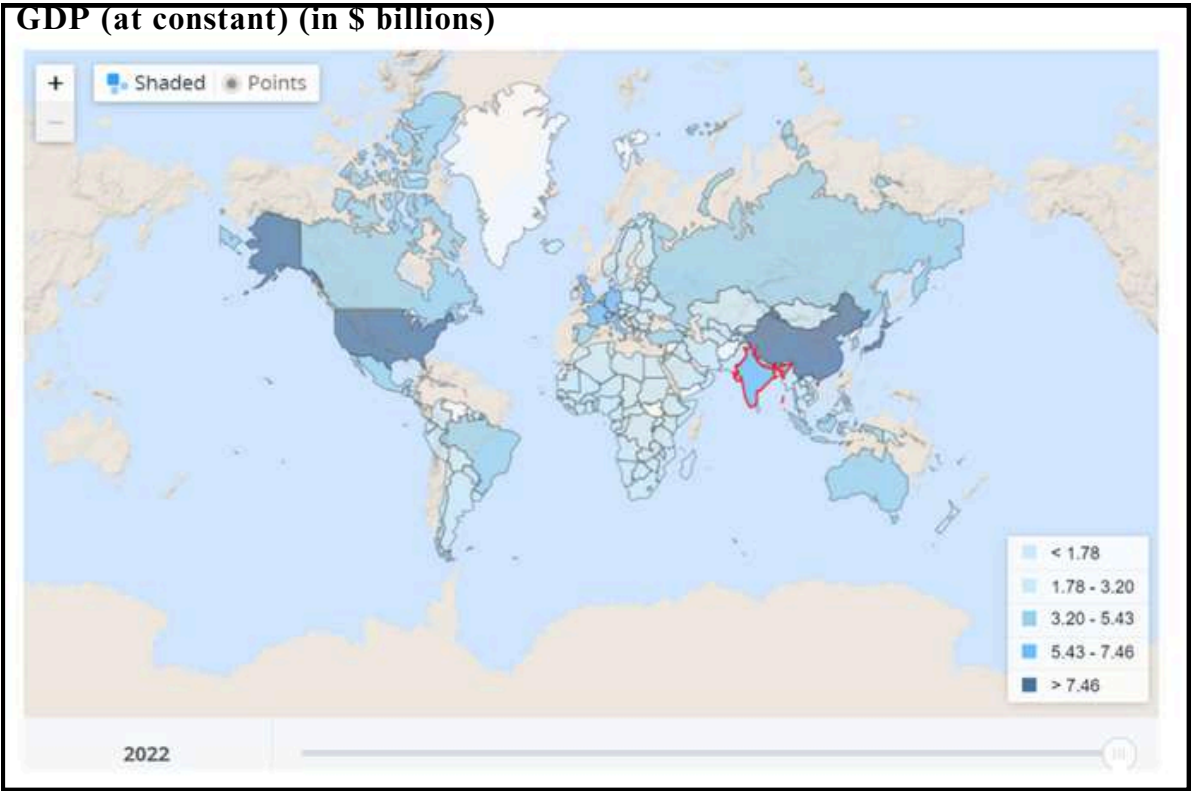
Variable Type	Variable Name	Description	Units	Source
Dependent/ Regressand/ Explained/ Predicted variable	log (Crime_Rate)	Natural log of Rate of crime per 1 Lakh of population	Positive real numbers	National Crime Records Bureau (NCRB), Ministry of Home Affairs, Government of India
Independent/ Explanatory variable	GDP	Gross Domestic Product	At constant, in \$ billions)	World Bank National Accounts data
Independent/ Explanatory variable	Defence Expenditure	Defence expenditure	As in % of GDP	World Bank National Accounts data

STATISTICS

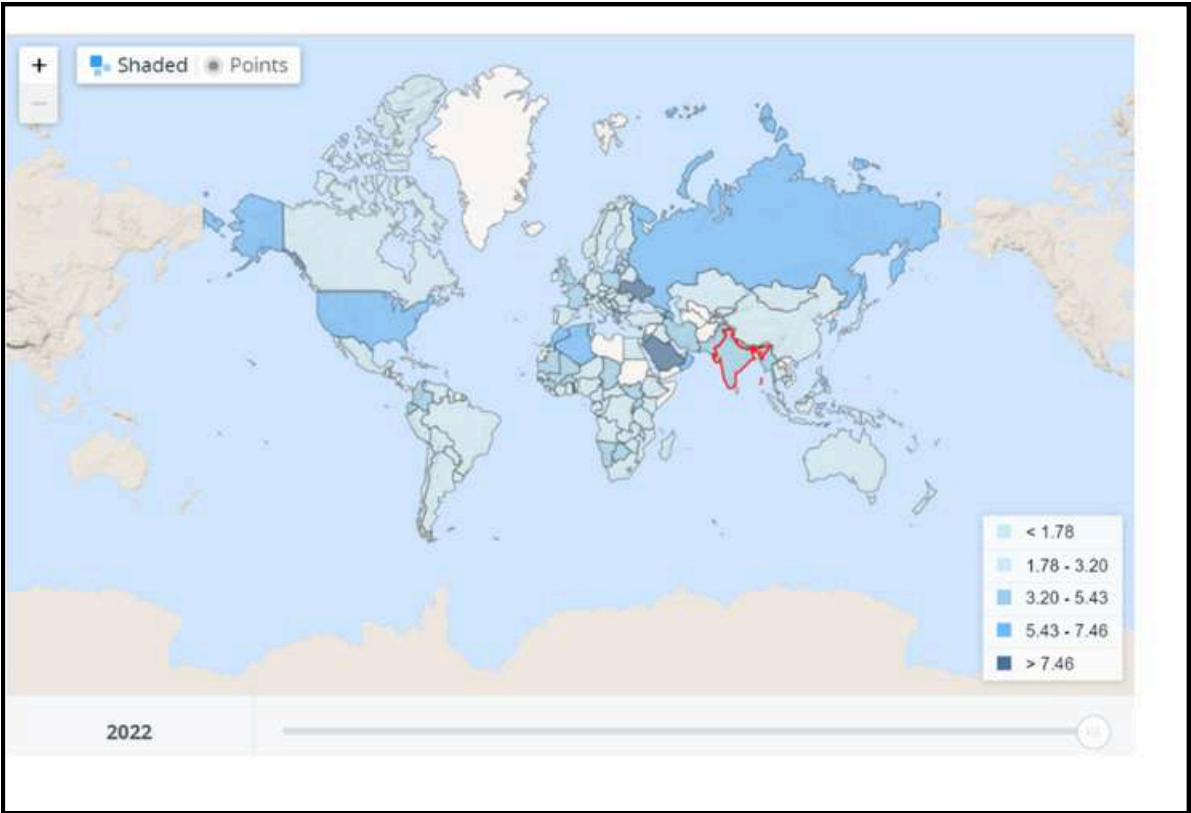
	Year	log (Rate of crime per 1 Lakh of population)	GDP (at constant) (in \$ billions)	Defense expenditure (in % of GDP)
Min.	1957	4.945	59.24	0.280
1 st Qu.	1973	5.137	89.06	2.600
Median	1990	5.211	283.75	2.900
Mean	1990	5.224	712.11	2.885
3 rd Qu.	2006	5.285	910.29	3.275
Max.	2022	5.750	3416.65	4.200
IQR	32.5	0.1477749	821.2275	0.675
sd	19.1963	0.1564807	913.7266	0.7392642
cv	0.96488	2.995586	128.3123	25.62575
Skewness	0	0.7799365	1.497121	-1.572559
Kurtosis	1.799449	4.091911	3.973733	7.305621

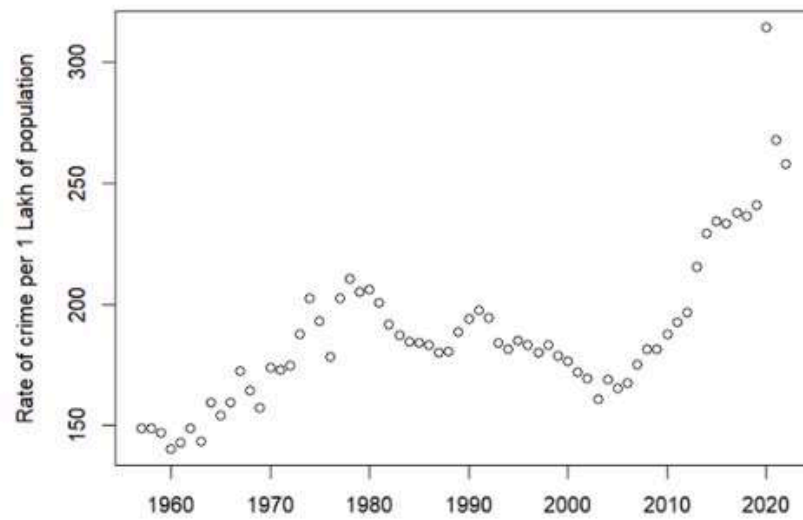
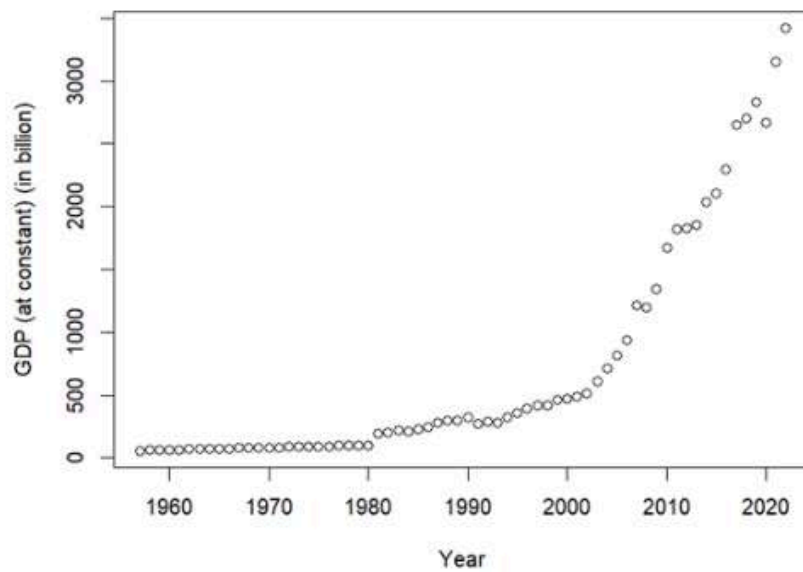
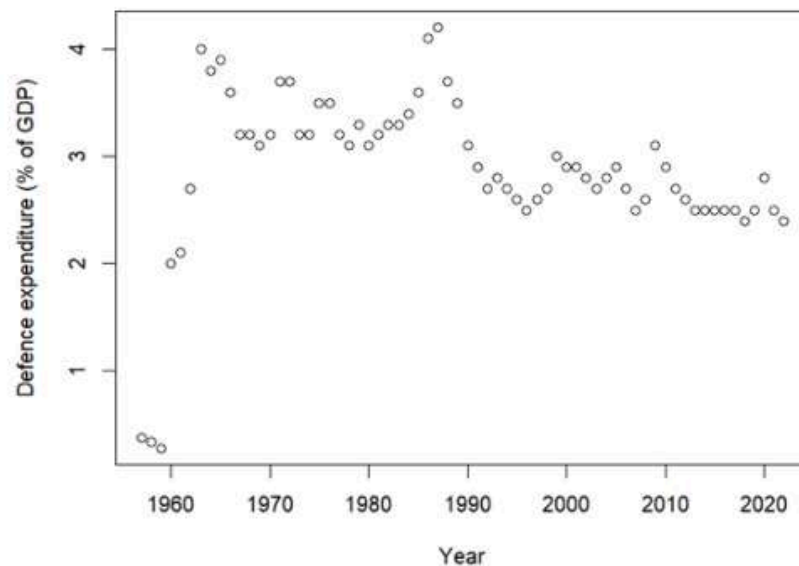
Distribution of the explanatory variables all over the world can be shown through the following maps. It shows the spread of the concerned variable across different countries in the world.

A. GDP (at constant) (in \$ billions)



B. DEFENCE EXPENDITURE (IN % OF GDP)



SCATTER PLOTS FOR DEPENDENT AND INDEPENDENT VARIABLES**Scatter plot of Rate of crime per 1 Lakh of population per Year****Scatter plot of GDP (at constant) (in \$ billions) per Year****Scatter plot of Defence expenditure (% of GDP) per Year**

MODEL 1

(A RESTRICTED SIMPLE LINEAR REGRESSION MODEL)

Regression Model Elements:

Dependent Variable: log (Rate of crime per 1 Lakh of population)

Intercept

Residuals:

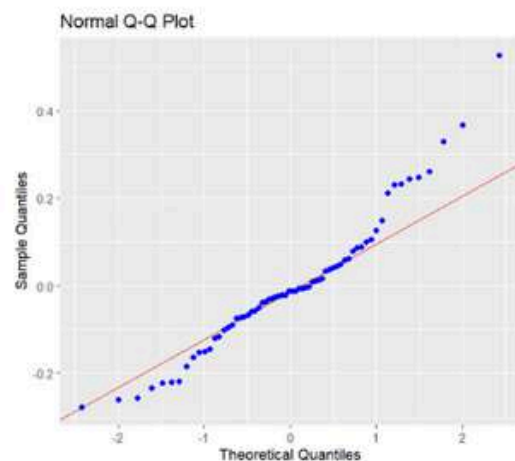
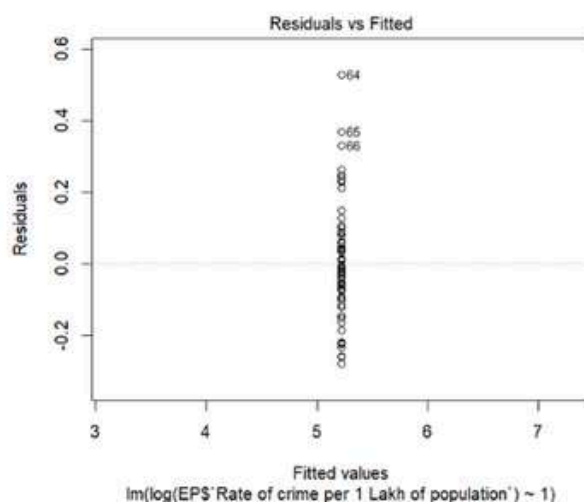
Min.	1 st Qu.	Median	3 rd Qu.	Max.
-0.27850	-0.08676	-0.01259	0.06101	0.52664

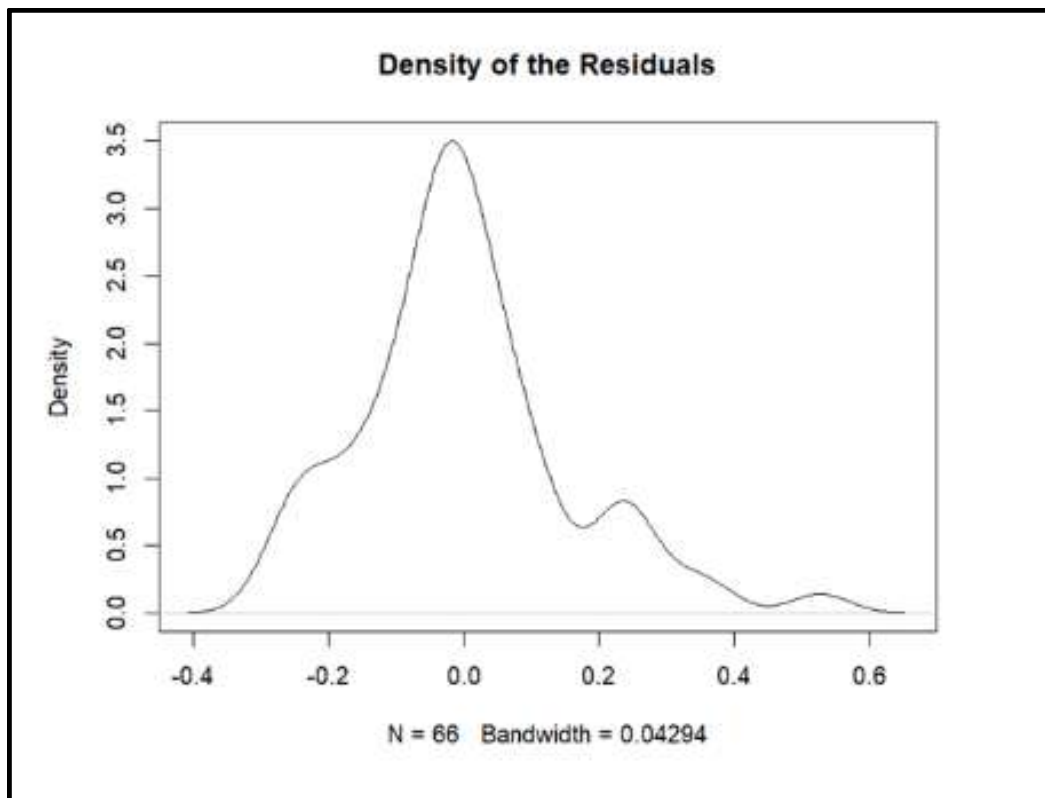
Coefficients: $H_0: B_2=B_3=0$ H_a : Neither B_2 nor B_3 is zero, i.e. $B_2 \neq 0$, $B_3 \neq 0$. Thus, B_2 and B_3 are statistically significant.

Number of restrictions imposed: 2

	Estimate	Std. Error	t value	Pr ($> t $)	Significant Code
Intercept	5.22371	0.01926	271.2	$<2e-16$	***

Residual standard error: 0.1565 on 65 degrees of freedom

 R^2 : 0.0Adjusted R^2 : 0.0**PLOTS FOR MODEL 1**



MODEL 2

(A TWO VARIABLE LINEAR REGRESSION MODEL)

Regression Model Elements:

Dependent Variable: log (Rate of crime per 1 Lakh of population)

Intercept

Independent Variable: GDP (at constant) (in \$ billions)

Residuals:

Min.	1 st Qu.	Median	3 rd Qu.	Max.
-0.195833	-0.084694	0.008189	0.055306	0.276074

Coefficients:

$H_0: B_3=0$

$H_a: B_3 \neq 0$. Thus, B_3 is statistically significant.

Number of restrictions imposed: 1

	Estimate	Std. Error	t value	Pr (> t)	Significant Code
Intercept	5.133e+00	1.642e-02	312.62	< 2e-16	***
GDP (in constant US) (in \$ billions)	1.279e-04	1.424e-05	8.98	6.13e-13	***

Residual standard error: 0.1049 on 64 degrees of freedom

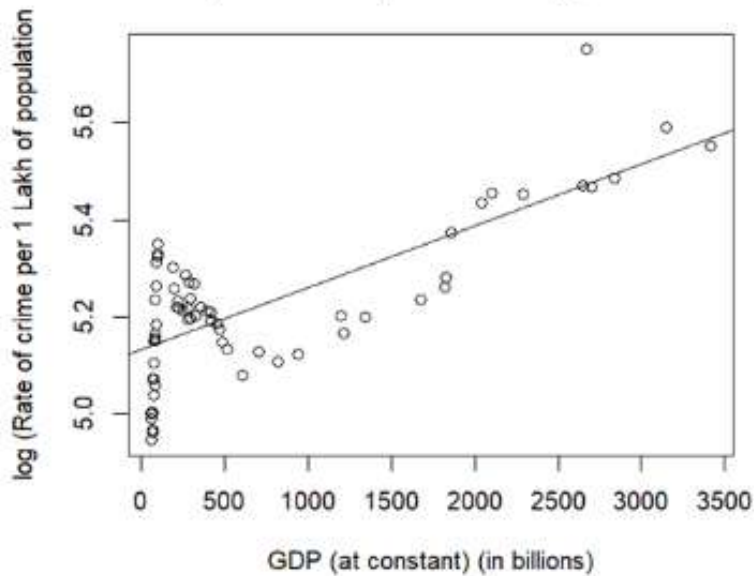
Multiple R^2 : 0.5575

Adjusted R^2 : 0.5506

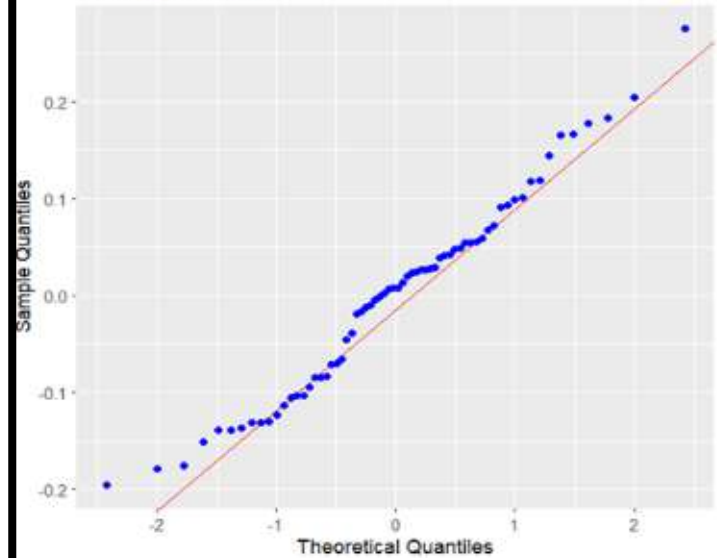
F-statistic: 80.64 on 1 and 64 DF, **p-value:** 6.129e-13

PLOTS FOR MODEL 2

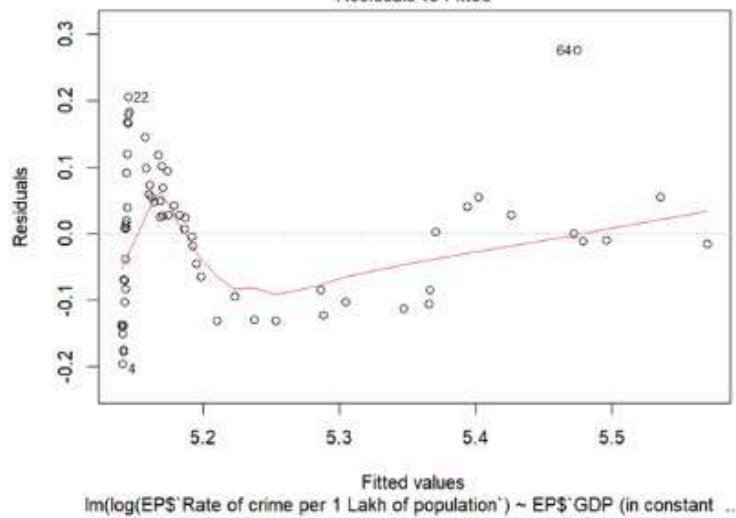
Scatter plot of GDP (at constant) (in \$ billions)



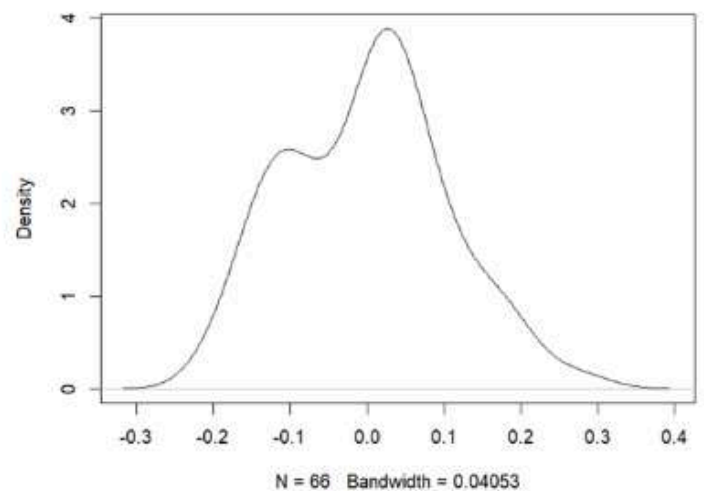
Normal Q-Q Plot



Residuals vs Fitted



Density of the Residuals



MODEL 3
(A TWO VARIABLE LINEAR REGRESSION MODEL)

Regression Model Elements:

- **Dependent Variable:** log (Rate of crime per 1 Lakh of population)
- **Intercept**
- **Independent Variable:** Defence expenditure (in % of GDP)

Residuals:

Min.	1 st Qu.	Median	3 rd Qu.	Max.
-0.28533	-0.08254	-0.02162	0.05935	0.52372

Coefficients:

$H_0: B_2=0$

$H_a: B_2 \neq 0$. Thus, B_2 is statistically significant.

Number of restrictions imposed: 1

	Estimate	Std. Error	t value	Pr (> t)	Significant Code
Intercept	5.15437	0.04305	119.737	< 2e-16	***
log (Defence expenditure (in % of GDP))	0.07018	0.03913	1.794	0.0776	.

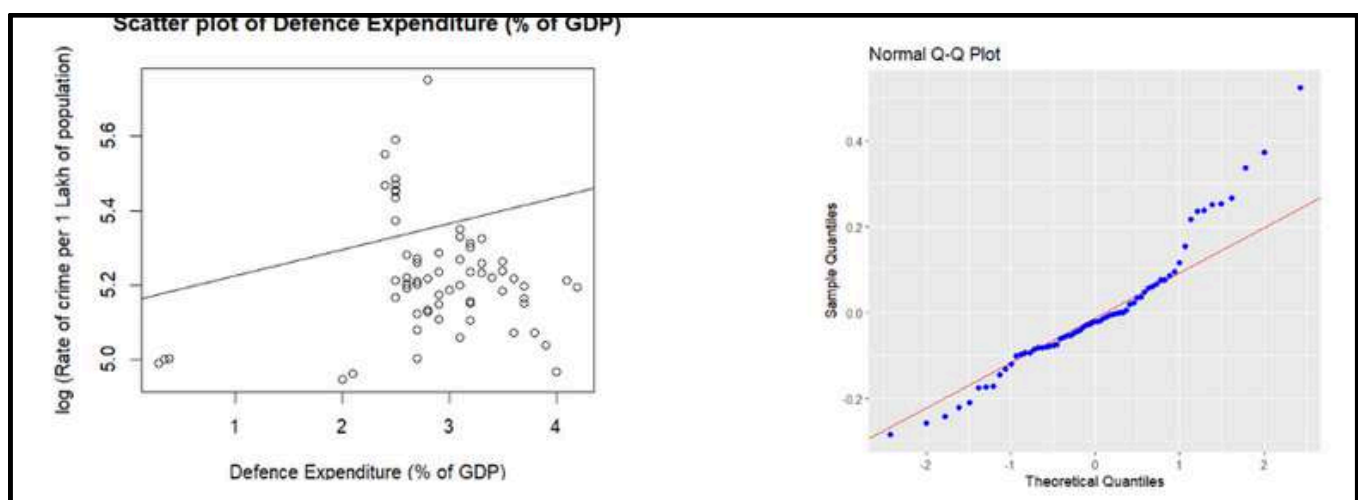
Residual standard error: 0.1539 on 64 degrees of freedom

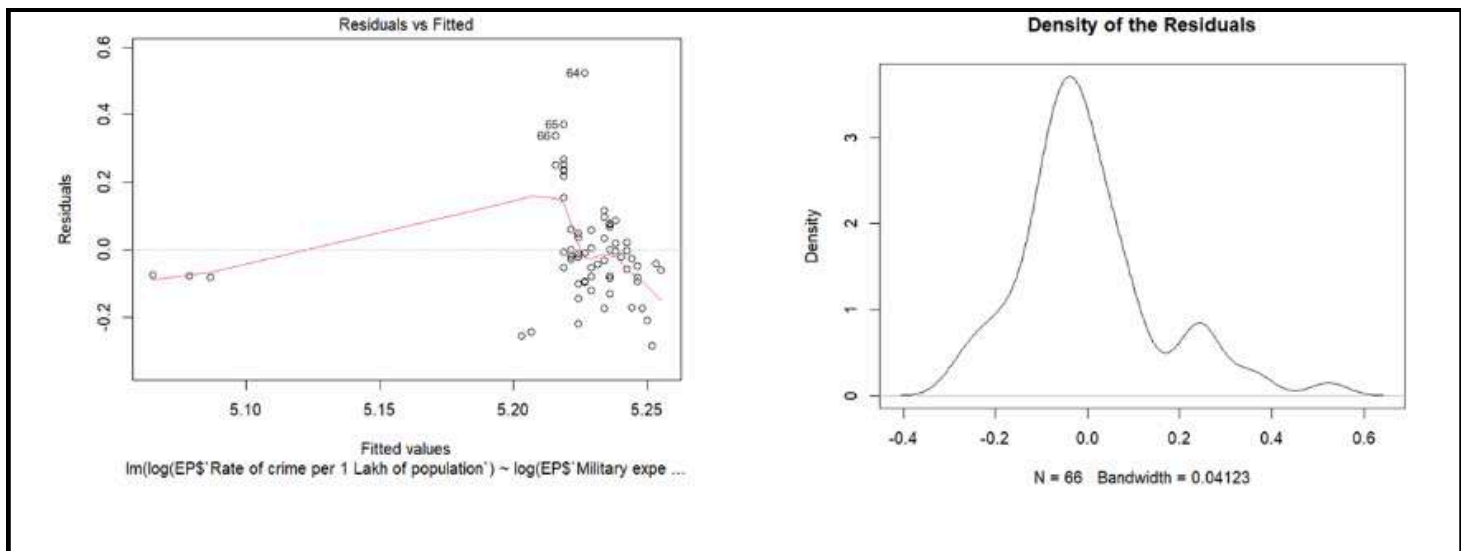
Multiple R^2 : 0.04787

Adjusted R^2 : 0.03299

F-statistic: 3.218 on 1 and 64 DF, **p-value:** 0.07757

PLOTS FOR MODEL 3





MODEL 4

(AN UNRESTRICTED MULTIPLE LINEAR REGRESSION MODEL)

Regression Model Elements:

- **Dependent Variable:** log (Rate of crime per 1 Lakh of population)
- **Intercept**
- **Independent Variables:** GDP (at constant) (in \$ billions) and Defence expenditure (in % of GDP)

Residuals:

Min.	1 st Qu.	Median	3 rd Qu.	Max.
-0.228152	-0.079024	-0.001037	0.054742	0.261280

Coefficients:

Number of restrictions imposed: 0

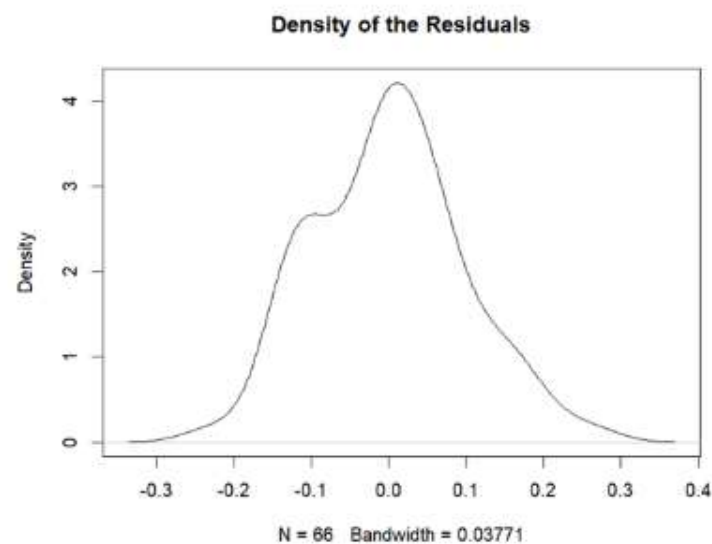
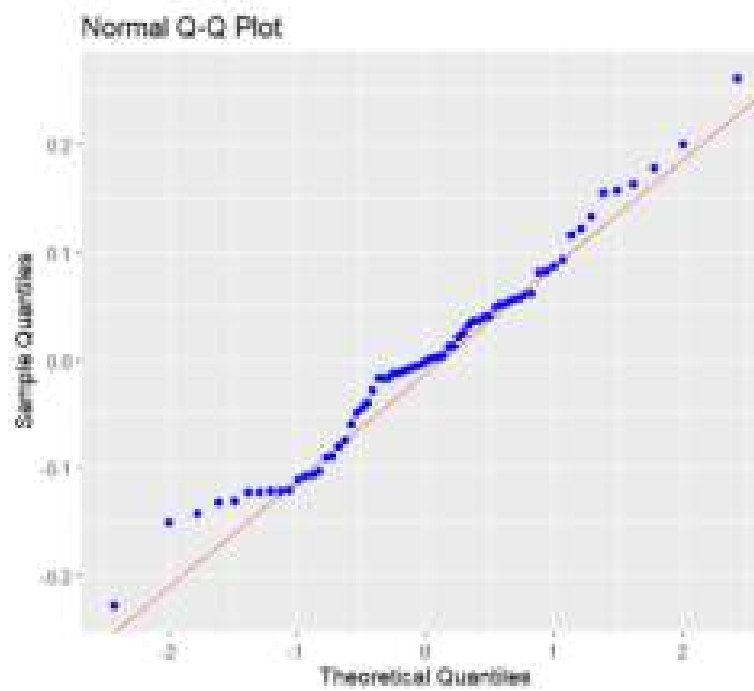
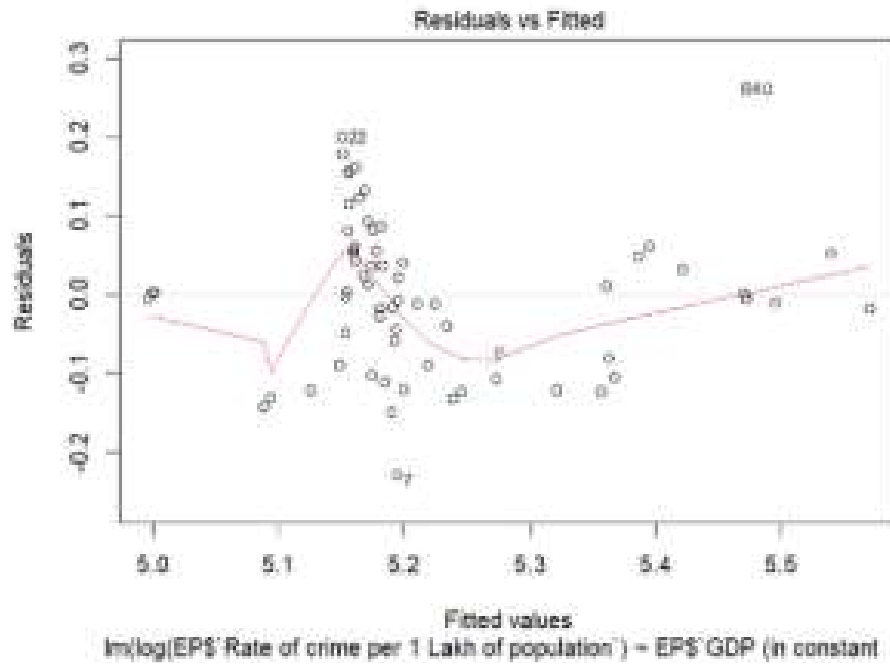
	Estimate	Std. Error	t value	Pr (> t)	Significant Code
Intercept	4.973e+00	5.344e-02	93.057	< 2e-16	***
GDP (at constant) (in \$ billions)	1.377e-04	1.372e-05	10.036	1.09e-14	***
Defence expenditure (in % of GDP)	5.298e-02	1.696e-02	3.124	0.0027	**

Residual standard error: 0.09838 on 63 degrees of freedom

Multiple R²: 0.6169

Adjusted R²: 0.6047

F-statistic: 50.72 on 2 and 63 DF, p-value: 7.508e-14

PLOTS FOR MODEL 4

COMPARISON BETWEEN THE MODELS (THEORETICAL INTREPRETATION) & CHOOSING THE BEST MODEL

Model 1: Model 1 doesn't appear to be suitable for predicting log (rate of crime per 1 Lakh of population) as it lacks explanatory power. This is because it includes only a constant term.

The coefficient for the constant term indicates the estimated mean log (Rate of crime per 1 Lakh of population) when all predictors are zero.

An adjusted R² of 0 indicates that the model is not explaining the variability of the outcome data around its mean. It also suggests that the included predictors (here the constant term) do not improve the model's fit compared to a model without those predictors.

When both R² and adjusted R² are zero, it suggests that the model lacks predictive power and does not explain any variation in the outcome variable. Hence, the model is not statistically significant.

Thus, the model can't be chosen for the regression analysis.

Model 2: The p-value associated with the coefficient for GDP (at constant) (in \$ billions) is less than the conventional significance level of 0.05. Therefore, we reject the null hypothesis at $\alpha=0.05$. In other words, GDP (at constant) (in \$ billions) does have a statistically significant effect on log (rate of crime per 1 Lakh of population) in this model.

The model does appear to be suitable for predicting log (rate of crime per 1 Lakh of population) based on the given variable as it is proved to be statistically significant.

Thus, the model can be chosen for the one variable linear regression analysis.

Model 3: In this case, the p-value associated with the F-statistic is much higher than the conventional significance level of 0.05 or 0.10, indicating that although Model 3 explains a good amount of proportion of the total variation caused by the independent variable, the model as a whole is proved to be statistically insignificant.

Thus, the model can't be chosen for the one variable linear regression analysis.

Model 4: The coefficient for GDP (at constant) (in \$ billions) interprets that a one-unit increase in GDP (at constant) (in \$ billions) results in an increase of approximately 1.377e-044 in estimate mean rate of crime per 1 Lakh of population, keeping defence expenditure (in % of GDP) as constant.

According to the general principle, addition of variables in any model can take place as long as the adjusted R² increases. In this model, the adjusted R² of 60.47% suggests that the inclusion of both GDP (at constant) (in \$ billions) and defence expenditure (in % of GDP) to the model betters its fit. Together they improve its explanatory power, as indicated by higher adjusted R².

Therefore, out of the 4 models, Model 4 is the most appropriate model for regression analysis.

CONFIDENCE INTERVALS

Dependent Variable: log (Rate of crime per 1 Lakh of population)

INTERVAL AT 95% LEVEL OF CONFIDENCE

MODEL	REGRESSION VARIABLES	LL (2.5%)	UL (97.5%)
1	(Intercept)	5.185242	5.262178
2	(Intercept)	5.099852e+00	5.1654489360
	GDP (at constant) (in \$ billions)	9.942543e-05	0.0001563193
3	(Intercept)	5.068371553	5.2403652
	log (Defence expenditure (in % of GDP))	-0.007979216	0.1483489
4	(Intercept)	4.866015266	5.0795907762
	GDP (at constant) (in \$ billions)	0.0001102951	0.0001651372
	Defence expenditure (in % of GDP)	0.0190871162	0.0868716438

JARQUE-BERA TEST TO CHECK FOR NORMALITY

The Jarque-Bera (JB) test is a goodness-of-fit test of whether sample data have the skewness and kurtosis matching a normal distribution. It evaluates whether the distribution of the residuals in a regression analysis follows a normal distribution.

The null hypothesis is that the data is normally distributed. This hypothesis is after following the CLRM assumption, of residuals being normally distributed.

DATA	Jarque-Bera test statistic (X^2)	Degrees of Freedom (df)	p-value
residuals(model1)	7.99	2	0.0047008
residuals(model2)	3.90269	2	0.0009281
residuals(model3)	6.03489	2	0.0006176
residuals(model4)	0.15823	2	0.6643004

Interpretation of the Test Results and Graph:

Test Statistic: The Jarque-Bera test computes a statistic based on the skewness and kurtosis of the residuals. A higher test statistic indicates greater deviation from normality.

p-value: This indicates the probability of obtaining the observed test statistic if the null hypothesis were true (i.e., if the residuals were normally distributed). A very low p-value suggests that it's highly unlikely to observe extreme test statistics if the residuals were normally distributed.

Normal Probability Plot: for all the models (attached) provides a visual representation of the distribution of residuals, highlighting any patterns, outliers, or deviations from normality in the data. Since the fourth model follow a normal distribution, the graphs show a symmetric bell-shaped curve centered around zero, with tails extending symmetrically on both sides. Deviation from this shape, such as skewness, would indicate departure from normality. The graphs show a peak around zero on the X-axis, indicating where most of the residual's cluster. If the graph extends towards positive and negative values on the X-axis, the bars will gradually decrease in height, reflecting the decreasing frequency of residuals as they move away from zero. Moreover, it is dependent on the shape of the histogram if there'll be any one-sided skewness in the distribution.

Result Interpretation:

For only the fourth model, the Jarque-Bera test statistic is low, indicating a substantial closeness to normality. Also, since the p-value is greater than the conventional level of significance 0.05, we fail to reject the null hypothesis. This suggests that the residuals are normally distributed.

If this could have been wrong, there would have been potential issues (easily observable in models 1 to 3) with the model assumptions. Therefore, we reject the null hypothesis of residuals being normally distributed in those cases.

DURBIN WATSON TEST TO CHECK FOR AUTOCORRELATION

The Durbin-Watson (DW) test is used to detect the presence of autocorrelation (a relationship between values separated from each other by a given time lag) in the residuals (prediction errors) from a regression analysis. The null hypothesis here is that there is no autocorrelation.

Model	lag	Autocorrelation	D-W Statistic	p-value
1	1	0.8843026	0.1327793	0
2	1	0.8110607	0.3511345	0
3	1	0.8784599	0.1634073	0
4	1	0.76318	0.4731452	0

Result Interpretation:

For all the models, the Durbin-Watson statistic is much less than 2, suggesting a positive autocorrelation. The p-value is 0, indicating that the autocorrelation is statistically significant. Therefore, in all cases, the null hypothesis of no autocorrelation is rejected, indicating the presence of autocorrelation in the residuals of all four regressions. This suggests that there may be some information in the data that is not captured by the predictors in the models, which could potentially be addressed by including additional relevant variables.

WHITE TEST TO CHECK FOR HETEROSCHEDASITY

The White's test is used to detect the presence of heteroscedasticity in a regression analysis. The null hypothesis is that the variances for the errors, or residuals, are equal (homoscedasticity).

Model	Statistic	p-value	Parameter
1	7.33e-15	0	0
2	1.38	0.500	2
3	4.87	0.0876	2
4	2.52	0.642	4

Result Interpretation:

Since for all the models except model 1, the p-value is greater than 0.05, we fail to reject the null hypothesis. This suggests that the residuals are homoscedastic i.e., they have constant variance.

For model 1, the residuals show heteroscedasticity. This could indicate potential issues with the model assumptions for regression.

LIMITATIONS OF THE ANALYSIS

Although the regression analysis is capable of capturing the best model among other regressed models, there are certain limitations that should be addressed effectively, to get significant results for the regressions in future.

1. **Positive Correlation:** The positive correlation found in the data is a key factor to consider while doing time series data. This could potentially indicate a spurious relationship due to common trends or cycles present in both crime rate and the explanatory variables (GDP and Defense Expenditure).
2. **Lack of Practical Solution:** Due to a lack of knowledge on how to solve the issue of positive correlation practically, the results have only been interpreted, not applied. This limits the practical applicability of the findings.
3. **Model Specification:** The model with a constant term and both the explanatory variables (GDP and Defense expenditure) was found to be the best model. However, there might be other relevant variables that were not included in the model, which could lead to omitted variable bias.
4. **Assumption of Normality:** The Jarque-Bera test shows normally distributed residuals, which is an assumption of the linear regression model. However, this test has limitations and may not always correctly identify non-normality in the residuals.

5. **Homoscedasticity:** The presence of homoscedasticity is an assumption of the linear regression model. If this assumption is violated, it can lead to inefficient parameter estimates.

6. **Explanatory Power:** While the variables jointly describe a good proportion of the total variation in the dependent variable, there is still unexplained variation that could be captured by other factors or variables not included in the model.

7. **Time Series Data:** The use of time series data can introduce additional complexities such as non-stationarity along with autocorrelation, which was not addressed in this project.

These limitations should be taken into account when interpreting the results of the project and considering its implications. Future research could address these limitations by incorporating additional variables, using techniques to address the positive correlation, and exploring methods suitable for time series data.

CONCLUSION

In conclusion, our analysis aimed to determine the most suitable model for predicting population variation using GDP (at constant) (in \$ billions) and Defence expenditure (in % of GDP) as independent variables. After thorough examination, it's evident that Model 4, which jointly includes GDP (at constant) (in \$ billions) and Defence expenditure (in % of GDP) outperforms models which includes constant term, GDP (at constant) (in \$ billions) and Defence expenditure (in % of GDP) respectively.

Through this project, we not only arrived at a conclusion regarding the most suitable model for predicting population variation but also gained valuable insights and learning outcomes.

1. **Model Evaluation:** We learned to critically analyze regression models, comparing their performance based on metrics such as R-squared, adjusted R-squared, and significance of coefficients. This skill is invaluable in selecting the most effective model for a given dataset.

2. **Variable Selection:** Understanding the importance of variable selection emerged as a key takeaway. We explored the significance of Total Fertility Rate and Net Migration Rate as independent variables and learned to consider their individual contributions to the model's explanatory power.

3. **Interpretation Proficiency:** Mastering the interpretation of regression results, including coefficients, confidence intervals, and p-values, was crucial. This proficiency enabled us to derive meaningful insights from the analysis and make informed decisions based on the findings.

4. Assumptions Testing: The necessity of testing regression assumptions, as demonstrated through the Jarque-Bera, Durbin Watson and Heteroscedasticity tests, underscored the importance of validating model assumptions for ensuring the reliability of results.

5. Effective Communication: Lastly, effectively communicating the findings of regression analysis, including model performance, variable significance, and limitations, proved essential. This skill is vital for conveying insights to stakeholders and facilitating informed decision-making processes.

Overall, this project provided valuable hands-on experience in regression analysis, enhancing our understanding of statistical modeling and its applications in real-world scenarios. The findings of this study could provide valuable insights for policymakers and researchers in the field of economics and criminology. It is hoped that it'll contribute to the ongoing discourse on crime and its prevention in India.

NOTES

1. Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated. In the context of multicollinearity, we would be looking for a correlation coefficient close to -1 or 1.
2. Mean: The average value of a variable across the observations is called the mean.
3. Median: The middle value of the variables is called the median.
4. Minimum (Min.): The smallest value of the variables is called the minimum.
5. Maximum (Max.): The largest value of the variables is called the maximum.
6. Standard Deviation (sd): The extent to which the variable data is spread out from the mean is called the standard deviation.
7. Coefficient of Variation (c.v.): The relative variability of the variable data, expressed as a ratio of the standard deviation to the mean, is called the coefficient of variation.
8. Skewness: The measure of the asymmetry of the variable data distribution is called skewness.

Positive Skewness: The distribution has a longer or fatter tail on the right side. This means that there are more low values and fewer high values.

Negative Skewness: The distribution has a longer or fatter tail on the left side. This means that there are more high values and fewer low values.

Zero Skewness: The tails on both sides of the mean balance out overall, indicating that the data is perfectly symmetrical.
9. Kurtosis: The measure of whether the variable data distribution is heavy-tailed or light-tailed relative to a normal distribution is called kurtosis.

Platykurtic (Kurtosis < 3): The distribution has a flatter peak and lighter tails compared to a normal distribution, indicating fewer extreme values.

Mesokurtic (Kurtosis ≈ 3): The distribution has a shape similar to a normal distribution.

Leptokurtic (Kurtosis > 3): The distribution has a sharper peak and heavier tails compared to a normal distribution, indicating more extreme values or outliers.

10. The restricted model assumes that explanatory variables have no influence on dependent variables. On the other hand, unrestricted models include all relevant variables in the model that suffices for significant regression results.
11. p-value: The p-value associated with each coefficient tests the null hypothesis that the coefficient is equal to zero (i.e., no effect). A small p-value (at the chosen level of significance, say $\alpha=0.05$ or 0.10) indicates that the coefficient is statistically significant.
12. Interpretation of values like $1.27e-04$ means 0.0001279 , i.e. number multiplied by 10 to the power of -4 .
13. Significant codes: 0 '****' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
14. The R^2 measures the proportion of total variance in the dependent variable that is explained by the independent variables.
15. The adjusted R^2 adjusts the R^2 for the number of predictors in the model.
16. The F-statistic tests the overall significance of the model.
17. Confidence Interval: A confidence interval is a range of values that is used to estimate the true value of a population parameter. It provides an interval within which we can be certain, to a given level of confidence (e.g., 95%), that the true population parameter lies.

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THE RISE OF DIGITAL PAYMENT SYSTEMS, AI INTEGRATION, AND THEIR IMPACT ON TRADITIONAL BANKING

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ABSTRACT

The financial services industry has undergone a profound transformation over the past two decades, driven by the rapid adoption of digital payment systems and the integration of artificial intelligence (AI) into banking operations. This paper explores the evolution of digital payment systems, from traditional cash-based methods to modern digital wallets, and examines how AI is reshaping the banking landscape. The study highlights the impact of these technological advancements on traditional banking models, focusing on changes in customer behavior, operational efficiency, and competitive dynamics. Additionally, the paper discusses the regulatory challenges and security concerns associated with digital banking and AI integration. By analyzing the opportunities and risks presented by these innovations, this research provides insights into how traditional banks can adapt to remain competitive in an increasingly digital-first financial ecosystem.

KEYWORDS

Digital Payments, Artificial Intelligence, Traditional Banking, Fintech, Regulatory Compliance, Cybersecurity, Digital Transformation

JEL CLASSIFICATION CODES

G21, O33, E58, L86

INTRODUCTION

The financial services industry has experienced a seismic shift in recent years, driven by the rise of digital payment systems and the integration of artificial intelligence (AI) into banking operations. Traditional banking models, which have long relied on physical branches and face-to-face interactions, are being challenged by the convenience, speed, and efficiency offered by digital payment solutions and AI-driven technologies. This paper aims to explore the evolution of digital payment systems, the role of AI in transforming banking services, and the impact of these innovations on traditional financial institutions.

1.1. Background

The advent of digital payment systems can be traced back to the introduction of Automated Teller Machines (ATMs) in the 1960s, which allowed customers to perform basic banking tasks without visiting a branch. The rise of the internet in the 1990s further revolutionized the industry, enabling online banking and the development of digital wallets. In recent years, the proliferation of smartphones and the growth of e-commerce have accelerated the adoption of digital payment systems, making them a cornerstone of modern banking.

Simultaneously, AI has emerged as a powerful tool in the financial sector, enabling banks to offer personalized services, detect fraud, and improve operational efficiency. AI-driven chatbots, machine learning algorithms, and predictive analytics are transforming how banks interact with customers and manage their operations. However, these advancements also present challenges, particularly in terms of cybersecurity, regulatory compliance, and workforce adaptation.

1.2. Objectives of the Study

This paper seeks to achieve the following objectives:

1. To examine the evolution of digital payment systems and their impact on traditional banking models.
2. To analyze the role of AI in transforming banking services and its implications for customer experience and operational efficiency.
3. To explore the challenges and opportunities presented by digital payment systems and AI integration for traditional banks.
4. To provide recommendations for traditional banks to adapt to the changing financial landscape and remain competitive.

THE EVOLUTION OF DIGITAL PAYMENT SYSTEMS

2.1. From Cash to Digital Wallets

The transition from cash-based payment systems to digital wallets represents a significant shift in consumer behavior and financial transactions. Traditional wallets, characterized by physical currency and cards, have gradually been replaced by digital wallets that offer enhanced convenience, security, and accessibility. The proliferation of smartphones, the growth of e-commerce, and the increasing demand for contactless payments have been key drivers of this transition.

Digital wallets, also known as e-wallets, are electronic applications or software that allow users to store payment information securely and make transactions online or in-store without needing physical cash or cards. They can hold various types of information, including credit and debit card details, loyalty programs, and even cryptocurrencies. The convenience and efficiency of digital wallets have made them increasingly popular among consumers, particularly in regions with high smartphone penetration and internet access.

2.2. Key Technologies Driving Digital Payments

Several key technologies have played a crucial role in the evolution of digital payment systems:

1. Mobile and Online Banking: Mobile banking applications have become a cornerstone of modern banking, allowing customers to manage their accounts, pay bills, and even apply for loans from their smartphones. Online-only banks, such as Revolut, N26, and Chime, are now competing with traditional banks by offering low fees, seamless interfaces, and innovative features.

2. Blockchain and Cryptocurrencies: Blockchain technology and cryptocurrencies have added a new dimension to digital banking. While initially seen as a disruptive force, many traditional banks are now exploring how they can integrate blockchain for faster, more secure transactions. Digital currencies such as Bitcoin and Ethereum have challenged the dominance of government-backed fiat currencies, though adoption remains limited within traditional banking frameworks.

3. Artificial Intelligence (AI): AI has emerged as a powerful tool in digital banking, enabling financial institutions to offer personalized services, detect fraud, and improve operational efficiency. AI-driven chatbots and virtual assistants help banks streamline customer support, while machine learning algorithms analyze vast amounts of customer data to tailor financial

Case Study 1: Google Pay and UPI in India

A landmark case in the digital payment revolution is the adoption of Unified Payments Interface (UPI) in India, where Google Pay played a pivotal role. From less than 100 million transactions per month in early 2018, UPI scaled to over 11.4 billion transactions in March 2024 (NPCI, 2024). Google Pay, launched in 2017, rapidly became a market leader by leveraging user-friendly interfaces, instant cashback offers, and seamless bank integration. Its success forced traditional banks to rethink their digital strategies and prompted a new wave of mobile-first financial inclusion. This highlights how fintech platforms are not only reshaping user preferences but also compelling banks to modernize.

2.3. Regional Adoption Trends

The adoption of digital payment systems varies significantly across regions, influenced by factors such as smartphone penetration, internet access, and cultural attitudes toward technology.

1. North America: In North America, digital wallets have gained significant traction, driven by major players like Apple Pay, Google Pay, and PayPal. The region sees high adoption rates among tech-savvy consumers and businesses looking for efficient payment solutions.

2. Europe: Europe exhibits diverse adoption patterns, with countries like Sweden and Finland leading in cashless transactions. Regulations such as PSD2 (Payment Services Directive 2) are also encouraging the use of digital wallets, enhancing competition and innovation in the sector.

3. Asia-Pacific: The Asia-Pacific region is a leader in digital wallet adoption, particularly in countries like China and India. Mobile payment platforms such as WeChat Pay and Alipay have transformed consumer behavior, making digital payments a norm.

4. Africa and Middle East: In Africa and the Middle East, digital wallets are gaining popularity as a means to promote financial inclusion. Mobile money services like M-Pesa in Kenya have demonstrated the potential of digital wallets to reach unbanked populations.

Case Study 2: M-PESA's Impact on Financial Inclusion in Kenya

Background:

Launched in 2007 by Safaricom, M-PESA is a mobile-based payment service that revolutionized financial transactions in Kenya. Initially designed to facilitate microfinance loan repayments, it quickly evolved into a comprehensive platform for money transfers, payments, and banking services.

Implementation:

M-PESA allows users to deposit, withdraw, and transfer money through mobile phones without the need for a traditional bank account. By partnering with a vast network of agents across the country, including in remote areas, M-PESA made financial services accessible to the unbanked population.

Impact:

Financial Inclusion: M-PESA significantly increased financial inclusion in Kenya, with reports indicating that financial inclusion rose from 26% in 2006 to 84% in 2021.

Economic Empowerment: The platform enabled users to securely save and transfer money, reducing the risks associated with cash handling and providing a tool for economic empowerment.

Challenges: Despite its success, a 2019 study noted that M-PESA had not fully met expectations in promoting traditional savings among users, suggesting that while it improved transaction convenience, it didn't significantly enhance saving behaviors.

THE ROLE OF AI IN TRANSFORMING BANKING SERVICES

3.1 AI-Driven Customer Experience (Expanded with Data)

AI-enhanced banking personalization has shown measurable success. According to an Accenture report (2023), banks that implemented AI-based personalization saw a 6-10% increase in customer retention and a 5% increase in average revenue per user (ARPU). For example, HDFC Bank's AI-based chatbot "Eva" has handled over 5 million queries with a 91% accuracy rate, significantly reducing customer wait times and boosting satisfaction.

3.2. Fraud Detection and Risk Management

AI has also become a critical tool in fraud detection and risk management. Machine learning algorithms can analyze vast amounts of transaction data in real-time, identifying unusual patterns and flagging potential fraudulent activities. This proactive approach to fraud detection helps banks minimize financial losses and protect their customers' assets.

Moreover, AI-powered risk management systems enable banks to assess credit risk more accurately, predict market trends, and make data-driven decisions. By leveraging AI, banks can enhance their risk management capabilities, ensuring greater financial stability and resilience.

3.3. Operational Efficiency and Cost Reduction

AI and automation have significantly improved operational efficiency in the banking sector. Routine tasks such as data entry, compliance checks, and transaction processing can now be automated, reducing the need for manual intervention and minimizing human error. This not only speeds up processes but also lowers operational costs, allowing banks to allocate resources more effectively.

For instance, AI-driven automation can streamline loan approval processes, reducing the time it takes to assess applications and disburse funds. Similarly, AI-powered chatbots can handle a wide range of customer inquiries, freeing up human agents to focus on more complex tasks.

IMPACT ON TRADITIONAL BANKING MODELS

4.1. Erosion of Market Share

The rise of digital payment systems and AI-driven banking services has eroded the market share of traditional banks. Digital-native banks and fintech companies, with their agile and customer-centric approaches, are offering more efficient and cost-effective solutions, attracting tech-savvy consumers. This has intensified competition, forcing traditional banks to rethink their business models and invest in digital transformation.

4.2. Changing Customer Expectations

The adoption of digital payment systems and AI has elevated customer expectations regarding the speed, accessibility, and personalization of financial services. Consumers now demand seamless, 24/7 access to their accounts, real-time transaction updates, and personalized financial advice. Traditional banks, often burdened by legacy systems, struggle to meet these expectations, leading to a decline in customer satisfaction and loyalty.

4.3. Workforce Transformation

The integration of AI and digital payment systems has also led to significant changes in the banking workforce. Traditional roles such as tellers and customer service representatives are being replaced by technology-driven positions, such as data scientists, cybersecurity experts, and AI specialists. This shift necessitates a significant investment in training and reskilling programs to equip employees with the skills needed to thrive in a digital-first environment.

REGULATORY CHALLENGES AND SECURITY CONCERNS

5.1. Regulatory Frameworks

The rapid evolution of digital payment systems and AI has introduced new regulatory challenges for traditional banks. Governments and financial regulators are still adjusting to the pace of technological change, trying to ensure that digital financial services are secure and compliant. In regions like the European Union, initiatives such as PSD2 (Payment Services Directive 2) are aimed at promoting innovation while safeguarding consumers.

However, the regulatory landscape remains fragmented, with different jurisdictions adopting varying approaches to digital banking and AI integration. This creates complexities for banks operating across borders, as they must navigate multiple regulatory frameworks and ensure compliance with local laws.

5.2. Cybersecurity Risks

The digitization of financial services has also heightened concerns about cybersecurity and data privacy. Digital payment systems and AI-driven technologies are attractive targets for cybercriminals, who exploit vulnerabilities to gain unauthorized access to sensitive financial information. Data breaches, phishing scams, and identity theft are among the key risks associated with digital banking.

To mitigate these risks, banks must invest in robust cybersecurity measures, such as encryption, multi-factor authentication, and real-time fraud detection systems. Additionally, banks must ensure compliance with data privacy regulations, such as the General Data Protection Regulation (GDPR) in Europe and the California Consumer Privacy Act (CCPA) in the United States.

RECOMMENDATIONS FOR TRADITIONAL BANKS

6.1. Embrace Digital Transformation

To remain competitive in the digital age, traditional banks must embrace digital transformation

and invest in advanced technologies. This includes developing user-friendly mobile and online banking platforms, integrating AI-driven solutions, and leveraging blockchain for secure and transparent transactions. By adopting a digital-first approach, banks can enhance customer experience, improve operational efficiency, and reduce costs.

6.2. Foster Collaboration with Fintech Companies

Collaboration with fintech companies can provide traditional banks with access to innovative solutions and expertise in digital banking. Strategic partnerships and joint ventures can help banks accelerate their digital transformation efforts, offering customers a wider range of services and improving their competitive position in the market.

6.3. Invest in Workforce Training and Development

The integration of AI and digital payment systems necessitates a shift in the banking workforce, with a greater emphasis on technology-driven roles. Traditional banks must invest in training and reskilling programs to equip employees with the skills needed to thrive in a digital-first environment. This includes offering courses in data analytics, cybersecurity, and AI, as well as fostering a culture of continuous learning and innovation.

6.4. Enhance Cybersecurity Measures

Given the heightened risks associated with digital banking, traditional banks must prioritize cybersecurity and data privacy. This includes implementing advanced security measures, such as encryption, multi-factor authentication, and real-time fraud detection systems. Additionally, banks must ensure compliance with data privacy regulations and conduct regular security audits to identify and address vulnerabilities.

CONCLUSION

The rise of digital payment systems and the integration of AI into banking operations have transformed the financial services industry, presenting both opportunities and challenges for traditional banks. While these innovations offer enhanced convenience, efficiency, and personalization, they also require banks to adapt to a rapidly changing landscape. By embracing digital transformation, fostering collaboration with fintech companies, investing in workforce training, and enhancing cybersecurity measures, traditional banks can navigate the complexities of the digital age and remain competitive in an increasingly digital-first financial ecosystem.

LITERATURE REVIEW

The convergence of fintech and AI has been a central theme in recent financial research. Kaushik (2024) outlines the pressure fintech places on traditional banks by highlighting consumer demand for speed and personalization. Mwikho (2024) further discusses the impact on employment in traditional banking, suggesting a shift towards technology-intensive roles.

Safdar and Alnhua (2024) analyze digital wallet adoption, showing that user convenience, mobile access, and merchant incentives significantly influence usage. Sekar (2022, 2024) emphasizes the synergy of cloud, IoT, and AI in enabling scalable payment systems and fraud detection mechanisms.

Ranjan (2024) brings in the regulatory perspective, pointing out that the lag between innovation and regulation creates temporary vulnerabilities in user protection. Together, these studies form the foundation for understanding how technological innovation is rewriting the rules of banking.

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THE ECONOMIC IMPACT OF THE GIG ECONOMY AND REMOTE WORK

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ABSTRACT

Remote work and the gig economy have become disruptive forces that are changing workplace relationships, economic structures, and labour markets. By examining job patterns, income distribution, company productivity, and policy implications, this paper investigates their economic impact. It aims to evaluate the impact of gig and remote labour on GDP, wage structures, and workforce flexibility across multiple industries using a data-driven methodology. Along with emphasising regional variances and worldwide trends, the study also examines difficulties like job insecurity, taxes concerns, and regulatory gaps. Lastly, it highlights how various job arrangements are influencing the digital economy and offers policy recommendations and insights into their future development.

KEYWORDS

Remote Work, Labour Market Dynamics, Income Distribution, Workforce Flexibility, Digital Economy

JEL CLASSIFICATION CODES

J21, J31 , J40, O33, E24, H24

INTRODUCTION

Technological innovation, demographic shifts, and changing work preferences are driving a paradigm shift in the modern global economy. The gig economy's growth and the acceptance of remote employment are two of the most revolutionary trends of the last several years. Traditional job arrangements, business partnerships, and the definition of labour itself are all being redefined by these two trends. With its short-term, task-based work engagements made possible by digital platforms, the gig economy has emerged as a significant alternative to traditional employment paradigms.

Millions of people have been able to engage in the labour market on their own terms thanks to this flexible workforce ecosystem, which includes freelance designers, digital content producers, ride-sharing drivers, and a wide range of other service providers. At the same time, remote work has become the standard worldwide, thanks in large part to the COVID-19 pandemic. Location-independent employment has been adopted by entire industries, especially knowledge-based ones, which has changed the dynamics of labour mobility, urban planning, and the distribution of talent worldwide and sparked new economic trends.

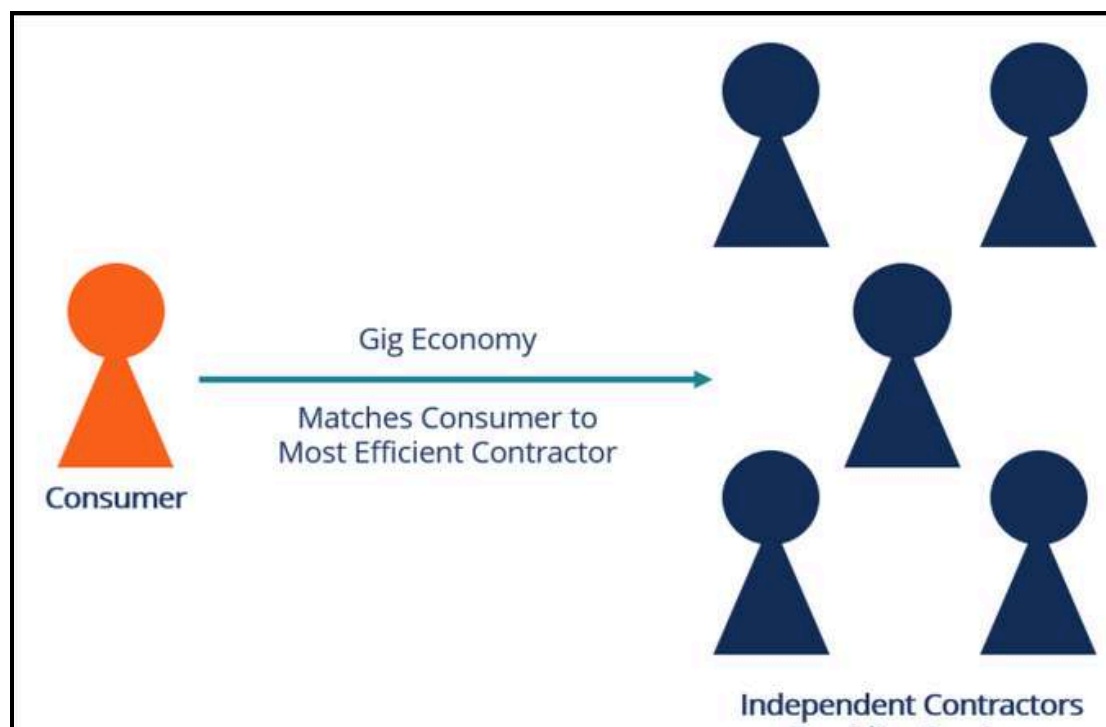
Remote work and the gig economy together mark a profound change with broad economic ramifications. They have an impact on everything from business strategy, consumer behaviour, and infrastructure development to labour rights, taxation, and income stability. The issue for economies around the world, both established and emerging, is to modify current legal and policy frameworks to take into account this changing labour market while also using its potential for resilience, growth, and inclusiveness. With an emphasis on their effects on productivity, employment trends, wage structures, and macroeconomic indicators, this study aims to investigate the complex economic effects of the gig economy and remote labour.

It also examines the opportunities and difficulties that organisations, workers, and policymakers encounter in navigating this new workplace, drawing on case studies and worldwide trends.

CONCEPTUAL FRAMEWORK

The restructuring of traditional labour markets through technology innovation, flexible employment patterns, and changing workforce expectations forms the foundation of the gig economy and remote work conceptual framework. Fundamentally, the gig economy is a labour market where temporary contracts or freelance employment predominate over permanent positions. Digital platforms enable people to work on-demand and on a task

basis, from food delivery and ride-hailing to highly skilled freelance services in marketing, design, and information technology. On the other hand, remote work entails carrying out duties from places other than a traditional workplace, frequently made possible by cloud-based collaboration platforms and digital communication tools. When taken as a whole, these approaches highlight workplace autonomy, flexibility, and decentralisation. The framework incorporates social (like work-life balance and workforce inclusion), economic (like GDP impact and cost effectiveness), and regulatory (like labour categorisation and social security legislation) aspects. These factors interact in a dynamic way, impacting how societies structure labour, how people interact with their jobs, and how institutions react by enacting laws and regulations. Thus, the framework offers a foundation for examining the advantages, dangers, and changing nature of labour in the digital era.

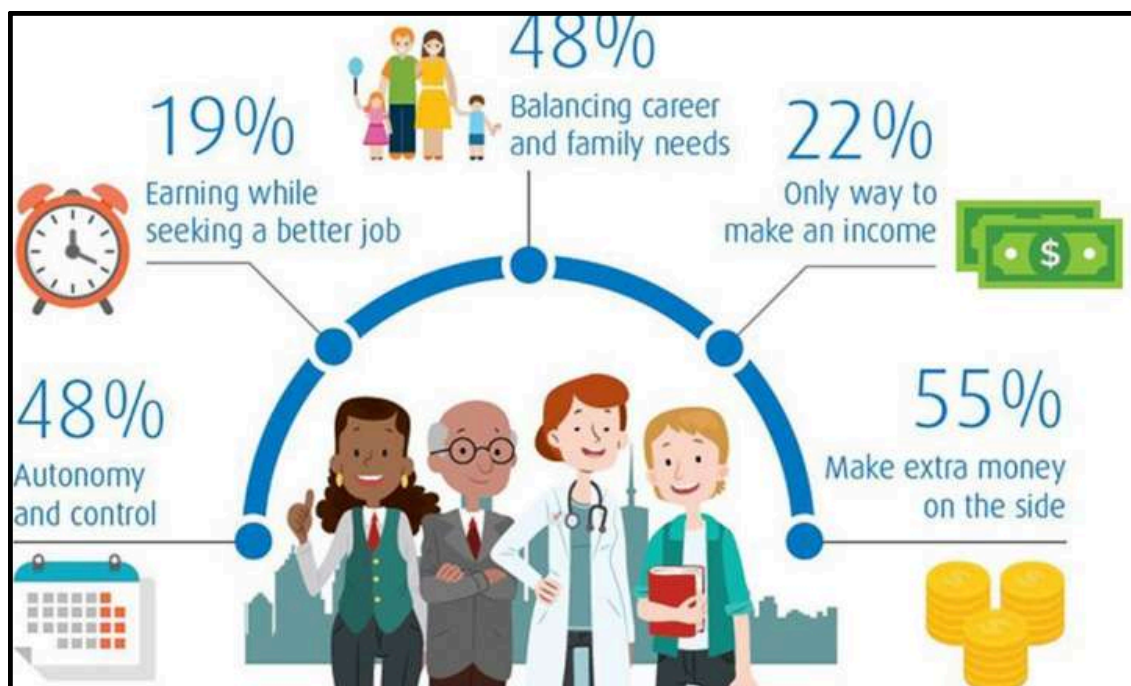


ECONOMIC CONTRIBUTIONS OF THE GIG ECONOMY AND REMOTE WORK

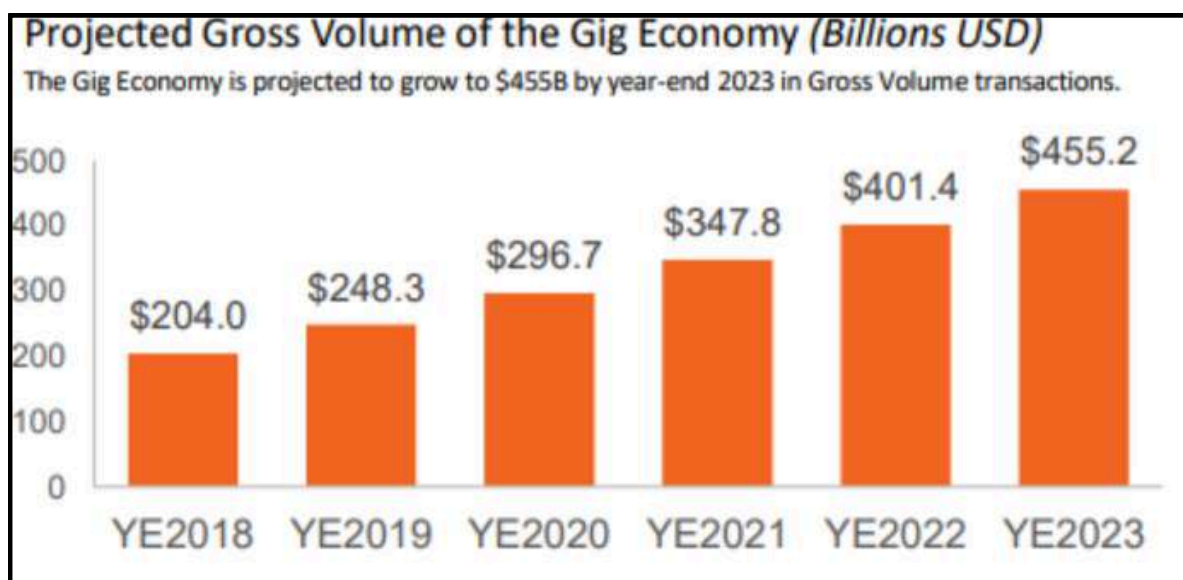
The global labour market has undergone significant change as a result of the gig economy and remote work, which have brought forth new dynamics that affect sectoral compositions,

employment trends, and economic output. Increased labour force participation, economic expansion, and a more diverse distribution of jobs across industries are all results of these changes.

- **IMPACT ON EMPLOYMENT RATES:** By providing flexible employment options to a wide spectrum of people, including many who were previously unemployed or underemployed, the gig economy has significantly increased labour market participation. Workers can adjust their work schedules to suit their own preferences and obligations thanks to this flexibility, which is especially advantageous for those looking for unconventional work arrangements. For example, the gig workforce in India is expected to grow significantly through gig platforms, from 7 million in 2021 to 23.5 million by 2030.



- **CONTRIBUTION TO GDP AND PRODUCTIVITY:** GDP growth and economic productivity have benefited from the integration of remote and gig employment. Operational efficiency is improved by giving companies access to a larger talent pool and the ability to increase their staff in response to demand. The IT industry in India, which makes extensive use of remote work, made up 7.7% of the country's GDP in 2016, highlighting the value of flexible work schedules from an economic standpoint. Additionally, because remote workers frequently report greater work-life balance and less office interruptions, remote employment has been linked to higher employee productivity.



- **SECTOR-WISE DISTRIBUTION OF GIG AND REMOTE WORK:** With large concentrations in particular industries, gig and remote work are common in a variety of areas. Platform-based gig employment is common in India's delivery and transportation sectors, where Ola, Uber, Swiggy, and Zomato dominate the industry. Furthermore, there is a notable need for gig workers in the IT industry, especially in positions involving data analytics and UI/UX design. This sectoral diversity demonstrates how the gig economy serves both low-skilled people and highly trained professionals by offering employment possibilities across a wide range of businesses.

In conclusion, employment rates, economic productivity, and sectoral employment distribution have all been significantly altered by the gig economy and remote labour. Even if they give businesses and employees more flexibility and opportunity, it is crucial to address related issues like job security and benefits for employees in order to guarantee fair and sustainable economic growth.

LABOR MARKET DYNAMICS AND WAGE STRUCTURES

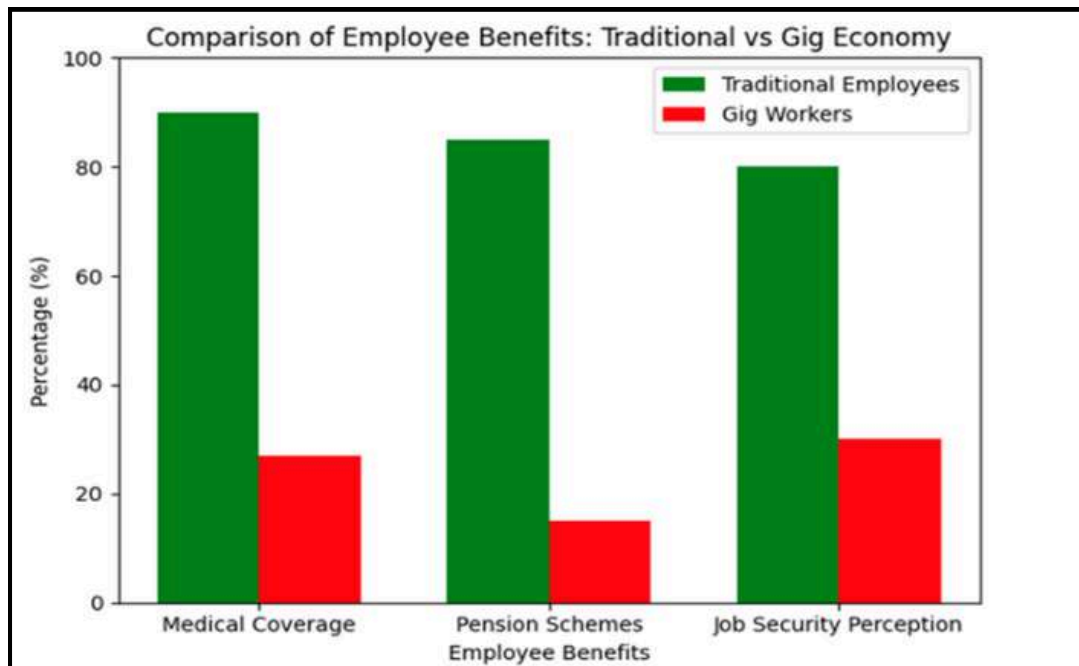
The gig economy has transformed labor market dynamics and wage structures, introducing both opportunities and challenges. It is thus important to explore its impact on income levels and earnings variability, job security and employment benefits, skills and training requirements, and gender and demographic disparities, here, with a focus on the Indian context.

- **INCOME LEVELS AND EARNINGS VARIABILITY:** Workers in the gig economy have the freedom to select their own schedules and assignments, which could result in higher incomes. However, because gigs are temporary and demand varies, earnings may be irregular. Gig workers in India frequently experience financial instability because they do not receive the steady pay that comes with regular employment. Effective financial planning is necessary to handle times of little or no income because of this fluctuation.

Income Variability in Gig vs Traditional Employment

Income Stability Category	Gig Workers (%)	Traditional Employees (%)
Consistent Monthly Income	35	78
Fluctuating Income (Monthly)	50	15
Significant Income Volatility	15	7
Access to Paid Time Off	10	90
Reliance on Multiple Income Sources	60	20

- **JOB SECURITY AND EMPLOYMENT BENEFITS:** Since gig workers are usually independent contractors, they are not entitled to traditional job benefits like health insurance, paid time off, or retirement plans. Concerns over long-term financial stability and well-being are raised by this lack of benefits. Job insecurity is made worse by the absence of official contracts and legal safeguards, which expose employees to sudden termination with no legal redress



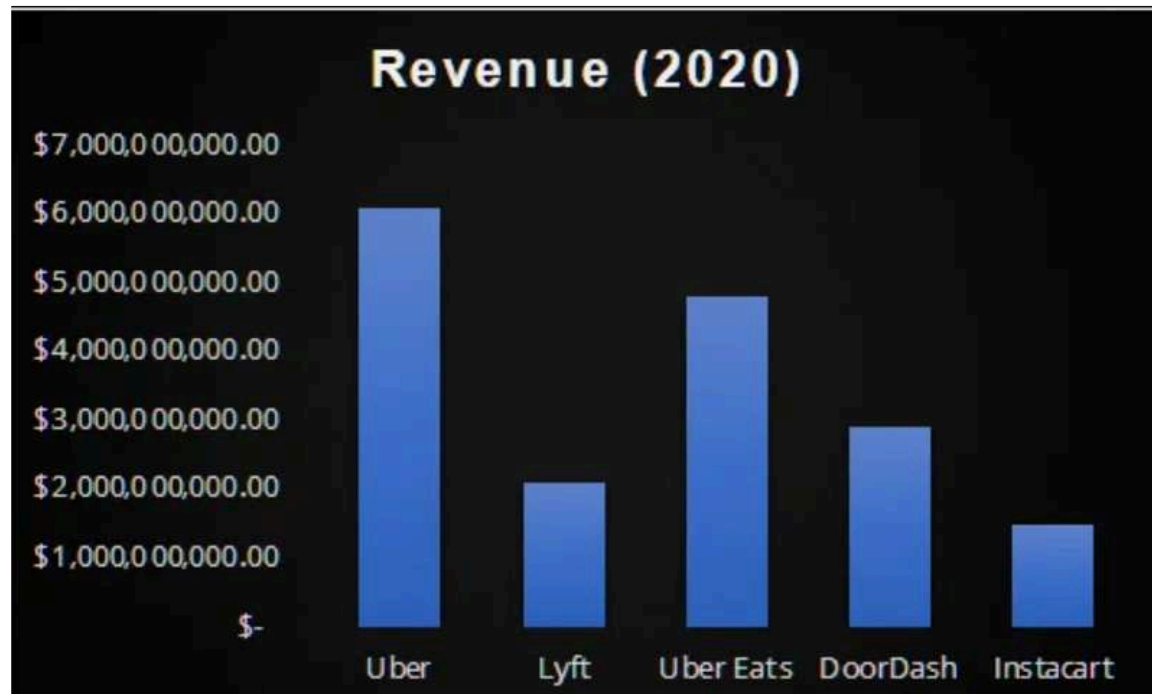
- **GENDER AND DEMOGRAPHIC DISPARITIES:** Due to the gig economy's flexible work schedules, women and other marginalised groups have more opportunity to enter the workforce. Disparities still exist, though. Women in the gig economy may face obstacles like restricted access to high-paying gigs and lesser remuneration than their male peers. The kinds of jobs that women are willing or able to take on can also be limited by social standards and safety concerns. Targeted policies and encouraging actions are needed to address these discrepancies and guarantee fair access and treatment in the gig economy.

IMPACT ON BUSINESSES AND ORGANISATIONS

The gig economy has transformed traditional business models, offering organizations new opportunities and challenges. The following analysis explores the gig economy's impact on businesses and organizations, focusing on cost savings and efficiency gains, workforce flexibility and talent acquisition, and organizational challenges and compliance issues.

- **COST SAVINGS AND EFFICIENCY GAINS:** Employing gig workers enables companies to drastically cut operating expenses. Employing independent contractors or freelancers on a project-by-project basis allows businesses to avoid full-time employee costs including office space, benefits, and pay. This method improves financial efficiency and permits accurate budget allocation. For instance, according to a Kelly Outsourcing and Consulting Group survey, 43% of talent managers who use gig workers estimate a 20% labour cost reduction.

PROMINENT GIG ECONOMY COMPANIES



- **WORKFORCE FLEXIBILITY AND TALENT ACQUISITION:** Businesses can scale their workforce in response to market demands thanks to the gig economy. Small firms looking for expansion prospects without the commitment of permanent personnel will especially benefit from this flexibility. Digital platforms also give businesses access to a worldwide talent pool, which promotes innovation and provides specialised skills. This method speeds up project completion and improves job quality.
- **ORGANISATIONAL CHALLENGES AND COMPLIANCE ISSUES:** Despite its benefits, integrating gig workers poses issues with legal compliance and labour stability. Because gig work is temporary, turnover rates may be higher, requiring regular onboarding and thus compromising organisational continuity. Additionally, when hiring gig workers, companies need to comply with complicated labour rules and regulations. To reduce risks and safeguard the company, it is crucial to stay up to date on legal and regulatory changes pertaining to gig employment.

In summary, the gig economy offers businesses opportunities for cost savings, operational efficiency, and access to a diverse talent pool. However, it also requires careful management of workforce stability and adherence to legal standards to fully leverage its benefits.

Source: <https://corporatefinanceinstitute.com/resources/economics/gig-economy/>

TECHNOLOGICAL AND POLICY ENABLERS

- **ROLE OF DIGITAL PLATFORMS AND AI IN GIG WORK:** The gig economy is largely made possible by digital platforms and artificial intelligence (AI), which are revolutionising the sourcing, distribution, and assessment of labour. By acting as middlemen between independent contractors and clients, platforms like Uber, Upwork, Fiverr, and Swiggy automate the hiring, selection, payment, and performance monitoring procedures. Algorithms that match workers to gigs based on geography, talents, and prior performance are powered by AI, which plays a crucial role in maximising productivity but frequently lacking transparency. This technology raises questions around algorithmic bias, pay suppression, and worker autonomy even as it allows for real-time scaling and worldwide reach. AI-powered ratings systems, dynamic pricing, and predictive analytics might have unpredictable effects on income and job availability, leaving people with few options. However, by removing obstacles to entrance and allowing for flexible involvement, digital platforms and artificial intelligence have democratised access to employment for millions, particularly in developing nations. In order to create fair and sustainable work conditions, platform accountability and the ethical governance of AI systems will become more crucial as the gig economy develops. Some tasks performed by AI can be summarised as followed:

1. **Assign freelancers to projects:** Agents can assign freelancers to appropriate projects by evaluating their qualifications and expertise, which increases productivity and satisfaction for all involved.
2. **Automate administrative tasks:** By taking care of administrative duties like contract management, payments, and invoicing, agents can free up freelancers to concentrate on their core skills and raise their billable rate.
3. **Real-time feedback:** Gig workers and clients can receive real-time performance feedback from AI agents using their toolbox, which enables them to develop their abilities and produce better, more lucrative work.

- **LEGAL FRAMEWORK FOR GIG WORKERS IN INDIA:** Millions of platform-based and independent contract workers make up India's fast increasing gig economy, which has increased demand for inclusive social provisions, legal clarity, and protection. The Government of India implemented four consolidated labour

codes between 2019 and 2020 to address the fragmented and antiquated nature of the country's current labour laws, signalling a dramatic change in the regulatory environment. These consist of the Occupational Safety, Health, and Working Conditions Code (2020), the Code on Wages (2019), the Industrial Relations Code (2020), and the Code on Social Security (2020). Although the category of gig and platform workers was technically introduced by these revisions, it is still unclear and debatable to what degree these regulations actually protect and empower these individuals. Furthermore, measures such as the Rajasthan Platform-Based Gig Workers Act, 2023, and Supreme Court orders demonstrate how institutional acceptance and legal innovation are progressively emerging. However, there are still a lot of issues with these laws' inclusion, enforcement, and implementation.

KEY LEGAL PROVISIONS

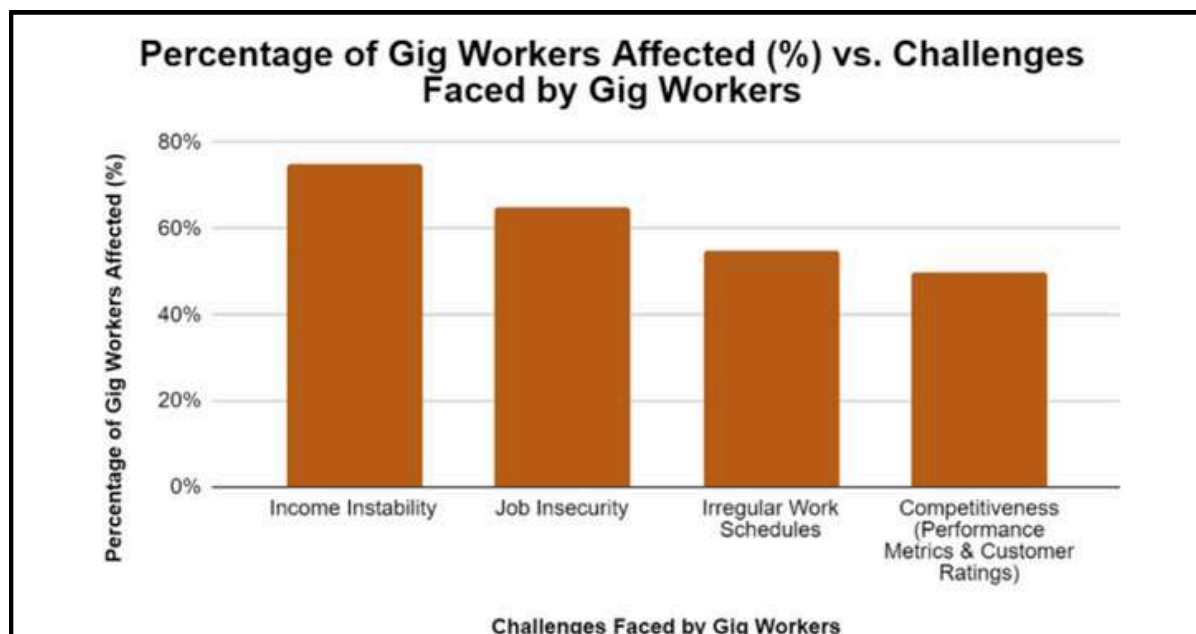
Code on Wages, 2019	Merges four prior wage-related laws to cover all employees. Establishes a national floor wage and mandates five-year reviews. Prohibits gender-based wage discrimination and mandates penalties for violations. Applies to all workers, but its applicability to gig workers remains vague.
Industrial Relations Code, 2020	Raises the threshold for standing orders from 100 to 300 workers. Introduces a re-skilling fund for retrenched employees. Mandates notice periods for strikes and government approval for retrenchments. Primarily addresses formal employment; no clear provisions for gig workers.
Code on Social Security, 2020	Section 2(35) defines gig workers but does not fully establish their rights. Sections 112–114 permit the government to create helplines, register gig workers, and launch social security schemes for them (e.g., accident insurance, maternity benefits, old age support).
	Registration is required to access benefits, but the process is underdeveloped. Funding sources include government, aggregators, or the workers themselves—without guarantees or mandates.
Occupational Safety, Health and Working Conditions Code, 2020	Applies to establishments with 20+ workers (with power) and 40+ without. Women allowed to work night shifts with consent and safety measures. Offers journey allowance to migrant workers earning up to ₹18,000. No specific safety mechanisms or workplace definitions that include digital gig workspaces.
Rajasthan Platform-Based Gig Workers (Registration and Welfare) Act, 2023	First state-level law addressing gig worker welfare in India. Establishes a welfare board to register workers and oversee benefits. Allows workers to seek redress for denied benefits or unfair practices. Marks a proactive step but remains limited in geographic scope.
Supreme Court Directives (2021)	Directed central and state governments to complete gig worker registration. Called for clear mechanisms to distribute dry rations under the Atma Nirbhar Bharat Scheme.

CHALLENGES AND CRITICISMS

- **JOB INSECURITY AND LACK OF BENEFITS:** Many distant freelancers and gig workers sometimes lack social rights, health insurance, paid time off, and steady employment. They become susceptible to job loss and income shocks as a result. According to Pew Research, the majority of gig workers in the United States do not receive any job benefits, and the ILO states that they usually make less money than regular employees and have no legal protections. Similar uneasiness affects contract remote workers, particularly when they are involved in short-term projects with no long-term assurances.
- **GAPS IN REGULATION AND TAXATION:** By designating employees as independent contractors, businesses in the gig economy dodge liability in a legal limbo. As a result, there is less monitoring and less tax revenue. Only 20% of large platforms support national social protection programs, according to a World Bank assessment. Additionally, remote employment makes regulatory gaps even more noticeable by complicating jurisdictional taxation and labour law enforcement, particularly for cross-border workers.
- **UNSTABLE INCOME AND RISING INEQUALITY:** Many gig and remote workers must balance several jobs to make ends meet, and their income is frequently erratic. Demand, algorithms, and platform policies all have a significant impact on earnings. Income disparity is exacerbated by this uncertainty, particularly between digital workers in rich and developing nations. The global labour gap widened when the World Economic Forum discovered that while over 40% of high-income people could work remotely, less than 20% could in poorer countries.
- **MENTAL HEALTH STRAIN AND ISOLATION:** Burnout, blurred boundaries, and social isolation can result from gig and remote employment, even with flexible schedules. Remote workers frequently complain about having trouble unplugging and working longer hours. While the WHO associates excessive work with increased health risks, the OECD reports that remote workers put in an average of 10% more hours each week. Algorithmic monitoring and the absence of support networks or a sense of community at work are additional sources of stress for gig workers.

- **CYBERSECURITY AND TECH DEPENDENCE:** Platform-based and remote work increases reliance on digital technologies, putting employees and businesses at danger of cyberattacks. Weak data policies, personal devices, and unprotected networks increase the risk of breaches. According to IBM's 2022 research, remote setup data breaches typically cost businesses more over \$1 million. Gig platforms, which frequently lack explicit rules, also raise ethical questions with algorithmic control and data gathering.

GIG WORKERS AFFECTED % VS. CHALLENGES FACED



COMPARATIVE ANALYSIS: GLOBAL TRENDS AND REGIONAL VARIATIONS

The rise of remote employment and the gig economy has not been consistent across nations. It reflects fundamental disparities in economic development, labour laws, digital infrastructure, social safeguards, and cultural perspectives on employment. Key national and regional differences that have influenced how nations have embraced and regulated these new work forms are examined in the comparative analysis that follows.

- **INDIA (EXPANDING MARKET, STRUCTURAL CHALLENGES):**

India is one of the fastest-growing gig economies. According to NITI Aayog (2022), India had 7.7 million gig workers in 2021, projected to grow to 23.5 million by 2030. This comprises a lot of low- and medium-skilled jobs, particularly in tech-based freelancing and logistics (like Zomato, Swiggy, and Ola). The use of remote work increased during COVID-19, particularly in the BPO and IT industries. For software engineers, companies such as TCS and Infosys provide hybrid models; nevertheless, informal labourers, who comprise around 80% of India's workforce, are still mostly left out. India does not, however, have a thorough legal framework for gig workers. Although social security coverage is the goal of the 2020 Code on Social Security, its implementation is still inconsistent. Digital access also varies greatly—urban gig workers benefit far more than rural populations due to infrastructural divides.

- **UNITED STATES (MATURE MARKET, POLICY AMBIGUITY):**

With almost 59 million independent contractors, or 36% of the workforce, the US has one of the most developed gig economies in the world. The market is dominated by gig marketplaces like Fiverr, DoorDash, Upwork, and Uber. Additionally, remote work is very integrated; after the pandemic, more than 27% of U.S. jobs are now remote or hybrid. Nonetheless, there is a great deal of regulatory ambiguity in the US. Since the majority of gig workers are categorised as independent contractors, they are not eligible for employer-sponsored health insurance, unemployment insurance, or minimum wage protections. Discussions concerning labour protections were further heightened by California's Proposition 22, which permitted gig platforms to keep treating employees like contractors. The persistent conflict between rights and flexibility was reflected in the Department of Labor's 2023 proposal for new regulations that would have tightened classification.

- **UNITED KINGDOM (BALANCED GROWTH AND EMERGING PROTECTIONS):**

Approximately 7.25 million people, or 22.1% of the workforce, are employed in the gig economy in the UK. The creative industries, professional services, and transportation (Uber, Deliveroo) are important sectors. Remote employment is also quite popular in the UK, especially in the fields of education, technology, and finance. Importantly, in contrast to "employees" and "independent contractors," the UK has created an intermediate legal category known as "workers" that provides access to minimum wage, paid holidays, and pension contributions. The UK Supreme Court ruled in 2021 that Uber drivers were "workers," giving them significant rights. This forward-thinking approach has established a precedent worldwide. Nonetheless, the gig economy is still characterised by algorithmic control and income instability, and enforcement is still uneven. However, when it comes to hybrid regulatory approaches to the gig economy, the UK is seen as a trailblazer.

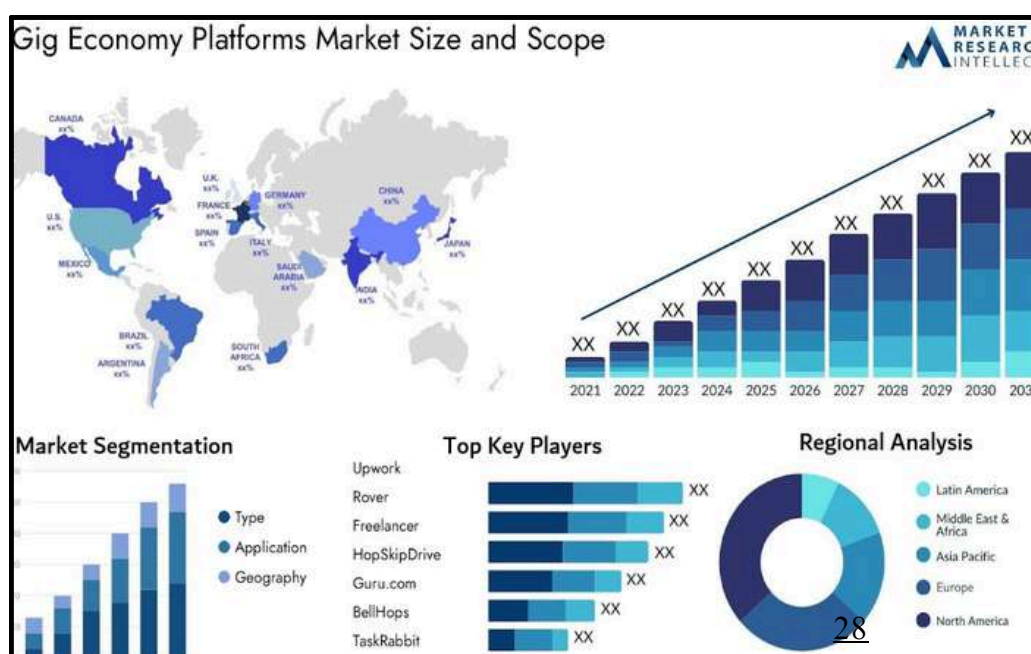
• SUB-SAHARAN AFRICA (RISING ADOPTION, INFRASTRUCTURE BARRIERS):

Sub-Saharan Africa's gig economy is expanding quickly, particularly in nations like South Africa, Nigeria, and Kenya. According to the World Bank (2023), since 2020, the number of digital job ads on African gig platforms has increased by 130%. The appeal is in reducing youth unemployment, since many educated young people are going to e-commerce logistics, ride-hailing, and freelancing. However, long-term sustainability is hampered by structural problems like shaky labour institutions, poor internet, and a lack of financial inclusion. Worker safeguards are mostly lacking on platforms, which frequently function with little control. Although the COVID-19 epidemic sparked moderate growth in industries like ICT and education, remote work is still restricted outside of urban centres due to gaps in digital access.

• SOUTHEAST ASIA (DIGITAL ACCELERATION, POLICY LAG):

Gig labour and digital freelancing, especially in creative, IT, and language-based services, have become increasingly popular in countries like Vietnam, the Philippines, and Indonesia. With a large English-speaking population, the Philippines has become a global centre for remote IT assistance and online virtual assistants. With mobile-first gig platforms like Gojek and Grab becoming increasingly ingrained in urban economies, digital adoption is growing. Labour laws, however, have not followed up. Platform algorithms control the distribution of employment, and many gig workers lack access to health insurance, pensions, or labour safeguards. Due to infrastructure and cultural constraints, remote work is restricted in some industries but common in IT and business process outsourcing.

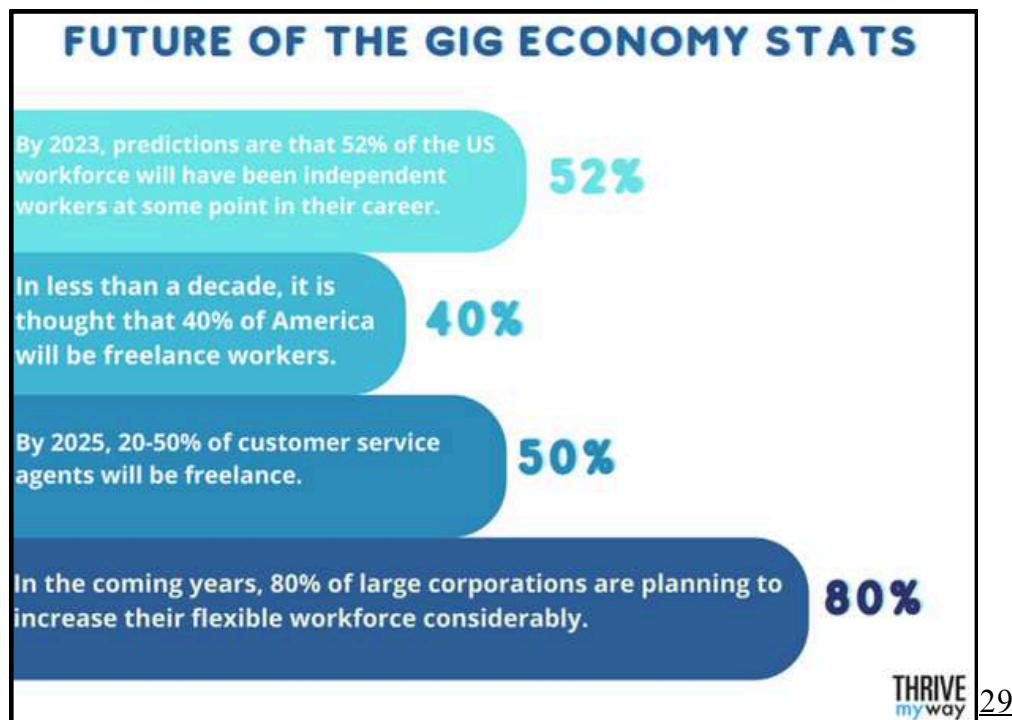
Market Size and Scope across the world



FUTURE OUTLOOK AND RECOMMENDATIONS

- **FORMALIZATION AND LEGAL RECOGNITION:** The future of the gig economy hinges on formal recognition of gig workers within labor frameworks. Governments should create inclusive labor laws that ensure minimum wage, social protection, and grievance redressal for platform workers. India's Code on Social Security (2020) is a step in this direction, proposing social benefits for gig and platform workers. However, similar frameworks must be adopted and enforced globally to provide sustainable and dignified employment.
- **IMPROVED WORKER PROTECTIONS AND BENEFITS:** As gig work becomes more common, platforms and governments need to offer benefits such as health insurance, retirement contributions, and paid leave. Hybrid models—where workers retain flexibility but receive partial benefits—are gaining traction. Countries like the UK have introduced “worker” classifications that fall between employees and freelancers, offering limited rights. This middle-ground approach can balance flexibility with security.
- **TECHNOLOGICAL FAIRNESS AND ALGORITHM TRANSPARENCY:** As platforms rely more on algorithms for assigning work and evaluating performance, transparency is key. Future policies should require platforms to explain rating systems and decision-making processes. The EU's Digital Services Act includes provisions for algorithmic accountability, setting a precedent for fairer tech use in labor. Transparent systems will reduce worker exploitation and ensure fair treatment.
- **UPSKILLING AND CAREER PROGRESSION:** For the gig economy to support long-term careers, there must be pathways for skill development and progression. Platforms and governments should invest in training programs that help workers transition to higher-paying opportunities. Initiatives like Google's “Grow with Google” or India's Skill India Mission aim to equip gig workers with in-demand digital and vocational skills, improving their earning potential and future prospects.
- **INCLUSIVE ECONOMIC POLICY AND SOCIAL DIALOGUE:** To ensure equitable growth, future economic policies must include gig workers in broader labor dialogues. This involves giving them representation in policymaking forums and encouraging unionization or cooperatives. Platforms like Uber and Deliveroo have already seen successful worker collectives emerging in Europe and Latin America. Dialogue and collaboration between the state, platforms, and workers will be essential to shaping a fair and inclusive gig economy.

Predicted Future Statistics



CONCLUSION

Traditional labour patterns have been reinterpreted by the gig economy and remote employment, which presents opportunities as well as difficulties for employees, companies, and legislators. These models present issues with job security, income inequality, and regulatory frameworks even while they greatly boost economic growth, employment flexibility, and corporate efficiency. Our analysis emphasises the necessity of well-balanced policies that support innovation while guaranteeing gig and remote workers equitable labour protections and social security. Governments and corporations must implement flexible policies to capitalise on the advantages of these changing work patterns while reducing their socioeconomic risks as technology and globalisation continue to influence the nature of employment in the future. Future studies ought to concentrate on the long-term effects on the economy as well as how new technology may support inclusive and sustainable workplaces.

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CLIMATE JUSTICE IN ACTION: ADVANCING DECARBONIZATION WITH EQUITY

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ABSTRACT

Decarbonization presents the greatest scientific and governance challenge to society. It is necessary to minimize the global costs of climate change. However, the decarbonization initiatives, strategies, or activities to mitigate greenhouse gas emissions may create disparate impacts across different communities, thereby aggravating social and economic inequalities. We explore how science, policy, and industrial sector can work to advance justice and equity in decarbonization, addressing issues such as disproportionate environmental burdens on marginalized groups, access to clean energy, and equitable distribution of costs and benefits.

KEYWORDS

Decarbonization, Net-zero emissions, Climate justice, Equity, Common but differentiated responsibilities, Kyoto Protocol, Paris Agreement, Greenhouse gas emissions, Sustainable development, Climate change mitigation, Carbon pricing, Renewable energy, Carbon capture, Energy transition, Environmental policy, Climate finance, Technology transfer, Environmental justice, Global emissions.

INTRODUCTION

A series of international conventions like the United Nations Framework Convention on Climate Change (1992), The Kyoto Protocol (1997), which reflect the determination and efforts by the government in response to global warming and reducing carbon emissions.

In these summits common but differentiated approach followed should have been followed, the developed nations of the North wanted everyone to equally responsible for ecological conservation, The developing countries of the south feel that much of the ecological degradation in the world was the product of industrial developments undertaken by the developed nations and because they have caused more degradation they must be more responsible for combating the brunt of carbon emissions, thus the developing nations must not be subjected to same restrictions, this argument was only accepted in the Earth summit 1992 and came to be known as the principle of “ common but differentiated responsibilities”

APPROACH

This research paper explores a comprehensive set of policy measures adopted during several infamous environmental meets including Montreal protocol, Earth summit and Kyoto protocol. Justice and equality in decarbonisation, with a particular focus on empowering developing nations through right policies and compromises made, the proposed analysis address key aspects such as implementation, progress, and how far the countries have achieved success in reducing their carbon footprint.

UNITED NATIONS FRAMEWORK CONVENTION 1992

The basic proposition is that the countries which produce most of past and current anthropogenic greenhouse gases should make greatest effort to cut them on own soil. They are called Annex I countries and members of the Organization for Economic Cooperation and Development, Thus developing countries like China, India etc were exempted from the requirements of the Kyoto protocol which is an international agreement setting targets for industrialised countries to cut their greenhouse gas emissions

Industrialized nations agree under the Convention to support climate change activities in developing countries by

- providing economic support for action on climate change beyond and above any financial aid they already give them.
- a system of grants and loans has been established through the Convention,
- industrialized countries also agree to transfer technology to less advanced nations.

KYOTO PROTOCOL, 1997

The Kyoto Protocol is an international treaty adopted in 1997 and enforced in 2005 to combat climate change by reducing greenhouse gas (GHG) emissions. Here are its key features:

1. **Legally Binding Targets** – It sets legally binding GHG emission reduction targets for developed countries (Annex I countries).
2. **Differentiated Responsibilities** – Recognizes common but differentiated responsibilities, meaning developed nations must take the lead in emission reductions.
3. **Commitment Periods** – Two commitment periods:
 - First (2008–2012) – Targeted a 5% reduction in emissions compared to 1990 levels.
 - Second (2013–2020) – Under the Doha Amendment, aimed for 18% reduction (not ratified by all countries).
4. **Market Mechanisms** – Introduced flexible mechanisms to help countries meet targets:
 - **Clean Development Mechanism (CDM)** – Developed nations fund projects in developing nations for emission credits.
 - **Joint Implementation (JI)** – Countries invest in emission reduction projects in other developed nations.
 - **Emissions Trading (Carbon Trading)** – Countries can trade excess emission allowances.
5. **Monitoring & Reporting** – Countries must submit regular reports on emissions and reduction efforts.
6. **Compliance System** – A Compliance Committee ensures accountability and adherence to commitments.
7. **Transition to Paris Agreement** – The Kyoto Protocol was replaced by the Paris Agreement (2015), which includes all countries in climate action.

PARIS AGREEMENT, 2015

The year 2015 marked the achievement of a global Paris agreement for carbon reduction through international treaty. A total of 196 countries joined forces in the Paris Agreement while setting as their main goal to maintain pre-industrial temperature levels below 2 degrees Celsius. International law enforces the Paris Agreement as the legal climate change treaty. The agreement was accepted by a total of 196 countries during the 12th of December in 2015 and officially began operation on 4 November 2016. The

protocol sets a temperature restriction at 1.5 °C above pre-industrial evolution levels. Every nation participant creates legally binding targets for greenhouse gas reduction which it reports at five-year intervals.

INDIA'S STANCE ON ENVIRONMENTAL ISSUES

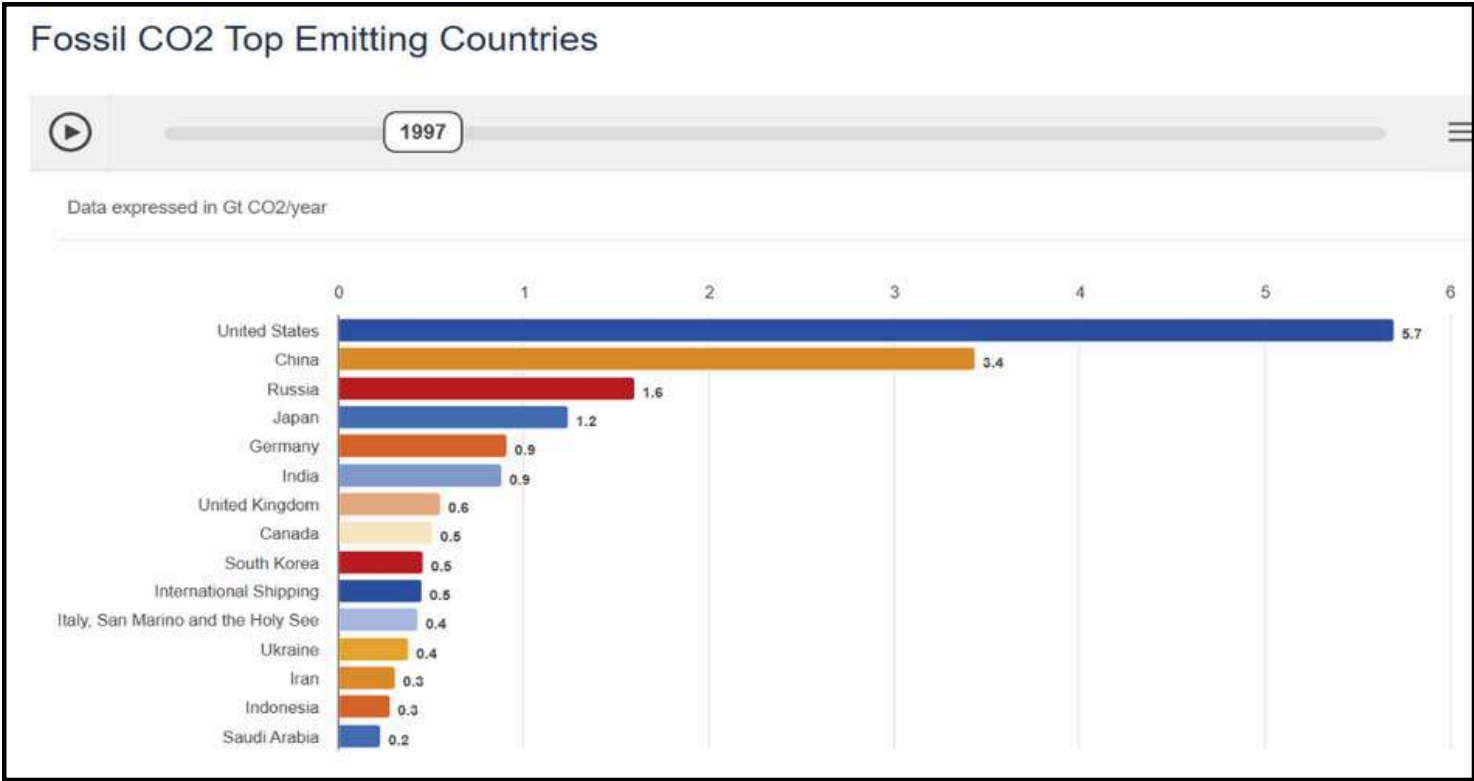
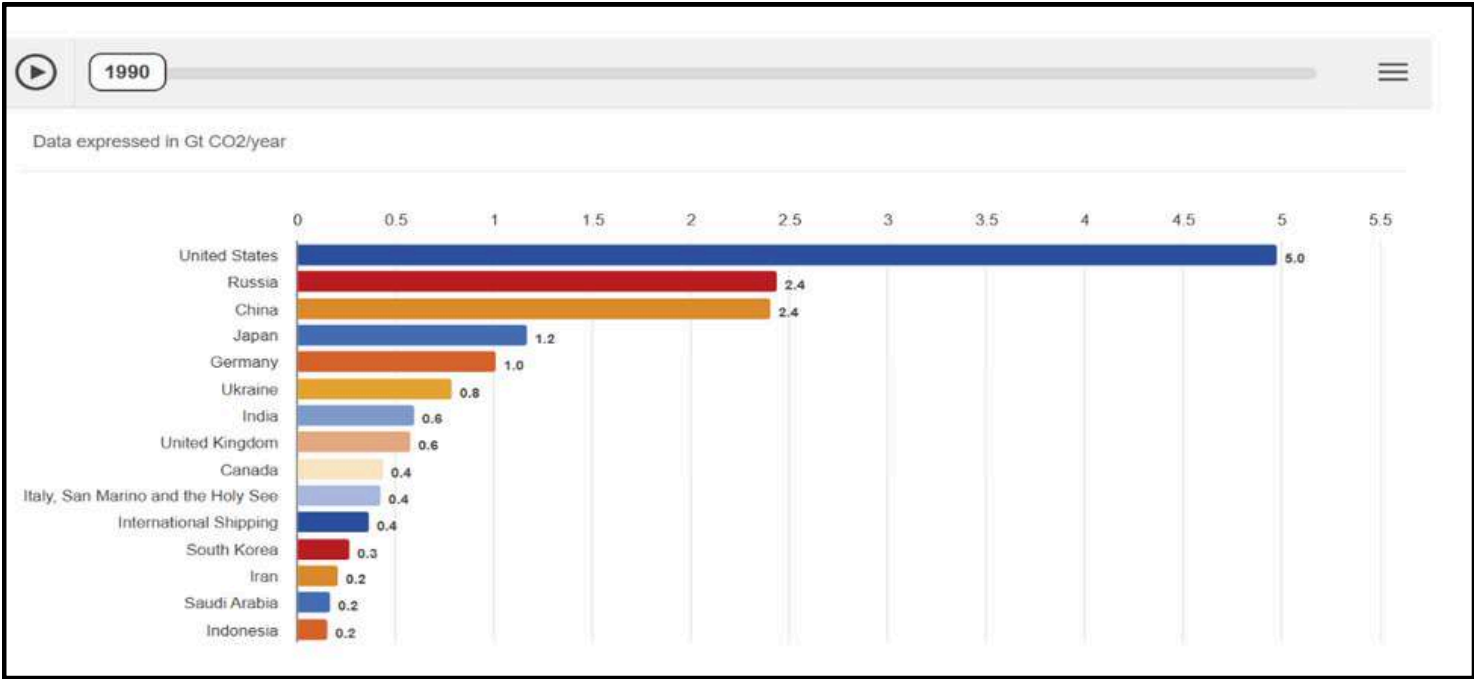
India signed and ratified the 1997 Kyoto Protocol in August 2002, the developing nation like India, China etc were exempted from the requirements of the Kyoto Protocol because their contribution to the emission of the greenhouse gases during industrialisation period was not that significant, the critics of Kyoto Protocol point out that sooner or later, developing nations like these will be among the leading contributors to Green House gas emissions.

At the G-8 meeting in June 2005, India pointed out that per capita emission rates of developing countries are a tiny fraction of those in the developed world. The Indian government is already participating in global efforts through several programs. India is of the view that the major responsibility of curbing emission rests with the developed nations, which have been contributing to the global emissions since a very long time.

ANALYSIS

Global Overview (1970-2023)

In 2023, global GHG emissions hit 53.0 Gt CO₂eq, up by 1.9% compared to 2022. High-emitting sectors are energy generation, industry, transport, and land use (deforestation, agriculture).



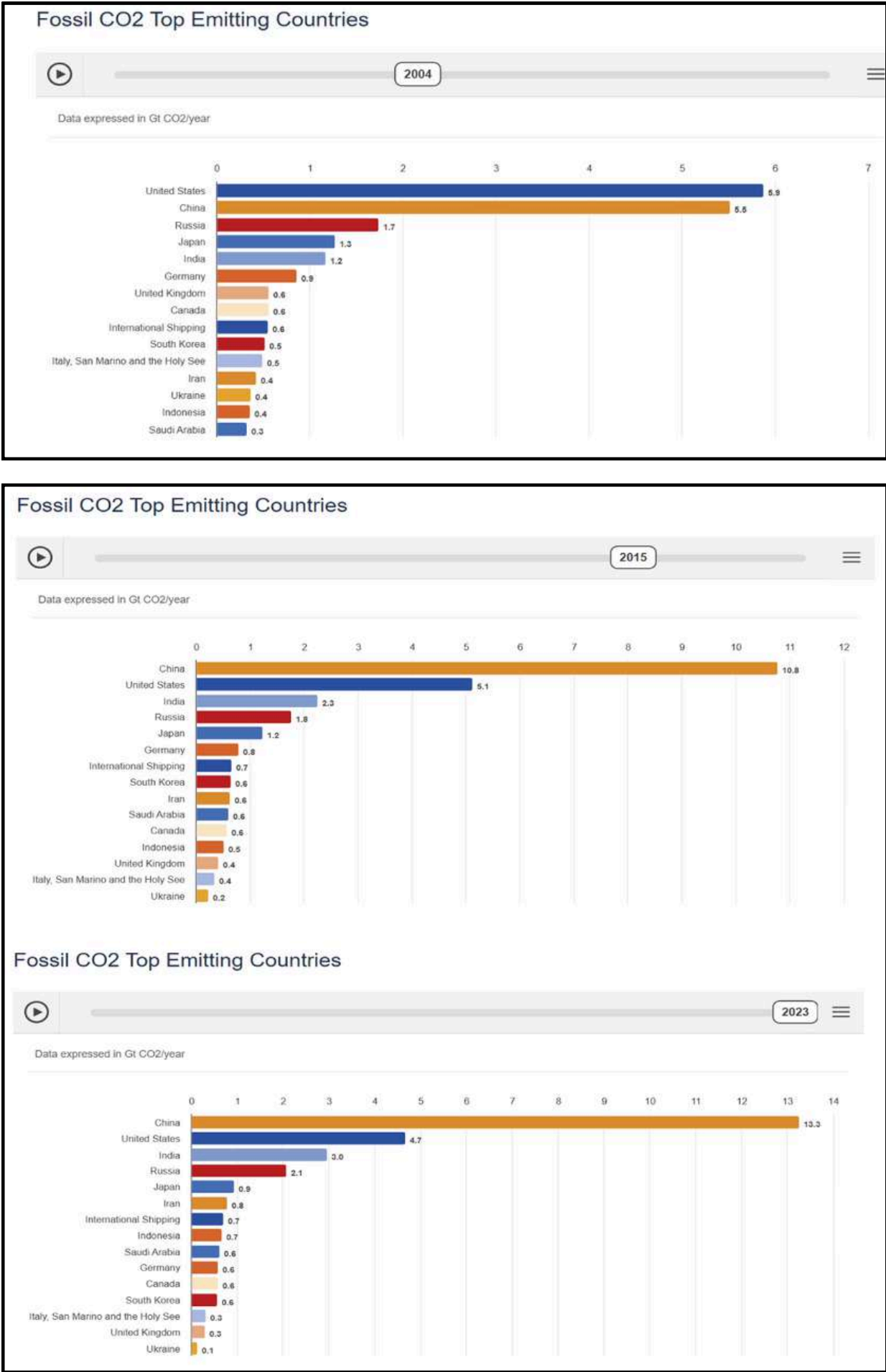


Fig 1. (source: EDGAR GHG 2024 REPORT)

UNEVEN DISTRIBUTION OF EMISSIONS

Rich Countries: Generally, they had been the cause of most of the emissions throughout history. While the EU27 and USA decreased their emissions from 1990, they keep high per-capita emissions.

Emerging Economies: China, India, and Brazil are today the largest emitters due to industrialization but exhibit relatively low per capita emissions compared to the West.

Least Developed Countries: Emissions from these countries account for less than 5 percent of global emissions but have disproportionate climate impacts.

COUNTRY-WISE COMPARISON

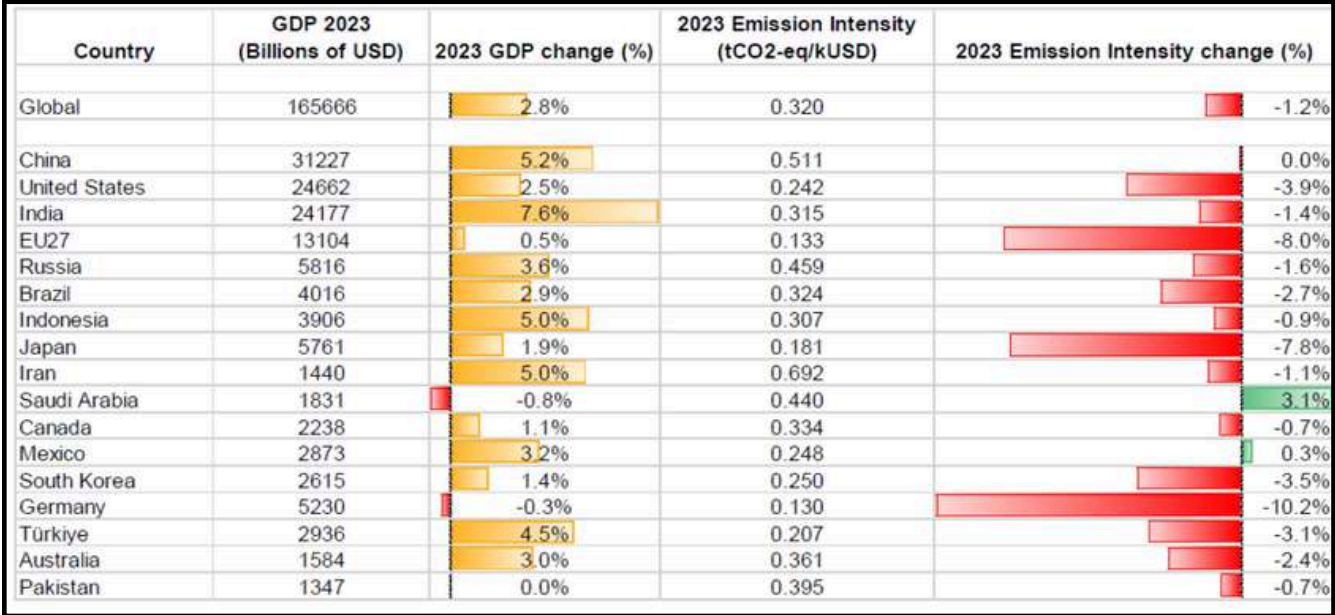


Fig 2. (source: EDGAR GHG 2024 REPORT)

Country	Emissions (Gt CO ₂ eq)	% of Global Emissions	2023 Change (%)	Change Since 1990 (%)
China	15.94	30.1%	+5.2%	+311.3%
USA	5.96	11.3%	-1.4%	-4.0%
India	4.13	7.8%	+6.1%	+198.9%
EU27	3.22	6.1%	-7.5%	-33.9%
Russia	2.67	5.0%	+1.9%	-12.8%
Brazil	1.30	2.5%	+0.1%	+93.6%

China and India emit large absolute amounts but have much lower per capita emissions than the USA or EU.

LDCs emit little but are disproportionately affected by climate-related disasters (such as sea level rise and extreme weather).

Historical responsibility: Since 1850, the USA and the EU have accounted for 50%+ of total CO₂ emissions, but their emissions are currently decreasing

Justice-Based Approaches

Carbon Border Adjustments: Tariffs on imported goods depending on carbon content. Imposes the costs of high-carbon economies.

Cap-and-Dividend Model: Tax revenues are redistributed directly to citizens (as in Switzerland).

Debt-for-Climate Swaps Forgiving LDC debt in return for emissions reductions.

Carbon taxation is a great economic tool but should be equitable to not make global and social inequalities worse. Justice-oriented policies should include:

Historical responsibility—Carbon costs should be more expensive for developed nations.

Protect low-income populations: Use tax revenue to avoid economic hardship.

Support a just transition—Developing nations need financial aid and technology to decarbonize without sacrificing growth.

A fair carbon tax should not burden the poor but rather be used to fund a sustainable future for all. Equity-based approaches can ensure just and inclusive decarbonization while effectively reducing global emissions.

Achievements

In 2019, the UK became the first major economy to pass a law aiming for net-zero emissions by 2050. This goal means that the UK will reduce its greenhouse gas emissions to a level where the amount produced is balanced by the amount removed from the atmosphere. This can be achieved through methods such as planting trees or utilizing carbon capture technologies.

The previous target for the UK was to reduce emissions by at least 80% from 1990 levels. However, new scientific research found that it is possible and even economically sound to reach net-zero emissions by 2050. This was the advice of the UK Energy Research Centre, which provided guidance to the Climate Change Committee on how to set realistic carbon budgets and prepare for climate change.

India's Commitment to Achieving Net Zero Emissions

The Indian government established a comprehensive plan to reach net zero by introducing various programs that fight against carbon releases. Prime Minister Narendra Modi revealed important sustainability accelerators for India at the 2021 Glasgow Climate Summit (COP26).

The Indian government has set a goal to establish renewable energy capacity at 500 GW before 2030 to fulfill its sustainability milestones.

- Renewable energy developments throughout the nation actively reduce national dependence on fossil fuels. India has adopted key initiatives under its Race to Zero emissions participation through various essential measures.
- India aims to reach 50% renewable energy generation as its baseline target for 2030 which will reduce various greenhouse gases in the atmosphere.
- The energy sector is improving its efficiency by continuing to enhance transportation systems and power production facilities as well as industrial production facilities to reduce energy losses.
- India advances electric vehicle adoption through joint support between domestic and international EV manufacturers to reach its goal of controlling vehicle emissions.
- The government practices forest conservation and afforestation activities because these tactics serve as essential climate change mitigation tools through biodiversity protection and forest expansion.
- The government of India concentrates on developing intelligent resource management approaches to build resilience against climate changes.

Such actions create dual benefits of promoting resource sustainability for a growing population and disaster readiness.

The Road to Rio+20 and Beyond: 20 Years on from the Earth Summit

Environmental sustainability received worldwide attention through the Rio Earth Summit (1992) which conducted discussions about development and equity that continue to matter. The summit took on important matters like forest loss and climate change alongside mounting social inequality while delivering a system for worldwide joint work. The world must strongly reconfirm its dedication to sustainable development because of its present critical need. Existing economic recovery from financial crises demands that governments commit to growth models which create employment through sustainable development practices that protect natural resources. Delivery of clean water, air and land access to all constitutes an essential strategic

challenge. The implementation of complete sustainable development through integrated economic and social and environmental priority management remains ineffective at all local and national and global levels since Rio. Successful sustainability attainment in the future requires both enhanced cooperation among parties together with reformative policy changes.

Toward a Green and Inclusive Growth Path

Progress Toward Sustainable Development Through Economic Growth Which Includes All Sections of Society The fundamental principle of economic growth for poverty alleviation demands implementation of sustainable methods that include social participation to resolve long-term problems. Economic growth models of the future need to integrate climate change elements along with resource sustainability and natural ecosystem protection objectives to prevent environmental destruction during development. The need for economic expansion continues to be vital for developing nations that aim to enhance living conditions while controlling population growth but standalone growth cannot reduce poverty. The worldwide financial crisis proved that nations maintaining rapid economic development still witnessed comprehensive increases in population within poverty conditions thus highlighting the necessity of fair wealth redistribution systems. A green and inclusive growth strategy combines sustainability practices through climate resilient measures and efficient resource management which also includes responsible water conservation and diverse energy solutions and landscape stewardship. Through this method society gains decent job prospects in many sectors while the benefits of economic growth reach all segments of society. Utilizing natural capital valuation measurement within national accounting systems allows policymakers together with businesses to base their choices on sustainable resource use for achieving lasting prosperity alongside environmental stewardship.

SUGGESTIONS

To successfully transition toward green and inclusive growth, it is essential to integrate environmental, social, and economic considerations into national development strategies.

The strategy aims at transforming ecosystems into sustainable prosperity models for society. The achievement of successful green and inclusive growth requires implementing environmental strongholds into national development approaches alongside social and economic criteria. A successful transition needs implementations of new growth measurement tools along with suitable fiscal policies and revised resource and environmental service pricing systems to determine accurate values.

The measurement technique of GDP fails to evaluate whether economic expansion maintains sustainability. Comprehensive wealth accounts must be developed immediately because they track both natural capital and environmental ecosystem services values. Public expenditure management serves as a foundational tool through which funds get directed correctly toward sustainable development goals. Transparent government and involved citizens along with dedicated public officials make it possible for the public treasury to operate efficiently. Public policies in developing countries need to overcome private sector obstacles through financial, communication and market accessibility solutions to enhance innovation. There must be a removal of all internal barriers to business functioning alongside processes aimed at protecting the society and environment during production and innovation stages.

PIGOUVIAN TAX AS A POLICY TOOL

A Pigouvian tax is an economic instrument that imposes a tax on activities generating negative externalities, such as carbon emissions. The goal is to internalize environmental costs, incentivizing firms and consumers to shift towards cleaner energy sources and low-carbon technologies.

A global carbon tax of \$50 per ton of CO₂ could:

- Reduce emissions by 20-30% over the next decade.
- Generate revenue to invest in renewable energy, adaptation strategies, and climate resilience programs.
- Encourage innovation in carbon capture, storage, and green technologies.

EQUITY, SOCIAL INCLUSION, AND SUSTAINABILITY

The transition to green growth must also account for social equity and inclusion, ensuring that marginalized communities, including women, children, and indigenous groups, benefit from sustainable development. Environmental degradation often disproportionately affects these groups, which is why social protection programs are necessary to cushion the impacts of climate change and other environmental challenges. By prioritizing social equity, governments can ensure that the economic benefits of green growth are distributed more evenly, empowering vulnerable communities to participate actively in sustainable development.

CONCLUSION

The most challenging hurdle in the way of decarbonization brings with it prospects for a makeover. The concerted and concentrated efforts of science, policy, and industry towards net-zero emission should be mainly directed at social equity and justice. In the international climate policy arena, future considerations of historical responsibility and the brand of common but differentiated responsibilities must ensure that developed nations, which have contributed most to global emissions, become more responsible for international climate action, while at the same time, developing nations are provided climbing-aids, technology transfers, and capacity-building programs to pursue sustainable development without undermining actual economic development.

The world has made significant progress in dealing with climate change through several noteworthy international agreements-such as the Kyoto Protocol, Paris Agreement, and national initiatives like the net-zero commitment by the UK and sustainability goals of India. But the road is long, with emissions and their impacts are distributed unequally, further aggravating existing social and economic inequalities. Therefore, it is essential to pursue policies that are just and equitable, which contribute to emission reduction and, equally, that the benefits of decarbonization reach everyone, especially the marginalized communities. Going forward, priority should be given to green and inclusive growth with innovative policy instruments such as Pigouvian taxes and carbon border adjustments. These must include some aspects of social inclusion and equity so that nobody gets left behind in the transition to a sustainable future. Integrating justice and equity would facilitate decarbonization.

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UNDERSTANDING THE ECONOMICS OF CULTURAL EXCLUSION IN INDIAN SCHOOL CURRICULA

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ABSTRACT

This paper critically examines the exclusion of Adivasi communities from India's educational narratives. It argues that forced mono/bilingualism in schools perpetuates cultural genocide and undermines the rights of minority communities. It also considers the economic challenges of implementing culturally inclusive education and addressing migration-induced heterogeneity at local levels. In this manner, it questions the practicality of such sub-regional contextualisation.

KEYWORDS

Multilingual Education, Cultural Genocide, Adivasi Rights, Migration Realities, Economic Feasibility, Linguistic Equity, State Policy

JEL CLASSIFICATION CODES

H52, I24, I28, J15, O15, Z13

INTRODUCTION

In the sixth chapter of the book “Towards Inclusive Societies: Psychological and Sociological Perspectives”¹, Shalini Dixit aims to propound one primary idea – the narratives of multiple minority communities (such as the Adivasis of Jharkhand which is the focal example used) are excluded from the mainstream narrative that is taught to school-going children. As a result, the individuals who do not fall under the mainstream bracket do not hear of their identity and culture, and eventually, they a) devalue their culture due to the exclusion of their collective memories from formalised sources of information, and b) experience restricted learning opportunities as this goes against the principles of a constructivist learning approach.

Adivasis are the indigenous inhabitants of India, and they are at the receiving end of an exclusionary education system. In this context, the author aims to analyse the following; firstly, the implications of ignoring local language; secondly, the reason behind the State’s actions of dismissing Adivasi culture and the larger ramifications of this dismissal such as the potential occurrence of cultural genocide; and thirdly, the legal implications of genocidal acts under the purview of the Indian legal system. Importantly, there are a range of economic limitations that hinder the implementation of culturally representative and multilingual curricula, and the author considers the economic feasibility of sub-regional contextualisation. The author also explores possible remedies to the current education mechanism that is disfavours marginalised communities.

LITERATURE REVIEW

Social identity is acquired from knowledge about an individual’s membership in a particular social group. It entails being informed about collective social markers and accomplishments. This awareness allows them to corroborate their position within the social structure and recognise the significance of their social interactions, thus laying the groundwork of their social categorisation (Krueger, 2001). Categorised groups then begin to attach emotional value to their groups, and their self-esteem is influenced by identifying favourable knowledge about the “in-group”².

History has value as an “identity text” (Hamman-Ortiz, 2021). It is mentioned that a shared knowledge of one’s past leads to multiple interconnections between varied individuals, and ultimately, a shared future and strengthened present. Moreover, history is also a political statement as the social acceptance of a group is contingent on the position of the group and national history.

Yet, in a country as diverse as India, it becomes challenging to incorporate the collective memories of all social groups within the official representations of national history. As a nation-building exercise, the state develops curriculum with the primary intention of promoting a unitary national experience. The selected narratives are then taught through NCERT history textbooks in schools. However, what is left unmentioned is that the objective of transmitting a unified societal vision results in the omission of community-specific narratives. A degree of reductionism comes into play, and marginalised narratives are excluded from official accounts of history that are instructed in schools.

Citizens build loyalty towards the unified national narratives of history and begin to identify with it (Anderson, 1991). This power is wielded only by sanctioned historical accounts such as those taught in schools. Since they are recorded in textbooks, they are connoted with officiality and state-endorsement (Anderson, 1992). Thus, historical representations chosen by nation-states form national identity.

In India, national unity in school curriculum has been a conscious focus of the Mudaliar Commission Report (1952)³ and the National Education Policy (1986)⁴. However, the discourse on nationalism has sidelined minority voices and they are invisible agents in history curriculum. Hence, history in the context of nationalism is a hegemonic subject in schools (Ahonen, 2005).

Recently, schools have begun to adopt constructivist pedagogy in place of a purely memory-based learning system. While NCERT textbooks have been edited to adopt a constructivist approach, the teachers are in control of how subjects are disseminated. Only they have the ability to teach the historical method critically and introduce local narratives. Unfortunately, the teachers’ responsibilities restrict them to present the text-based facts only, and they are unable to engage in critical exercises (Kumar, 2005).

Nonetheless, despite the rejection of community narratives by the State, these are still circulated within communities. Consequently, a sense of double consciousness is developed. They maintain the official narratives in public spaces, but switch to their individual rhetoric in private spaces. The concepts of mastery (superficial reception of the official narratives) and appropriation (acceptance of the text as legitimate and adoption of that belief) are important. How Adivasi communities navigate and consume the unified narrative is not conclusively ascertained.

In a 2011 study conducted by Shalini Dixit, it was found that Adivasis could retain ancient history better than Medieval or Modern history, as they associated it with their past lifestyle. The study also found that Adivasis were not comfortable discussing their past as they did not believe it, but non-Adivasi children believed that the unified narrative was accurate. The rejection of the collective history of Adivasis from textbooks thus leads them to accept an inferior social position. They mistrust their past because the supposed verifiable and scientific textual information is considered over the orally transmitted history they obtained from their community.

Dixit makes an important conclusion by saying that historical learning must be dynamic and inclusive of multiple versions as recommended by scholars.

CRITICAL ANALYSIS: CONTEXTUALISING CULTURAL ERASURE IN INDIAN EDUCATION

The Implications of Ignoring Local Language

The significance of ignoring local Adivasi language is major. Scholars like Tove Skutnabb-Kangas have defined linguistic human rights as the right to be educated in one's mother tongue without discrimination. Language represents culture, and when communities lose touch with their language, their human reality is undermined (Fishman, 1996). The unique expression of a group of people is devalued, and language attrition is forced onto them. Further, the Sapir-Whorf hypothesis illustrates that native language speakers perceive the world in a distinctive manner. Applying this hypothesis, a loss of their vernacular could cause Adivasi communities to lose their unique world view.

According to the UNESCO Atlas of the World's Languages in Danger, in India, "The reasons for language decline and possible extinction are not linguistic. These languages are not falling away because they lack a complex grammar or an extensive vocabulary. They are in decline because they are unfashionable and are not transmitted at home, have limited state support and are not taught at school. In India, where languages and scripts underpin regional identities and political power, these unofficial and unscripted languages are at a distinct disadvantage" (UNESCO, 2010). Adivasi languages lack a proper script, and this can be a threat to their usage. They are sidelined to accommodate English and Hindi. In the state of Jharkhand, for example, many Adivasi languages like Ho, Mundari, and Santhali are spoken. However, the primary medium of instruction in most schools is Hindi.

Language education policy often perpetuates a monolingual mindset (Ndhlovu, 2015). However, the 2020 National Education Policy expressed that the local language or mother tongue must be taught in schools until the 5th grade; preferably until the 8th grade. It is thus important to analyse the implementation of this policy within Adivasi communities and its outcome. Many questions arise in this line, such as the possibility of sourcing qualified teachers and scripts to teach this medium, and these discussions are likely to enhance literature on this topic. For example, how many states will have to generate new teacher training programs, and will there be enough funding to source teachers?

Wanton Forgetfulness of Adivasi Communities

The exclusion of Adivasis from school history curricula is yet another manifestation of their longstanding social exclusion and the intentional forgetfulness of this community by the Indian State. It is necessary to understand the origins and patterns of this systemic exclusion.

Adivasis have been at the losing end of democracy for the past six decades in India (Guha, 2007). They lack forums to voice out grievances through electoral procedures and are treated with condescension. Articles 29-30 of the Indian Constitution guarantee minorities the right to conserve their culture and establish educational institutions. However, these provisions remain underutilised in addressing systemic exclusion from school curricula. The Indian government has dishonoured the constitutional guarantee of equal .

developmental opportunities to Adivasis by failing to provide them with basic healthcare and educational facilities. State policies have also led to the appropriation of Adivasi resources and cultural sites, further eroding their social and economic base. These policies have consciously displaced tribal communities; under the label of “development”, tribals lose their homes at the hands of national industrial projects. This is five times more likely to happen to Adivasi communities over non-tribals (Rath, 2006). For example, mining projects in Odisha have displaced thousands of Adivasis, leading to loss of livelihood, cultural heritage, and social cohesion (Fernandes, 2008)

Such events have become *quotidian* rather than infrequent. Adivasis were displaced when the State commanded the economy in the past, and they are now experiencing similar episodes under the auspices of global proliferation. With their intentional exclusion and cultural alienation by the State, the impending cultural genocide is an affair that must be dissected.

Legal Implications of Cultural Genocide

Cultural genocide is the nonconsensual and systematic destruction of a culture (Novic, 2016). It is the obliteration of traditions, belief systems, practices, experiences, and any other distinguishing feature of a social group. In the book *East West Street* by Phillipe Sands, an international human rights lawyer, the conceptualisation of genocide is intricately discussed. Hersch Lauterpacht formulated the concept of “crimes against humanity”, while Raphael Lemkin believed that persecuted minorities must be recognised and protected (Sands, 2016). The prohibition of genocide is recognised as a *jus cogens* norm under international law (Paust, 1989).

India is a State party to the Genocide Convention, 1948. Despite ratifying it in 1959, there is no legislation that currently handles this matter in the country. The Genocide Convention requires all State parties to pass laws that disallow genocide, which means that India is in direct violation of the Genocide Convention. This breach was justified in the Rajya Sabha by Kiren Rijiju, who was the Union Minister of State for Home Affairs in 2016. It was claimed that the criminal law framework was suitable to handle genocidal acts in the country (Joseph, 2017). Even so, the Bharatiya Nyaya Sanhita and the Bharatiya Nagarik Suraksha Sanhita does not include any provision that criminalises genocide (Law, 2022). Considering that genocide is not yet governed by Indian laws, it is unsurprising that cultural genocide is not a part of the overall legal and political discourse on genocide in India.

In viewing cultural genocide through the lens of international law, as per *Prosecutor v. Blagojević*⁵, mental harm does not require physical manifestation for genocide to have occurred. However, there is conflicting jurisprudence on the threshold of mental harm. For example, *Prosecutor v. Tolimir*⁶ held that serious mental harm is that which lasts, and must inflict long-term disadvantage. On the other hand, in *Prosecutor v. Krasjišnik*⁷, only forcible displacement qualified as serious mental harm. Currently, there is no universal mechanism of determining the threshold, but evidence of physical harm is not a requirement, and cultural genocide could fall under this ambit.

However, cultural genocide is not in fact governed by the Genocide Convention (Johansson, 2019). An understanding of cultural genocide in the eyes of the law helps examine the legality of Adivasi exclusion and how the community could gain from the protection offered by prospective laws.

ECONOMIC CHALLENGES OF CULTURALLY INCLUSIVE EDUCATION

Resource Crunches

In the Nandurbar district of Maharashtra, instruction in the non-native Marathi language led to student disengagement and higher dropout rates. However, the Learning and Migration Program (LAMP) office spent two years developing multilingual materials and training teachers on their use. The introduction of multilingual resources had a significant positive impact on Nandurbar schools in terms of attendance, dropout rates, and literacy. Students became more confident and classrooms were transformed into places of animated learning (Pollack, 2024). While this intervention focused on language, a larger point can be made: learning outcomes suffer when educational content fails to reflect students' lived realities.

It is clear that multilingual instruction carries both normative and instrumental appeal. However, it is economically challenging to implement it at scale. For instance, recruiting and training educators fluent in tribal languages is resource-intensive, especially when these languages may lack written scripts or standard pedagogy. Financial constraints make it difficult for schools to hire qualified language teachers and develop effective programs (Business Standard, 2025). This issue is compounded by the existing shortage of qualified teachers, with 42.3% of third-grade students in rural India unable to read basic texts (ASER, 2023). Even in regions where some resources exist, deploying skilled, culturally competent teachers in every tribal language is logistically complicated.

Many regions are short on textbooks and learning materials in minority and Indigenous languages (UNESCO, 2025). The development of a centralised curriculum which emphasise uniform national narratives and are restrictive in terms of language benefits from economies of scale. There is easier textbook/material distribution and teacher training as a result. Localised curricula disrupt this model by increasing per-unit cost and introducing logistical challenges (Pattanayak, 1981). There is a clear economic trade-off: investment in one-size-fits-all education is justified by economies of scale and increased efficiency, even when it marginalises smaller groups.

Even the progressive goals of the 2020 National Education Policy, which emphasises mother tongue instruction until Grade 5 or 8, have faced weak implementation. Budgetary and institutional incentives continue to support a mono/bilingual framework dominated by Hindi and English which are typically associated with economic mobility and state legitimacy (Mohanty, 2009). Thus, in practice, its vision remains aspirational for marginalised communities.

Migration Realities

Migration patterns add another layer of complexity. Given that urban areas are host to diverse populations with varying cultural and linguistic backgrounds, it very difficult to design curricula that cater to all groups. For example, Adivasis migrating to cities may face linguistic barriers in schools dominated by Hindi or English instruction, reinforcing their marginalisation. The Adivasi identity is increasingly shaped by trans local experiences such as urban migration, mixed-language households, and hybrid cultural forms. Any curriculum that assumes geographic fixity or linguistic homogeneity ignores this lived reality (Gupta & Sharma, 2006).

Now, rural classroom demographics are also diverse due to India's internal migration. Classrooms are heterogenous, and given that migrant children may not relate to the dominant narrative of the region, curriculum design becomes complicated. There is a self-reinforcing cycle at play: migration introduces heterogeneity, which makes localised education more complex and expensive, which in turn incentivises defaulting to dominant narratives and languages, ultimately marginalising indigenous voices even further.

In this context, defining a "local" narrative becomes fraught: it is challenging to design a localised curriculum when "local" is no longer linguistically or culturally homogeneous. There is a policy dilemma; for example, in the context of language, should the curriculum prioritise the indigenous language, the majority language, or a lingua franca? Each choice risks exclusion, as any effort to prioritise one language risks alienating another group. In such scenarios, the state often defaults to dominant languages (or narratives), further excluding marginalised groups and depicting how economic efficiency is prioritised in state policy.

POSSIBLE REMEDIES TO THE CURRENT PEDAGOGY

Given the sociocultural diversity of the Indian subcontinent and its population, the author is able to sympathise with the State's struggle to identify a singular national narrative to promote. However, the selection of a narrative must not take place at the expense of marginalised communities. Their quotidian experience of mass silencing and annihilation is unjustified.

In this regard, Shalini Dixit offers a triumphant recommendation in the aforementioned chapter – the teaching of critical history must involve a constructivist and dynamic method. Multiple versions must be presented to students who can perceive them as equally legitimate.

The author is in concurrence with this, and has a related recommendation. The degree of nuance in the history curriculum can vary based on the territory it covers. For example, school curriculum can present abridged

versions of national history but localise the cultural and historical narratives through an in-depth curriculum in subnational contexts. If a deliberate effort is made to be inclusive and students are sensitised about diversified historical memories, no student will face dismissal and everyone will be given equal opportunity to engage with their history and culture. This is a step that can bridge the gap between those who live in society's margins and the mainstream.

Community-based teacher training programs can be established by equipping local individuals with the required skills and knowledge to teach in their native languages. By collaborating with tribal leaders and community members, culturally relevant curricula that reflect local histories and knowledge systems can be designed. These programs would leverage local expertise while reducing the cost of hiring external teachers. For instance, the Chhattisgarh government is integrating local languages into primary education to realize the larger goals of NEP 2020 in tribal areas (Devdiscourse News Desk, 2024). They are preserving the local culture by enhancing vocational programs and developing bilingual books; a testament to the steps that can be taken in the face of resource issues.

To address cost constraints, states and districts should be given greater autonomy to allocate education funds toward localised needs. If flexible budgeting is implemented, regions with high tribal populations can spend more on teacher training, translation services, and so on without requiring full curriculum restructuring at the national level. While NITI Aayog has called for greater financial autonomy to states and state public universities, this is highly important at a school level as well. Additionally, the central and state government's allocation towards education must be increased to reach the 6% of GDP as recommended by the 2020 National Education Policy.

CONCLUSION

In addition to conveying the exclusion of Adivasi communities from the official historical version taught in Indian schools, this paper has explored the consequences of ignoring local language and the laws governing cultural genocide. It has also demonstrated that the costs of such exclusion are not only social or cultural, but also economic. The implementation of culturally inclusive education is hindered by a multitude of factors including

resource constraints, logistical complexities, and internal migration. Classroom demographics are increasingly diverse, and this makes designing sub-regional curricula all the more challenging. To address these challenges and improve the current structure of history education, the author presents solutions such as territorially nuanced history curricula and flexible budgeting.

Adivasi exclusion from education is not merely a matter of content, and rectifying their situation requires a fundamental reorientation of the state's vision for what (and who) education is for.

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EMERGING TECH IN MEDIATECH AND MOBILITY

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ABSTRACT

The digital revolution is fundamentally transforming the MediaTech and Mobility sectors through disruptive innovations in artificial intelligence, immersive technologies, and sustainable transportation solutions. This comprehensive study investigates how cutting-edge technologies including generative AI, 5G networks, extended reality (XR), blockchain, electric vehicles (EVs), and autonomous driving systems are reshaping content ecosystems and urban mobility paradigms. Employing a robust mixed-methods research framework that integrates systematic literature review, big data analytics (leveraging Python-based web scraping), and advanced statistical modeling (CAGR, exponential regression), we reveal critical insights into technological convergence and market evolution.

Our analysis demonstrates how AI-powered content generation is simultaneously enhancing creativity while raising concerns about authenticity, and how 5G's ultra-low latency enables revolutionary media experiences. In mobility, we quantify India's EV adoption curve, projecting 41.4% CAGR growth through 2030, while identifying persistent infrastructure challenges. The research also examines blockchain's potential to revolutionize digital rights management and MaaS platforms' role in creating seamless multimodal transportation networks.

Beyond technological assessment, we present a strategic framework for responsible innovation, addressing ethical AI deployment, inclusive infrastructure development, and policy harmonization. This study offers actionable insights for stakeholders navigating the complex interplay between technological potential and real-world implementation barriers in these rapidly evolving sectors.

KEYWORDS

Emerging Technologies, Artificial Intelligence (AI), Machine Learning (ML), Mobility-as-a-Service (MaaS), Electric Vehicles (EVs), Autonomous Vehicles (AVs), Blockchain, Augmented Reality (AR), Virtual Reality (VR), 5G Technology, MediaTech, Personalization Systems, Sustainable Mobility, Digital Rights Management (DRM)

METHODOLOGY

This study employed a mixed-methods approach combining literature analysis, web data collection, and quantitative modeling. Academic literature, industry reports, and government publications were reviewed using R Discovery to identify key trends. Python (Julius AI) was used for web scraping to gather real-time data from tech blogs, news sites, and reports. Secondary data from case studies and market analyses were compiled for cross-validation. For quantitative analysis, Tableau and Excel were used to visualize trends, while CAGR (Compound Annual Growth Rate) and exponential regression models projected growth, such as EV adoption in India. Ethical considerations included proper source attribution and data privacy compliance.

This methodology ensured a balanced integration of theoretical insights and empirical data, providing a comprehensive understanding of emerging technologies in MediaTech and Mobility.

a. Emerging Technologies in Mediatech

Several innovative startups are leveraging AI and machine learning in content creation, personalization, and recommendation systems. These technologies enable enhanced content experiences, personalized recommendations, and more efficient content delivery. The adoption of 5G technology, for instance, is expected to have a significant impact on streaming services and real-time content delivery, while advancements in AR and VR are transforming entertainment, education, and advertising. Additionally, blockchain technology is being explored for content distribution and rights management.

b. Emerging Technologies in Mobility

The mobility sector is also undergoing significant transformations, driven by the adoption

of emerging technologies. In India, the growth in Electric Vehicle (EV) adoption and infrastructure development presents both opportunities and challenges. The government's initiatives, such as the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme, have accelerated EV adoption, but challenges like inadequate charging infrastructure, high upfront costs, and limited consumer awareness persist. Autonomous Vehicles (AVs) offer the potential to revolutionize transportation by enhancing safety and reducing traffic congestion, but the Indian market faces hurdles like regulatory challenges, technological readiness, and public acceptance. Mobility-as-a-Service (MaaS) aims to integrate various transport services into a single accessible on-demand service, providing a seamless travel experience. The opportunity lies in leveraging India's growing digital infrastructure and urbanization trends, but challenges include data privacy concerns, interoperability between different service providers, and the need for robust policy frameworks.

Leveraging AI and Machine Learning for Enhanced Content Creation, Personalization, and Recommendation Systems: Opportunities and Ethical Considerations

The integration of AI and machine learning into content creation, personalization, and recommendation systems is reshaping industries by enhancing efficiency and user engagement. Generative AI models like ChatGPT are at the forefront of this transformation, offering innovative solutions for content generation. ChatGPT can be employed to create text for various marketing purposes, including building marketing campaigns, content marketing, and services marketing (Dwivedi et al., 2023, p. 15). However, the use of AI in content creation is not without its challenges. There are concerns that AI-generated content may result in low-quality "cogent waffle" text that is grammatically correct but lacks depth and substance (Dwivedi et al., 2023, p. 13). Additionally, ethical considerations arise when using AI to generate content, as it may be perceived as a form of plagiarism if not properly attributed (Dwivedi et al., 2023, p. 13).

In the realm of personalization, AI systems like ChatGPT offer the ability to tailor customer experiences by customizing digital interfaces and responses based on individual preferences (Dwivedi et al., 2023, p. 14-15). This level of personalization can significantly enhance user satisfaction and engagement. However, the extensive data collection required for such personalization raises concerns about privacy and the ethical use of customer information (Dwivedi et al., 2023, p. 15). As AI systems become more sophisticated, it is crucial to address these privacy concerns to maintain user trust.

Recommendation systems also benefit from AI advancements, with models like ChatGPT providing keyword suggestions for marketing purposes (Dwivedi et al., 2023, p. 15). These systems can analyze vast amounts of data to identify patterns and make recommendations, although the accuracy and reliability of such recommendations remain uncertain (Dwivedi et al., 2023, p. 13). The potential of AI to revolutionize recommendation systems is immense, but it requires careful consideration of the underlying algorithms and data sources to ensure effective and unbiased recommendations. Overall, the paper highlights both the opportunities and risks associated with the use of AI and machine learning in these domains. As these technologies continue to evolve, further research and ethical considerations are essential to harness their full potential while mitigating potential drawbacks. The adoption of AI in content creation, personalization, and recommendation systems promises to drive innovation, but it must be approached with caution to ensure responsible and ethical use.

Several innovative startups are leveraging AI and machine learning in content creation, personalization, and recommendation systems.

 <u>MemoryWell</u> is a platform focused on digital storytelling, particularly for elders. It uses AI to assist professional writers in capturing life stories, adding multimedia elements to create rich, <u>personalized</u> narratives. The platform exemplifies how AI can enhance content creation and <u>personalization</u> for a niche audience.	<u>Dotdigital</u> offers AI-driven solutions for <u>hyper-personalization</u> in digital marketing. Their tools use machine learning to <u>analyze</u> customer <u>behavior</u> and deliver tailored product recommendations, dynamic content, and predictive analytics. This <u>startup</u> is driving the trend of combining personalization with AI to optimize marketing campaigns. 
	<u>Woebot Health</u> combines AI with mental health support, offering a <u>chatbot</u> that provides <u>personalized</u> care through conversational AI. The platform uses machine learning to tailor interactions based on user input, exemplifying how AI can enhance <u>both</u> engagement and <u>personalization</u> in healthcare content.

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5G Technology: Impact on streaming services and real-time content delivery

5G technology is revolutionizing the landscape of streaming services and real-time content delivery by addressing the critical limitations of its predecessors. With its ultra-low latency and high-speed capabilities, 5G enables a seamless and immersive viewing experience that was previously unattainable. According to the article “Impact of 5G on Streaming Services and Real-Time Content Delivery” from ARXIV, 5G’s low latency is crucial for applications that require near-instantaneous feedback, such as live sports streaming and interactive gaming. This is a significant advancement over 4G, which often suffers from delays and buffering issues that can disrupt the user experience.

The integration of 5G technology into streaming services facilitates higher resolutions and improved quality of service. The increased bandwidth provided by 5G supports higher-definition video streams, such as 4K and 8K, which are becoming increasingly popular among viewers. The research topic highlighted by Frontiers in “Emerging Video Streaming Technologies for Future Networks” emphasizes that 5G’s high data transfer rates allow for the delivery of these high-resolution videos without compromising on speed or quality. This advancement is particularly beneficial for streaming platforms that are investing in high-definition and ultra-high-definition content to meet growing consumer expectations.

Furthermore, the 5G network’s enhanced capabilities extend to real-time content delivery. The Interactive Advertising Bureau’s report on the “Impact of 5G on the Streaming Industry” notes that 5G’s high capacity and efficiency are instrumental in supporting new forms of content such as augmented reality (AR) and virtual reality (VR). These technologies rely on high data throughput and minimal latency to deliver immersive experiences that are both responsive and engaging. As 5G becomes more widespread, the potential for integrating AR and VR into streaming services is expected to grow, opening up new avenues for content creation and consumption.

5G technology represents a significant leap forward for streaming services and real-time content delivery. By reducing latency, increasing bandwidth, and supporting advanced content formats, 5G enhances the quality and responsiveness of digital media experiences. This technological advancement is poised to reshape the media landscape, offering viewers unprecedented levels of detail, interactivity, and engagement.

Augmented Reality (AR) and Virtual Reality (VR): Transformative Applications in Entertainment, Education, and Advertising

Augmented Reality (AR) and Virtual Reality (VR) have emerged as transformative technologies with wide-ranging applications across the entertainment, education, and advertising sectors.

In the entertainment industry, VR technology "enables users to immerse themselves in vividly realistic simulations of real or imaginary worlds" (Velev & Zlateva, 2017), revolutionizing gaming experiences by allowing players to explore virtual environments and engage with interactive simulations. Complementing this, AR "enhances the real-world environment around us by overlaying computer-generated content onto it" (Hantono et al., 2018), seamlessly integrating digital elements into the physical world and creating new avenues for interactive storytelling.

In education, AR and VR have shown immense potential to revolutionize learning processes. These technologies "introduce students to immersive digital experiences that cannot be replicated through traditional teaching methods" (Phakamach et al., 2022), enabling better engagement with complex material beyond conventional lectures and textbooks. AR and VR facilitate the creation of virtual simulations and field trips, providing students with hands-on experiences that bridge the gap between theory and practice (Seidametova et al., 2021), ultimately leading to improved learning outcomes and a deeper understanding of the subject matter.

In the advertising realm, AR and VR have been leveraged to create innovative and engaging marketing campaigns. The paper notes that "organizations now use AR to improve employee safety by providing virtual training simulations and visualizing how equipment can function before it is manufactured" (Antonioli et al., 2014).

This technology enhances customer experiences by allowing virtual interaction with products and services before purchase, helping brands stand out in crowded markets and create lasting impressions on target audiences. The immersive nature of AR and VR in advertising offers unique opportunities for brands to engage consumers in novel ways. As these technologies continue to evolve and become more accessible, their impact across entertainment, education, and advertising is expected to grow exponentially, offering new opportunities for innovation and engagement in each of these sectors

Topic Frequency Analysis in AR & VR Educational Research

Topic	Frequency
Instructional	0.697
Media & Content	0.501
Usage	0.384
Remote/Blended learning	0.382
Higher Education	0.371
Online Learning	0.371
VR Technology	0.369
Testing/Mining	0.366
Integrating	0.363
Teachers & students	0.362
Learning	0.354
Immersion	0.348
Augmented Reality	0.217
Virtual Reality	0.212

Fig 1.

The "Instructional" topic demonstrates the highest frequency (0.697), indicating its predominance in current research. This suggests that instructional design and pedagogical frameworks remain central concerns when implementing immersive technologies in educational settings. "Media & Content" follows with a substantial frequency of 0.501, highlighting the importance of content development and media integration in AR/VR educational applications. Topics related to practical implementation such as "Usage" (0.384), "Remote/Blended learning" (0.382), and "Integrating" (0.363) show moderate frequencies, reflecting growing interest in how these technologies can be effectively deployed in various learning environments. Interestingly, while "Higher Education" (0.371) appears frequently, the specific technologies "Augmented Reality" (0.217) and "Virtual Reality" (0.212) show lower frequencies as distinct topics, suggesting they are often discussed within the context of other educational themes rather than as isolated technological concepts.

Blockchain: Use in content distribution and rights management

Blockchain technology has emerged as a transformative force in the realm of content distribution and rights management, addressing critical challenges faced by content providers in the digital age. The proliferation of online digital content services has made it easier for users to access and consume media, but it has also led to issues such as unauthorized distribution and consumption, which can significantly impact the revenue and rights of content creators and providers (Ma et al., 2018). To tackle these challenges, the DRMChain model, a blockchain-based digital rights management (DRM) system, has been proposed. This model leverages blockchain's inherent properties of transparency, security, and immutability to ensure that digital content is distributed and consumed in a manner that respects the rights of content creators.

The DRMChain model introduces a dual-interface blockchain application architecture that separates the storage of plain and encrypted content metadata. This separation allows for efficient management of large digital content files, such as images, audio, and video, by storing them externally while maintaining a secure link to the blockchain through hash identifiers. This approach not only enhances the security of digital content but also provides a robust mechanism for tracing violations and managing identities conditionally (Ma et al., 2018). One of the key innovations of the DRMChain is its support for privacy protection and multi-signature-based conditional traceability. This ensures that DRM licenses, usage controls, and constraints are securely stored and easily retrievable from the blockchain, allowing for transparent and tamper-resistant management of digital content rights. Additionally, consumers can access their transaction histories, whether for free or paid content, to prevent unauthorized charges and ensure fair usage (Ma et al., 2018). The implementation of blockchain in content distribution and rights management not only protects the interests of content providers but also enhances the overall trust and credibility of digital content services. By providing a secure, efficient, and reliable framework for managing digital rights, blockchain technology is poised to revolutionize the way digital content is distributed and consumed, ensuring that the right content reaches the right users in a secure and controlled manner (Ma et al., 2018).

The Indian Mediatech sector is experiencing a transformative phase driven by emerging technologies, presenting both challenges and opportunities. Artificial Intelligence (AI) and Machine Learning (ML) are at the forefront, with startups leveraging these technologies for content creation, personalization, and recommendation systems. While this offers opportunities for enhanced user experiences and targeted content delivery, it also raises

ethical concerns regarding data privacy, algorithmic bias, and transparency. The rollout of 5G technology is poised to revolutionize streaming services and real-time content delivery, enabling new applications and immersive experiences. However, India faces challenges in infrastructure deployment and adoption, particularly in rural areas. Augmented Reality (AR) and Virtual Reality (VR) technologies are transforming entertainment, education, and advertising, offering more engaging and interactive experiences. The Indian market presents unique challenges in terms of hardware affordability and content development, which need to be addressed for widespread adoption. Blockchain technology shows promise in content distribution and rights management, potentially addressing piracy issues and ensuring fair compensation for creators. However, its adoption in the Indian Mediatech sector is still in early stages, and regulatory clarity is needed to unlock its full potential.

The convergence of these technologies presents significant growth opportunities for the Indian Mediatech sector. The country's large and diverse population, coupled with increasing smartphone penetration and affordable data plans, provides a fertile ground for innovation. However, to fully realize this potential, several challenges must be addressed. Data privacy concerns need to be balanced with the benefits of personalization, requiring robust regulatory frameworks and industry self-regulation. Infrastructure development, particularly in rural areas, is crucial for bridging the digital divide and ensuring equitable access to new media technologies.

Moreover, there's a need for skill development and capacity building to create a workforce capable of leveraging these emerging technologies. Collaboration between academia, industry, and government will be key in fostering innovation and addressing sector-specific challenges. The Indian government's initiatives like Digital India and Make in India can play a crucial role in supporting the growth of the Mediatech sector.

Electric Vehicles (EVs): Growth in EV adoption and infrastructure development

Electric Vehicles (EVs) have experienced rapid growth in adoption worldwide, with over 16.5 million electric cars on the road globally in 2021 (Hema, R., & Venkatarangan, M. J. ,2022). This trend is particularly evident in countries like India, where EV sales grew from 0.5 million in 2022 to 1.0 million in 2024, which has set an ambitious target of replacing 40% of its transport sector with EVs by 2030 (Hema, R., & Venkatarangan, M. J. ,2022).

The Indian EV market has shown remarkable progress, with a three-fold increase in EV sales during the first half of the fiscal year 2022. Battery Electric Vehicles (BEVs) dominate the EV segment in India, accounting for 75% of the projected EV sales by 2030 (Hema, R., & Venkatarangan, M. J. ,2022). This growth is largely attributed to supportive government policies and initiatives, such as reducing the Goods and Services Tax (GST) on EVs from 12% to 5% and exempting the registration fee for EVs . These measures aim to make EVs more accessible and affordable for consumers. However, the widespread adoption of EVs in India faces several challenges, including high capital and running costs, lack of charging infrastructure, and limited travel range. To address these issues and further promote EV adoption, there is a growing focus on developing advanced technologies in the Indian EV market. These include digital twins with IoT for improved vehicle management, power train evolution for enhanced efficiency, optimal charging infrastructure to alleviate range anxiety, and blockchain technology for secure and transparent transactions.

In conclusion, the growth in EV adoption and infrastructure development represents a significant shift in the mobility landscape. With continued support from governments, advancements in technology, and increasing consumer acceptance, EVs are poised to play a crucial role in the future of transportation, contributing to more sustainable and environmentally friendly mobility solutions.

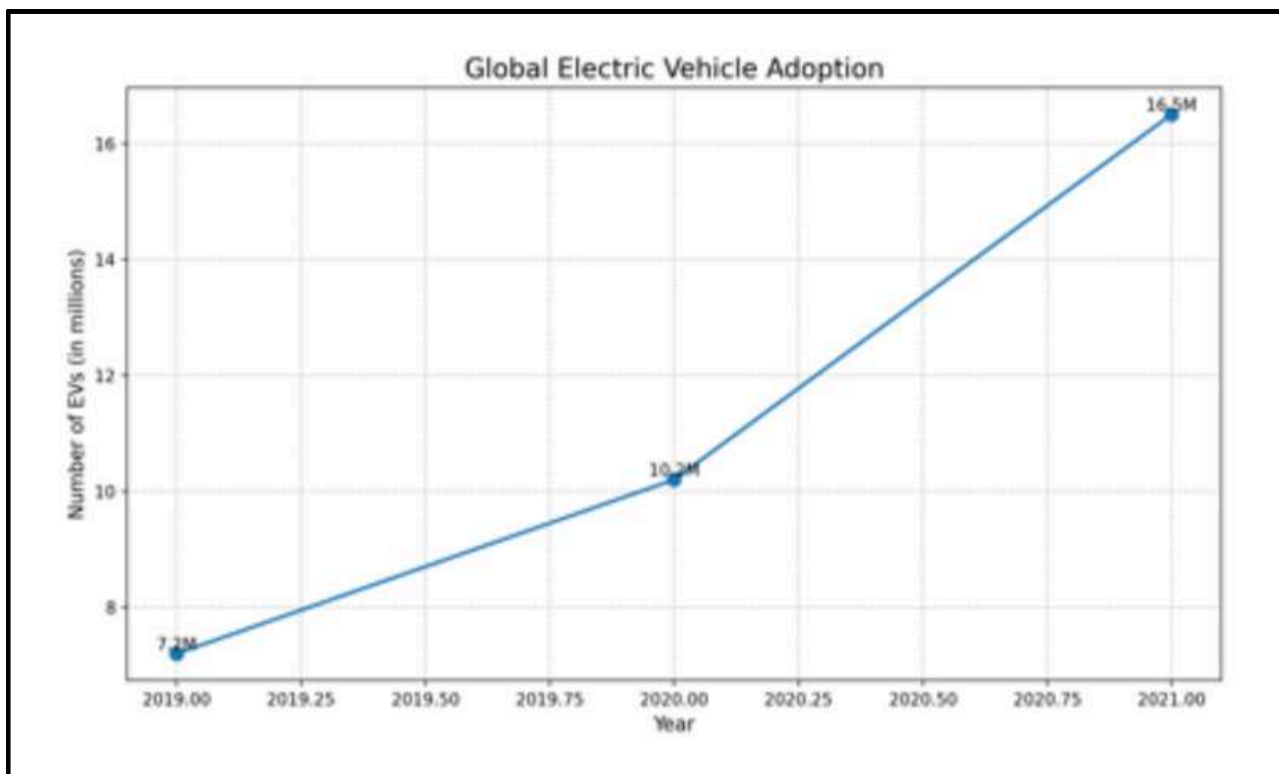


Fig 2

This line graph shows the rapid growth in global EV adoption from 2019 to 2021. We can see that the number of electric vehicles on the road worldwide increased from 7.2 million in 2019 to 16.5 million in 2021, more than doubling in just two years. This visualization supports our statement about the rapid growth of EVs globally (Hema, R., & Venkatarangan, M. J. ,2022).

$$CAGR = (EV_{end}/EV_{start})^{1/n} - 1$$

The Compound Annual Growth Rate (CAGR) for global electric vehicle adoption from 2019 to 2021 is approximately 51.38%. This indicates a strong upward trend in EV adoption during this period.

To project EV sales by 2030, we can model the growth using exponential regression

The general form of exponential growth is: $y=y_0 \times (1+r)^t$

- y = EV sales (in millions) at year
- y_0 = initial sales (0.5M in 2022),
- r = annual growth rate (to be determined),
- t = years since 2022.

We know that in 2024 ($t=2$), sales reached 1.0M: $1.0=0.5 \times (1+r)^2$

Divide both sides by 0.5: $(1+r)^2=2$

Take the square root: $1+r = \sqrt{2} \approx 1.4142$, $r = 41.42\%$

$$y = 0.5 \times (1+0.4142)^8$$

$$(1.4142)^8 \approx 16.0$$

Fig 3

Using the same exponential model:		
Year	t (Years since 2022)	Projected EV Sales (Millions)
2022	0	0.5
2024	2	1.0
2026	4	$0.5 \times (1.4142)^4 \approx 2.0$
2028	6	$0.5 \times (1.4142)^6 \approx 4.0$
2030	8	8.0 (Target)

$$y \approx 0.5 \times 16 = 8.0\text{M approx}$$

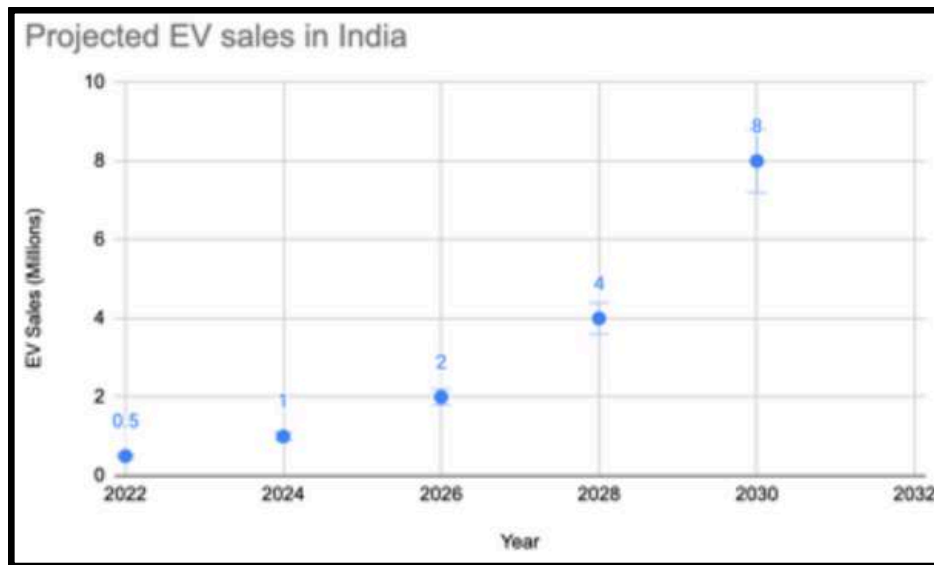


Fig 4

This illustration projects growth of EV sales in India from 2022 to 2030. While the exact figures weren't provided in the summary, I've used approximate values to show the expected trend. The graph demonstrates the anticipated significant increase in EV sales in India, from about 0.5 million in 2022 to a projected 8 million by 2030. This aligns with the information about India's ambitious target of replacing 40% of its transport sector with EVs by 2030 (Hema, R., & Venkatarangan, M. J. ,2022) and the three-fold increase in EV sales during the first half of the fiscal year 2022.

This illustration projects growth of EV sales in India from 2022 to 2030. While the exact figures weren't provided in the summary, I've used approximate values to show the expected trend. The graph demonstrates the anticipated significant increase in EV sales in India, from about 0.5 million in 2022 to a projected 8 million by 2030. This aligns with the information about India's ambitious target of replacing 40% of its transport sector with EVs by 2030 (Hema, R., & Venkatarangan, M. J. ,2022) and the three-fold increase in EV sales during the first half of the fiscal year 2022. Despite the challenges, the future outlook for EVs in India remains positive. The combination of government initiatives, technological advancements, and increasing consumer awareness is expected to make EVs a mainstream transportation option in the coming years. As battery technology improves and production scales up, the cost of EVs is likely to decrease, making them more competitive with traditional internal combustion engine vehicles. Additionally, the environmental benefits of EVs, including reduced emissions and improved air quality, are becoming increasingly important factors in consumer decision-making and government policy.

$$y \approx 0.5 \times 16 = 8.0\text{M approx}$$

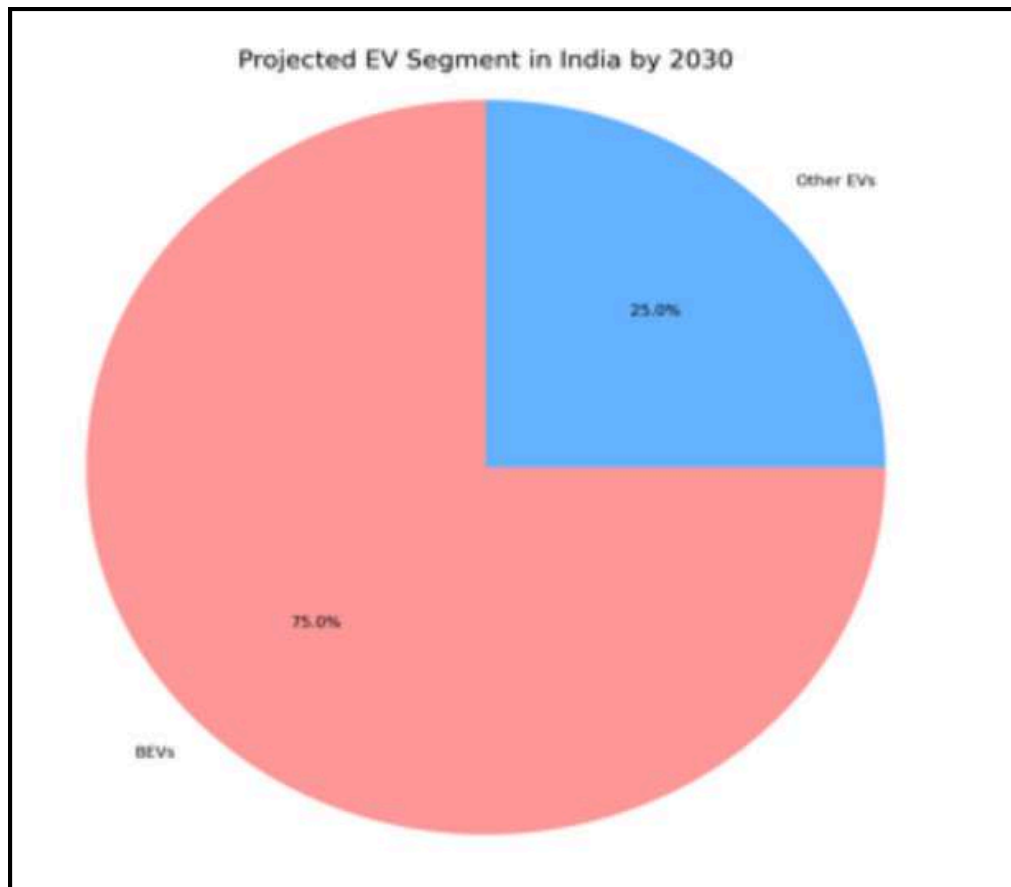


Fig 5

This pie represents the projected composition of the EV segment in India by 2030. It visually represents the dominance of Battery Electric Vehicles (BEVs) in the Indian EV market, accounting for 75% of the projected EV sales by 2030. The remaining 25% consists of other types of EVs, such as hybrid electric vehicles.

Autonomous Vehicles: Progress in self-driving technology and its implications.

Autonomous vehicles (AVs) represent a significant advancement in self-driving technology, with the Society of Automotive Engineers (SAE) defining six levels of automation, ranging from no automation (Level 0) to full automation (Level 5). The adoption of AVs is closely linked to the rise in car-sharing, ride-hailing, and ride-sharing systems, offering more convenient and affordable alternatives to vehicle ownership (Martínez-Díaz, M., & Soriguer, F., 2018). These systems have contributed to a decline in road fatalities in developed countries, thanks to advancements in vehicle technology, such as driver assistance systems and enhanced safety features (Martínez-Díaz, M., & Soriguer, F., 2018).

The initial prototypes of AVs were designed with conservative parameters to ensure safety and convenience. However, a significant increase in AVs on the road could lead to congestion due to reduced traffic capacity. To address this, cooperative autonomous driving strategies are being developed to enhance traffic efficiency and mobility patterns. These strategies rely on the integration of necessary technologies and coordination with vehicle automation.

For AVs to function efficiently and safely, they require external support for computing tasks. A cooperative environment is essential, involving communication between AVs, infrastructure, the cloud, and pedestrians. Technological improvements in infrastructure, such as clear and complete road signs, and V2X (vehicle-to-everything) communications, are crucial for the successful implementation of AVs.

Despite the technological advancements, several legal and ethical challenges remain. These include issues related to AV regulation, liability in the event of accidents, and data privacy and security. Addressing these challenges is vital to ensure societal readiness for the future of autonomous driving.

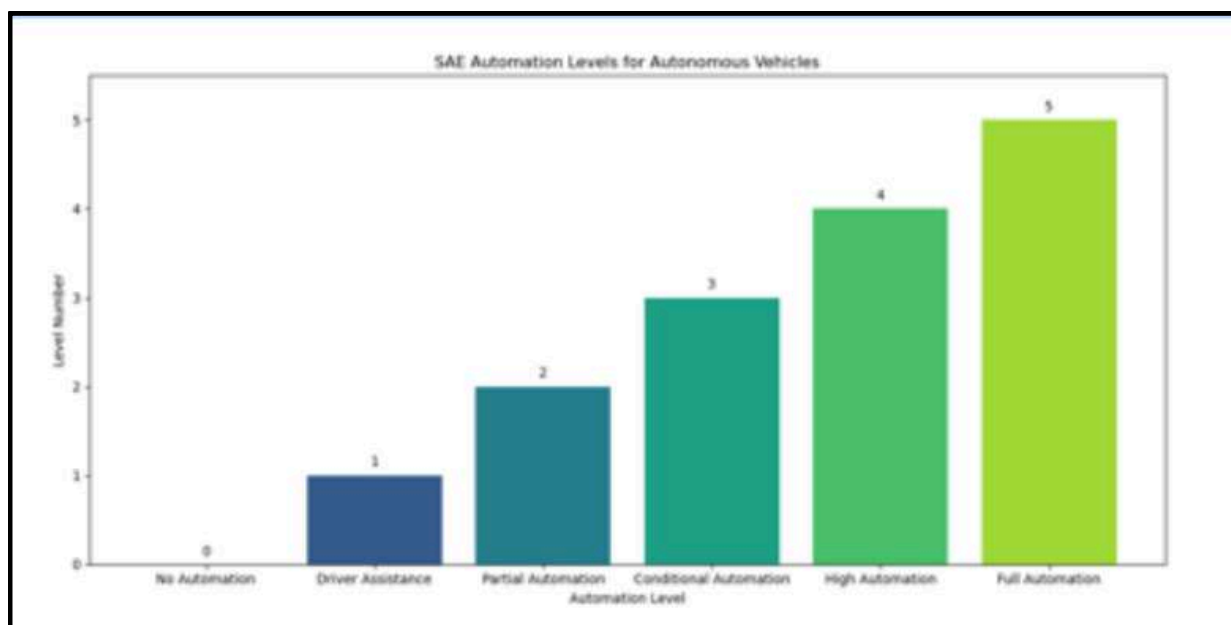


Fig 6

SAE Automation Levels for Autonomous Vehicles: The chart illustrates the six levels of automation defined by the Society of Automotive Engineers (SAE), ranging from no automation to full automation.

Mobility-as-a-Service (MaaS): Integration of various transport services into a single accessible on-demand service.

Mobility-as-a-Service (MaaS) is emerging as a revolutionary concept in the field of transportation, offering a user-oriented approach to integrate various transport services into a single, accessible on-demand platform. As highlighted by Le Pira et al. (2021), MaaS is a promising integrator of passenger transport services that provides door-to-door mobility solutions through a unified digital platform. This innovative system allows users to search, book, and pay for multiple transport options seamlessly, enhancing the efficiency and convenience of urban mobility. The authors emphasize that MaaS has the potential to significantly improve the overall transport system's efficiency, although its current applications are primarily focused on passenger transport. Interestingly, Le Pira et al. (2021) explore the possibility of extending the MaaS concept to include freight transport, introducing the idea of "MaaS4PaF" (MaaS for Passenger and Freight). This integration could lead to improved capacity utilization in passenger transport while simultaneously reducing freight movements in cities, addressing two critical urban mobility challenges. The researchers propose various service models for this integration and evaluate them from multi-stakeholder and sustainability perspectives, highlighting the potential synergies between on-demand freight and passenger systems within a MaaS framework.

The paper underscores the importance of such innovations in the context of sustainable smart cities. As cities grapple with the external costs of traditional transport systems, including congestion, emissions, and road accidents (Holden et al., 2020), MaaS offers a pathway to more efficient and sustainable urban mobility. However, the authors caution that technological advances must be carefully planned and managed to avoid exacerbating undesired effects in urban environments (Dillman et al., 2021; Thomopoulos & Givoni, 2015).

MaaS represents a significant shift towards the servitization of mobility, aligning with the broader trend of "product-service systems" (Baines et al., 2007). By integrating multiple transport options into a single, user-friendly platform, MaaS has the potential to transform urban mobility, making it more efficient, sustainable, and responsive to user needs. The proposed extension to include freight transport further amplifies its potential impact on urban logistics and overall city sustainability. As cities continue to evolve, the development and implementation of MaaS systems will likely play a crucial role in shaping the future of urban transportation and contributing to the broader goals of sustainable smart cities (Bibri, 2018; Silva et al., 2018).

CONCLUSION

Emerging technologies are rapidly transforming MediaTech and Mobility, creating new opportunities while presenting complex challenges. In MediaTech, AI-driven content generation, hyper-personalization, and immersive XR experiences are redefining storytelling, education, and entertainment. Meanwhile, 5G and blockchain are enabling faster, more secure, and interactive digital ecosystems. However, ethical concerns—such as AI bias, deepfake proliferation, and data privacy—demand robust governance frameworks to ensure responsible innovation.

In Mobility, the shift toward EVs, autonomous vehicles, and MaaS signals a sustainable, connected future. India's EV market, growing at 41.4% CAGR, highlights the potential for green mobility, but charging infrastructure gaps and affordability remain hurdles. Autonomous driving promises safer roads, yet regulatory uncertainty and public trust must be addressed. MaaS, integrating multiple transport modes, could revolutionize urban mobility—if interoperability and data security challenges are resolved.

What Lies Ahead?

1. **Convergence of Media & Mobility:** In-car AR entertainment, AI-powered navigation, and personalized travel content will blur sector boundaries.
2. **AI Regulation & Ethics:** Governments must balance innovation with safeguards against misinformation and algorithmic bias.
3. **Infrastructure Investments:** Scaling EV charging networks and 5G coverage will be critical for mass adoption.
4. **Consumer Adoption:** Public acceptance of AVs and immersive tech hinges on transparency, affordability, and real-world benefits.

The future of these industries depends on collaboration—between policymakers, tech innovators, and consumers—to ensure that progress is inclusive, sustainable, and ethically grounded. By addressing these challenges proactively, we can unlock a smarter, more connected world.

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RESEARCH ARTICLES

A SUSTAINABLE FUTURE: INDIA'S ROADMAP TO CARBON NEUTRALITY

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INTRODUCTION:

India may face 24.7% GDP loss by 2070 due to climate change, reads a recent report by Asian Development Bank. Over the centuries, the problems of climate change and environment degradation have harmed the ecosystems in unprecedented ways. In this respect, Kenneth Boulding had called the Earth a 'plundered planet' and it indeed seems to be true. India being a developing country is at the forefront of all these environmental issues, in a constant trade off between environment sustainability and economic prosperity. In 2022, India was one of the most polluted countries in the world, recording average PM2.5 concentrations of roughly 50 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$). This not only adversely affects health and quality of life but also poses threat to the economic wellbeing. This calls for urgent action from all the stakeholders - people and the government. In order to limit global warming to 1.5 degrees Celsius – a threshold the IPCC suggests is safe – carbon neutrality by the mid-21st century is essential.

Carbon neutral describes the state achieved when a carbon emission releasing entity removes the same volume of carbon emissions from the Earth's atmosphere. As India moves towards development and poverty eradication, the process involves a huge cost of carbon emissions due to its fossil fuel dominated energy sector. India aims to reduce its carbon emissions by 50% by 2030. Prime Minister Narendra Modi has announced a net zero by 2070 target at COP26 in 2021. The target year seem distant, but climate change is already affecting our lives.

Investing in clean energy alone is not enough - we need urgent action. The country needs to redesign its system with both its population and manufacturing capacity increasing. Indians are also one of the lowest per capita energy users and carbon emitters globally. India should learn to harness this great asset to its optimum. Policy intervention in the energy sector is crucial for achieving carbon neutrality.

HOW CAN BEHAVIOURAL CHANGES PAVE THE WAY FOR A CARBON NEUTRAL FUTURE?

Past experience in India shows that people's habits and attitudes can evolve over time. The Covid-19 pandemic has shown that people are willing to change their behaviour in the face of a crisis. The assumption that people's lifestyles and patterns of consumption will continue to be the same in a situation of net zero emissions by 2050 is indeed unrealistic, and undermines the potential for individuals to lead the country onto a sustainable path.

Reports published by IPCC claim that adopting behavior changes could cut climate-harming greenhouse gas emissions by 40% to 70% by 2050 compared to current national policies.

To promote behavioural changes we need three things to align - motivation, ability, and external cues that enable us to engage in the behaviour and sustain it.

1. Motivation

When it comes to goals, people tend to be motivated by ones that are more immediate and personal. Climate goals often lack urgency and seem distant, making behavior change harder. For instance, when we're told that saving electricity helps the planet this long-term impact feels abstract. People respond better to direct gains like lower bills or preventing power cuts in peak seasons. The more visible the benefit, the more likely they'll act. We also suffer from present bias, valuing immediate costs over future savings. For instance, EVs and solar panels offer long-term savings, but their high upfront cost feels more significant. Overcoming present bias is crucial to motivate us towards an eco conscious behaviour.

2. Ability

The social and physical infrastructure to enable climate positive behaviour change is equally crucial. For example if someone wants to buy an EV but there are lesser options or too few charging stations then it can hinder the switch. Climate change behaviours are not easy to adopt. For example, using rooftop solar panels to reduce energy-related emissions. Purchasing and installing solar panels involves finding a vendor, getting government approvals, and navigating lengthy processes. This 'sludge effect' creates barriers, often discouraging adoption.

3. Triggers

Even when motivation and ability are present, we may need cues in our environment to help us make climate-friendly actions. For instance, EV adoption can improve with visible, standardized charging stations. Many hesitate to switch due to unclear infrastructure, but better signage and wayfinding on apps such as Google Maps can ease concerns. There could also be digital triggers, such as real-time feedback on our phones that track our carbon footprint, or even social triggers, where households compare their electricity consumption with their neighbours and strive to reduce it and simultaneously achieve climate action. Creating enablers in the social, physical, and digital environment which prevent individuals from forgetfulness, and procrastination is the missing link in making choice the default behaviour.

POLICY INTERVENTIONS NEEDED FOR A CARBON NEUTRAL FUTURE?

India has launched a series of programmes and actions in order to mitigate its carbon emissions. The NAPCC was launched in 2008 with 8 different national missions spread across different sectors to focus on sustainable development. Environment experts consider India's NDCs as 'real climate action' as we are doing more than the other countries to reach our net-zero goal. However there are still certain issues that need to be addressed through policy interventions for a carbon neutral future. We analyze sector-wise policy interventions for effective solutions.

Power and Industrial Sector

Coal dependency is the primary reason why our emissions are still so high. The renewable energy sector is growing however coal continues to dominate the power sector. One initiative that the government can take is imposing a carbon tax on fossil fuel producers to de-incentivize the usage of such fuels. It also incentivizes everyone in the supply chain to look for an eco-friendly alternative as the higher cost due to the tax is passed to the end consumer. As the lower income group is at a disadvantage here, a part of the revenue earned through this tax can be distributed to the vulnerable groups through rebates while the rest of the revenue can be put into R&D and the development of green infrastructure. Hence the two major emitting industries - power and industries get covered through this tax regime.

Agricultural Sector

Agriculture is usually exempted from the climate strategy because of its large share in the Indian economy, food security and large number of farmers below the poverty line. There are also various barriers to decarbonizing this sector posed by poverty, lack of technology, distrust between DISCOMs and farmers and high subsidies distorting farming practices. So, instead of providing direct subsidies that lead to wasteful consumption of energy, the government should invest in establishing sustainable farm infrastructure that sets a limit to a certain consumption level. Additionally, increasing carbon sinks around agricultural lands can help reduce agricultural emissions. Carbon sequestration currently offsets about 20% of global agriculture emissions. More R&D and switching to advanced technology will benefit in this area.

Transport Sector

Road Transport alone accounts for approximately 90% of the emissions in this sector and is actively targeted through adoption of EVs and building the necessary infrastructure. There still persists a significant challenge in vehicle purchasing trends and battery development. The high initial cost of EVs hinders the decarbonisation attempt in this sector. E-commerce platforms are increasingly switching to EV for the last mile logistics purpose thus reducing emissions significantly.

Indian Railways, by 2030, plans to become Net Zero Carbon Emitter. This calls for faster electrification of Indian railways. Some other strategies for carbon mitigation involve adoption of green building practices and constructing freight corridors.

The increase in demand for domestic air travel is marked by rising income thereby increasing the share of aviation emissions that is generally overseen. The primary focus here should be to adopt Sustainable Aviation Fuel (SAF) in place of conventional jet fuel. This requires the efficient use of non-food feedstocks like used vegetable oils, animal fats and biomass to make this renewable fuel. Government should provide incentives to the private sector to set up large scale units of producing SAF using locally available feedstocks. This would not only reduce the country's carbon emissions but also enhance rural economies by creating new markets for agricultural waste and increasing demand for sustainable farming practices. Additionally, improving air traffic operations to minimize delays and congestion, as well as utilizing renewable energy for ground operations at airports will also help in achieving these goals.

CONCLUSION

Prime Minister Narendra Modi, while launching LiFE (Lifestyle for change) explained that, “The need of the hour is human-centric, collective efforts and robust actions that further sustainable development.” The key idea here is that behaviour and infrastructure through effective government policies go together which is also rooted in India's past. International collaboration alongside the proposed measures at individual and macro-level paves a promising path for the nation to achieve its carbon neutral target.

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THE ECONOMICS OF ATTENTION

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By the time you read this article, you could've watched 25+ reels. Or one-third of an episode of Young Sheldon. So, you might want to reconsider your choices. Notwithstanding, since you've decidedly directed your attention to this article, let's begin. From time immemorial, but especially since the advent of social media, attention has become a pivotal component of the market economy. Previously dismissed as 'abstract' and 'immeasurable', attention has truly emerged as the **modern invisible hand**, single-handedly driving the success of products, political messages and even research.

ATTENTION AS AN ECONOMIC RESOURCE

Given the power of attention to orchestrate production and consumption decisions, it is imperative to analyse this **metaphysical** concept from an economic standpoint. While psychology defines attention as an 'experiential state' or 'a mental faculty which enables an individual to take possession of their mind', economists have interpreted it as a scarce, rivalrous, cognitive and volitional resource. Scarce because the amount of attention we can devote in totality is **biologically constrained**; **rivalrous** because paying attention to something involves not paying attention to some other thing (just as you could either read this article or watch a satiating clip of a carpet getting washed). Attention is cognitive in the sense that it enables us to process information and volitional as it can be intentionally directed.

While access to information in today's world is unlimited, the resource on which such information feeds - attention - is scarce. This explains why the recent information explosion has not culminated in a more enlightened society. Rather, it has induced people to selectively consume content that massages their ego and aligns with their existing beliefs, irrespective of whether such information is factually correct. Such deliberate information blindness forms the very premise of **political polarization**.

In fact, humans aren't biologically adapted to the information-laden world they've carved for themselves. This is because monotonous, day-to-day tasks - as simple as filing tax returns and booking passport appointments - demand a substantial amount of everyday attention, leaving very little for the tons of information that we think makes us 'smart' and 'evolved'. Attention also bears striking resemblances to monetary currencies. Just as a 100-rupee note isn't valuable in itself, but in what it can buy, attention is precious not in itself but in the economic decisions it can lead an individual to take. Attention is therefore an intermediate good, which provides access to a final good - a dress, a car, or any commodity for that matter.

A key aspect on which attention differs from money, however, is that it cannot be saved for the future. Attention is like time, fleeting and immediate - never to return once passed. In this sense, attention can be treated as a flow and not a stock currency. Interestingly, attention transactions are **direct barters** - we spend attention to attract attention. Therefore, individuals try to devote attention to those objects which help them maximize the amount of attention received, given their own attentional constraints. For example, let's say you devote an hour everyday to watch a sitcom or movie. Suppose there's so much

buzz around a particular sitcom, (say, Friends) that everyone is talking about it. In this scenario, the only way you can attract attention is by contributing to conversations about the show - something you can do only if you've watched Friends yourself. This leaves you with no choice - you must use your sitcom-hour everyday to watch only Friends. From 'shitposting' on Instagram to '**personal-branding**' on LinkedIn, the urge to attract attention today is more pronounced than ever. This applies to all contexts, be it social, economic or political. Those 'in-the-know' are pushed into the spotlight and become thought-leaders, eventually gaining **agenda-setting power**. Such power can be both used and misused to distract attention from crucial happenings or incidents. From something as simple as increasing the sales of Chelsea boots to something as high-stakes as war, professionals have decreed that it's all a matter of sustained attention.

SCROLL, CLICK, REPEAT: SOCIAL MEDIA AND CALCIFIED ATTENTION

The entry of social media has been nothing short of game changing for the attention economy, allowing corporations to quantify attention using metrics like subscribers, likes, comments and shares. This has opened doors to another dimension of attention reality - calcified attention. **Calcified attention** is any attention which can be accumulated externally. For example, the number of followers an influencer has determines the amount of calcified attention he can capitalize on. Such calcified attention can be utilised in two ways - (i) To generate more attention, creating a self-reinforcing loop or, (ii) To exchange for other resources like money.

Attention can be used to generate more attention. It has been systematically observed that paying attention to already attention-rich individuals is a means of attracting attention (to oneself). This idea forms the backbone of Twitter and Facebook, where tweets and comments about celebrities/politicians 'go viral' and '**unpopular opinions**' thrive. This concept has been popularly termed as second-order attention creation. The recent Ambani wedding offers an apt example. Many influencers created Instagram reels on the 'inside' gossip of the wedding, spilling sensational details about high-stakes guests. Naturally, such reels took the internet by storm, encouraging influencers to release multiple sequels and even convert it into a full-fledged series. A more direct, obvious form of **second-order attention** creation is when the children, friends or relatives of attention-rich individuals, by virtue of public association, inherit their attention-attractiveness.

Attention can also be exchanged for money. For instance, vloggers can leverage their massive subscriber-base to get sponsors, which helps them encash their calcified attention (social media following and fame). This is a win-win as companies can then ask influencers to direct their audience's attention to certain products. This is more effective as viewers are likely to pay more attention to the influencer than to the company or the company's ad itself.

Just as attention-virality can result in thousands of 'village-boy-turned-internet-superstar' cases, negative virality can lead to deplatforming, just as quickly and easily. '**Getting cancelled**' is the intentional, collective and punitive withholding of attention from an individual and their work (art, opinions etc.). However, it is being recently observed that a lot of individuals and corporations are willingly subscribing to the idea of 'All PR is good PR'. This theory stems from the belief that any form of attention - positive or negative - can result in economic gains, provided it ensures spotlight on an individual, company or incident. The 2024 Poonam Pandey case reinforces this theory perfectly.

THE GRADUAL DEMISE OF ATTENTIONAL POWER: BRAIN ROT & EMOTIONAL DETACHMENT

Attention spans have been invariably declining with time and there is plenty of empirical evidence to support this claim. From cricket matches that lasted for 5 days to One-Day Internationals (ODIs) and eventually 20-over games, the demand for short-format entertainment has consistently been on the rise. In fact, the nature of modern communication - short-form texts, omission of articles in sentences and the widespread use of GIFs, stickers and emoticons - stands testimony to increased inattention and mental-laziness.

A phenomenon, however, which has completely disrupted the attention landscape is '**brain rot**'. Brain rot can be defined as any low-quality, low-value content found on social media that is designed to exploit micro-stimuli. It is an assortment of memes, trendy audio and fleeting visuals (oftentimes completely nonsensical) to boost endorphin levels for 10-15 seconds or less. The wide range of emotions that were previously evoked during the course of a 3-hour movie are all now being experienced in the span of seconds, courtesy brain rot. You could be watching people getting shot in Gaza, only to be laughing over Moo Deng the next second. Anything which is out-of-sight is truly out-of-mind. Such emotional acceleration and digital overstimulation are key ingredients in the recipe of a toxically fast-paced, frenzied and detached society.

MENTAL LAZINESS: AN OPPORTUNITY FOR MARKETERS

While it has become increasingly difficult for marketers to hold the sustained attention of buyers, the evolution of strategic techniques have helped them flip this threat into a rich opportunity. Among the various tactics that have evolved to capitalize on inattention, the most prominent ones are **Hidden Fees** and **Urgency Tactics**.

Under the Hidden Fees strategy, marketers advertise a low initial price, which significantly increases at the checkout stage due to price of add-ons and warranty services (not specified earlier). Companies also obfuscate the price of add-ons sometimes, such as the long-run recurring cost of printer ink and ATM **overdraft fees**.

The 'Hidden Fees' phenomenon is most commonly observed with Q-Commerce platforms. Such platforms attract customers under the garb of 'Free Shipping' only to charge fees as absurd as 'Veg Mode Enablement Fee' at the final checkout stage. Low attention span prevents consumers from reading the price break-up which is often mentioned in minute font at the bottom of the screen (or accessible only after multiple clicks). Q-Commerce platforms are also infamous for marking up item prices by a small margin, something that totally goes unnoticed by buyers due to reckless attention.

Capitalizing on the quick stimulation enjoyed by consumers, companies deploy tactics like time bombs and 'limited-time offers' to create a sense of urgency. Low attention induces consumers to make impulsive purchases without checking original prices, leaving them with a false sense of accomplishment and financial 'smartness'.

Propelled by the reign of AI and social media, attention as a resource has become dangerously powerful. The mantra has evidently shifted from '**More Money, More Power**' to '**More Attention-Seeking Capacity, More Social, Economic and Political Power**'. Although the idea is still in its infancy, it is being said that we're rapidly moving towards an economy where attention will emerge as the new medium of exchange, governing all kinds of transactions. While technicalities such as quantification of attention pose serious challenges, content creators, corporates and even the Government is gradually waking up to the fact that attention might be the new oil needed to run the economy.

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ECONOMICS OF DOWRY: TILL DOWRY DO US PART

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ABSTRACT:

The practice of dowry has always been a stain on the legacy of our progressive Hindu traditions. Even after the enactment of the Dowry Prohibition Act, 1961 this menace refuses to subside. The dowry system in India represents a complex economic and social construct that transcends simple transactional dynamics. Existing literature predominantly addresses the moral and social dimensions, leaving substantial gaps in understanding the economic mechanisms underlying dowry practices. This article aims to provide some economical insights regarding the same and thus aims to delve deep into how family compositions, individual benefits, and societal attitudes determine the effect of the practice of dowry on households and their intertemporal consumption decisions.

THEORY:

In our analysis, we simply consider rational application of mind from all the agents involved, based on their inherent preferences, to maximise their expected payoffs. If we consider a standard nuclear household with one male and one female child, then net dowry flow is ambiguous. In case of exclusively two or more females then net dowry outflow and for exclusively two or more males then there is net dowry inflow. In the ambiguous case with a single male and female child, it depends on the inherent qualities of son and daughter whether there would be a net inflow or outflow. As for the daughter, her appearance must be pleasing, her height proper, her bearing good. Her educational level, accomplishments, musical abilities, culinary skills, reputation, horoscope, etc. are also taken into consideration (Dasgupta, 1991). These are essentially done by arranging an interview, where the groom's family comes to see and talk with the bride.

In a family with an elder son and younger daughter with an earlier expected date of marriage for the son, parents take into account inflation expectations while determining the dowry amount. Thus, they demand a higher dowry if they have the necessary bargaining power as it would be utilized for their daughter's wedding in the future with an inflated dowry. With a younger son and an elder daughter, parents would keep in mind the expected age of son's marriage to come to a suitable value while discounting it in PV terms to arrive at an adjusted amount to extract from the bride's family. Thus, with an extended family with no single child, certain familial structures incentivise the parents to become more forward looking as compared to Single-Child Families (SCFs).

Hence, if a household conceives a daughter, they then try to conceive a son so that the dowry burden can be offset a bit in anticipation of dowry inflows from the son. Considerations will also be given to the number of members in the groom's family. A family with a large number of male members for example, will be preferred over one with a large number of female members as there is a chance that the dowry given at this marriage will be recirculated in the payments of future dowries during marriages of the

in-laws rather than staying with the in-laws spending it on common goods for the household from which the bride can also benefit such as TV, car, fridge, AC, among other material goods. In fact, working women often contribute towards their own dowry and would prefer retention of goods bought from the dowry amount. Furthermore, society prescribes a "correct marriage age" (usually twenty-two or twenty-three years but a bit higher in cosmopolitan areas). If a woman is unmarried after this age, society imposes negative sanctions, labelling her unmarried status as to being of a promiscuous tendency. She impairs, for example, the marriage prospects of her sisters and brothers (Dasgupta, 1991). The family, thus, tries to marry her off, often by paying a high dowry.

Also, when a girl child is born, parents start saving a higher portion of their incomes to fund her dowry which otherwise could have been spent on material goods or invested in meaningful educational or investment avenues which would have generated long term returns for the family. This creates a huge opportunity cost and lost prosperity due to this patriarchal dogma.

It is found that, on average, parents in rural India work and save more and hence increase their labor supply today with payoff after 18 years (the minimum age at marriage for girls in India). However, the effects on savings and father's labor supply are larger and only significant for households that are above the poverty line. This suggests that more severe income-constraints or behavioural biases resulting from poverty do prevent extremely poor households from saving for their daughters' dowries in advance (Anukriti et al., 2019).

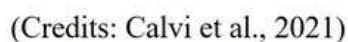
High dowries do not merely have an economic impact but can also raise the risk of domestic violence, as shown by Bloch and Rao (2002). They developed a model using a "participatory econometric" approach of mixing anthropological and economic methods with data from rural Karnataka to decipher the rationale behind a man inflicting violence on his wife in order to extract a higher dowry. They deduced the following logic: Due to high societal costs associated with divorce, this option is usually out of bounds for the married couple and would be exercised under extremely rare circumstances. For simplicity, suppose that there are two types of husbands – those who are capable of committing murder and those who are not. Since marriages are mostly arranged (the major reason the concept of dowry still exists in India), often with limited information, wives do not really know which type of husband they have married even after extensive information aggregation by the bride's family and intense negotiations that ensue to decide upon the marriage. There is a cost associated to violence in the form of legal and social sanctions so a rational husband would weigh the appropriate costs and benefits before beating his wife.

If the husband chooses to beat his wife, he is revealing to her that he is a violent type who can inflict harm if needed. Thus, violence also acts as a signal – communicating information about the type of husband and thereby instituting a "regime of terror" (Rao, 2006). Given the possibility of this extreme threat the wife's parents then are forced to acquiesce to the demands of violent husbands in order to prevent him from exercising the ultimate threat of murder. The model therefore predicts that, *ceteris paribus*, wives who come with lower dowries are more likely to be beaten because husbands who received high dowries would be relatively more satisfied than those who received low dowries.

In fact, there exists a unique Perfect Bayesian Nash Equilibrium (a separating equilibrium) of the game that satisfies this intuition whereby only dissatisfied husbands facing a low cost of violence engage in domestic violence, only dissatisfied husbands with a high cost of violence separate from their wives, and wives accept their husband's request of additional dowry only if violence occurs. (Calvi et al., 2021)

Also, husbands with richer in-laws would be more likely to beat their wives than those who have married women from poorer families, because violent husbands can extract more resources from rich in-laws than poor ones.

Although it can be argued that even though well-off families have better access to the legal apparatus of our country and therefore can file dowry charges against the groom's family, this won't happen if the bride's family values the union more than separation, even after the husband inflicts violence on their daughter, which unfortunately is still the grim reality in contemporary marriage markets like ours.



The analysis reveals that dowry is not merely a financial transaction but a multifaceted mechanism that intersects with family structure, and social norms. Families navigate this practice through rational yet deeply problematic calculations involving considerations such as family composition, social status, marriage prospects, and intergenerational wealth transfer.

Until these social structures ensuring the continued existence of dowry remain intact, it is virtually impossible to bring any meaningful changes in the current system due to various incentives of the agents mentioned in this study to keep the current system alive. The path forward demands collective societal commitment to dismantling these patriarchal structures and recognizing the inherent dignity and worth of women beyond their economic value.

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MADE IN CHINA: A CASE STUDY IN AI DISRUPTION

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“Hopeless to compete with us”, Sam Altman declared in 2023 when asked whether a small, smart team with a budget of \$10 million could create a model at par with OpenAI’s. Today, that statement is being put to the test as DeepSeek’s advanced-AI sends shockwaves through the GPU market, triggering regulations in the West and capturing the fascination of tech consumers and investors worldwide. The meteoric rise of DeepSeek puts forth an interesting case in the long-standing timeline of AI and its prospects. Based on empirical research, objective assessment and critical journalistic perspectives, this research article aims to provide a comprehensive analysis of DeepSeek AI; its origin, disruptive impact and challenges.

INTRODUCTION

The evolution of AI has been characterized by significant milestones throughout its history, beginning in the early 1940s and 1950s to the development of neural networks leading to today’s machine learning, followed by the dot com bubble. Further down, the 2010s saw major advancements in deep learning, revolutionizing fields like natural language processing and reinforcement learning. Data is highly valued in industries like automotive, finance, and healthcare. In 2020, OpenAI began beta testing GPT-3, known for its human-like content generation. Today, DeepSeek’s latest AI advancements have significantly affected major tech stocks, leading to a notable drop in their value.

OVERVIEW OF DEEPSEEK

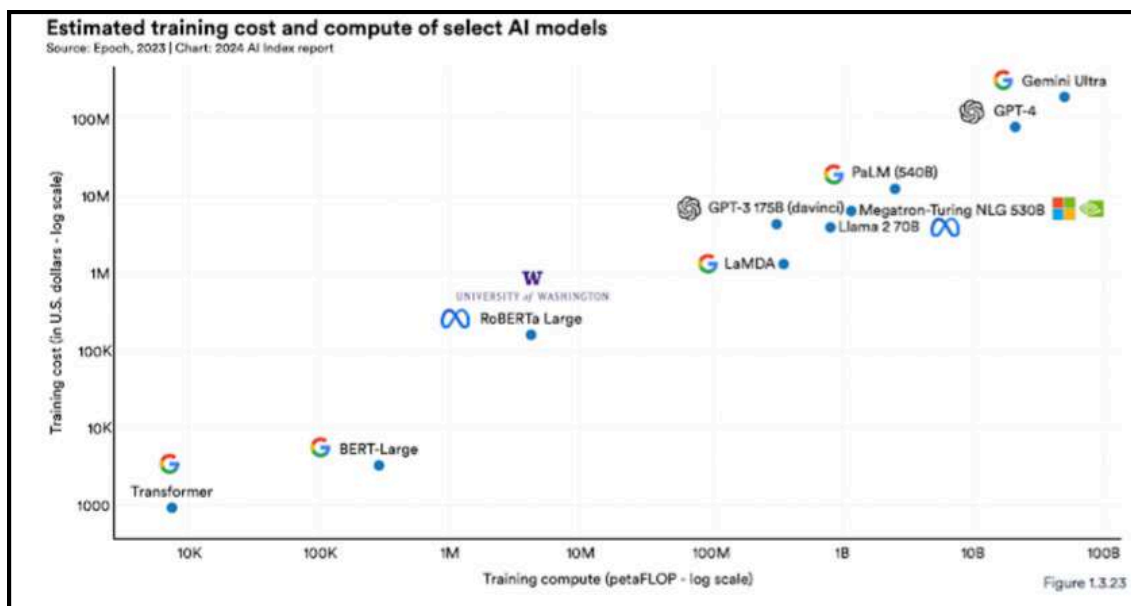
DeepSeek is an AI-development firm, based in China, founded by Lian Wenfeng. Lian is a graduate of Zhejiang University, also the mind behind High-Flyer, a China-based quantitative hedge fund that owns the rights to DeepSeek. Lian, who finds himself shot to global fame, once said “If the US can develop its quantitative trading sector, why not China?”

The actions that have followed the statement has left the world, especially Sam Altman and stakeholders at Nvidia in shock. The R1 model launched only a few weeks ago has gained attention for its competitive operation speed and lower cost, as low as \$6m— a fraction of over \$100m invested in OpenAI. This lethal combination of performance and reduced cost to perform tasks has led to DeepSeek’s AI assistant becoming the most downloaded free app on Apple’s App Store, an aggregate of nearly 2 million times.

DEEPSEEK’S IMPACT ON THE GPU MARKET

The emergence of a cost-effective, open-source AI bot has raised concerns for Silicon Valley, as many tech giants depend on GPU stock to develop their models. This reliance has contributed to a 50% drop in Nvidia’s stock, a key player in AI hardware. DeepSeek Artificial Intelligence Co., Ltd. is still emerging in the tech industry, but a significant advancement—like a 30% increase in machine learning efficiency—could disrupt market dynamics and impact established players like Nvidia and Google, challenging the

U.S.'s long-standing dominance in AI. However, while the innovation proves the race in AI to be competitive, its way to western countries and in the functioning of the giants in the US is obstructed by the restrictions of the US government. As Daniel Ives, the MD and Senior Equity Research Analyst at Wedbush securities mentioned, “No U.S. Global 2000 is going to use a Chinese startup DeepSeek to launch their AI infrastructure and use cases....at the end of the day, there is only one chip company in the world launching autonomous robotics, and broader AI use cases and that is Nvidia.” The low-cost training of the model is also being counter-questioned by the consequences of when the startup has to account for the huge demand for the consumption of their AI technology, thus creating requirements for massive amounts of infrastructure and capital.



DEEPSEEK'S IMPACT: BEYOND NVIDIA AND THE FINANCIAL MARKET

While the potential for regulatory scrutiny exists—similar to challenges faced by TikTok or Huawei—there's also the possibility that DeepSeek could leverage opportunities in high-growth fields like cloud computing and cybersecurity. These industries are expected to expand significantly in the coming years, and DeepSeek's success could catalyze a sector-specific rally. Furthermore, DeepSeek's AI technologies hold the promise to transform sectors such as healthcare and scientific research. They can process vast datasets at unprecedented speeds, with AI-driven drug discovery already shortening timelines by up to 50%. Innovations from DeepSeek could further enhance this efficiency.

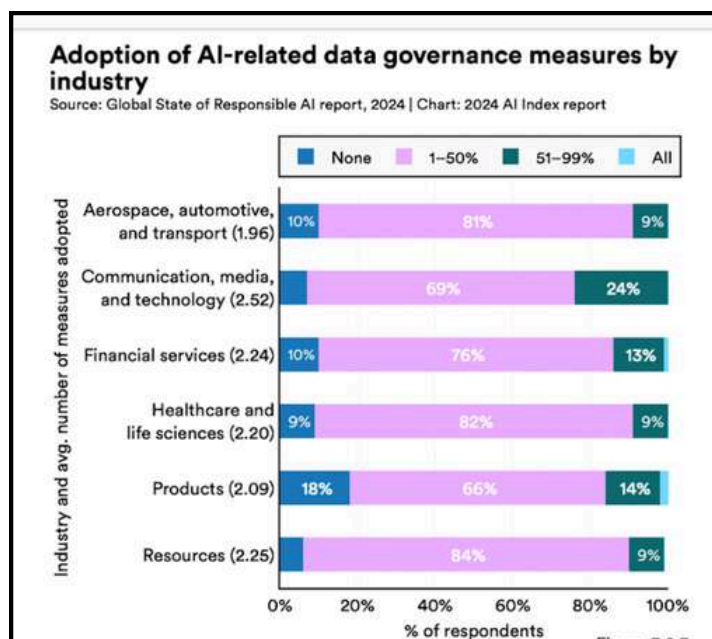
Additionally, DeepSeek has the potential to address global educational disparities, as noted by UNESCO, which reports over 260 million children lack access to education. By bridging this gap, DeepSeek could promote global literacy and skill development, which are essential for economic growth. Addressing a pressing global issue, DeepSeek could play a vital role in promoting environmental sustainability. Climate change poses one of the most significant challenges of our time, with the Intergovernmental Panel on Climate Change (IPCC, 2023) highlighting the urgent need to cut global carbon emissions by 45% by 2030 to limit warming to 1.5°C. Innovative approaches are vital for optimizing energy use, minimizing waste, and transitioning to renewable energy.

In the healthcare sector, DeepSeek has already proven its effectiveness by achieving a 30% reduction in misdiagnosis rates in initial regions, demonstrating its significant potential. As the technology continues to evolve, it offers promising solutions to pressing challenges across multiple sectors.

DEEPSEEK AND THE AI REVOLUTION: SHAPING THE FUTURE OF CONVERSATIONAL INTELLIGENCE

The evolution of chatbots from their early beginnings to today's AI integration showcases a significant transformation. Initially, chatbots were rule-based programs with limited flexibility. The second generation introduced machine learning, allowing for more personalized interactions. The third generation, powered by deep learning, enables a sophisticated understanding of natural language and continuous learning from interactions. Leading this evolution are DeepSeek's AI bots, which utilize advanced Natural Language Processing (NLP) for seamless, context-aware conversations and can handle various data forms, including text, images, and voice, making them versatile for many applications.

DeepSeek's AI bots play a crucial role in customer service, providing 24/7 assistance and achieving a 30% reduction in costs and a 20% boost in customer satisfaction for a major e-commerce company. In business administration, DeepSeek's bots automate repetitive tasks, resulting in a 25% increase in efficiency and a 20% cut in operational costs, enabling management to focus on strategic growth. The company envisions a future where AI bots work collaboratively across sectors, opening new avenues for societal progress.

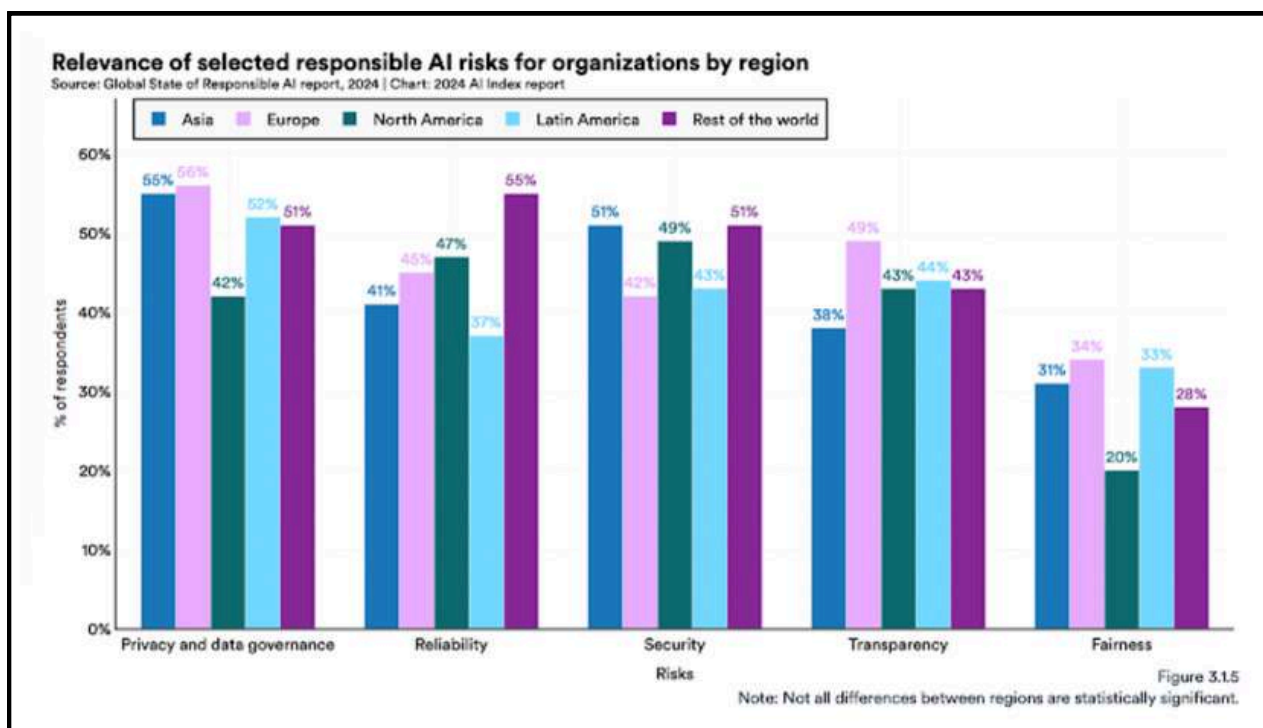


BEYOND THE SHINE: RISKS AND ISSUES WITH DEEPSEEK

Amongst global fame, all hasn't been well for the instant rise-to-fame bot. By early February 2025, several governments and organizations had imposed restrictions on DeepSeek in lieu of concerns relating to national security and privacy concerns. Taiwan, Texas, NASA, and the U.S. Navy were among the first to impose internal bans related to AI usage. Italy's data protection authority blocked the AI nationwide due to privacy concerns, while Australia's Home Affairs Minister Tony Burke banned DeepSeek on government devices citing security risks.

Following the footsteps of earlier Chinese AI models like Baidu's Ernie or Doubao by ByteDance, DeepSeek is also trained to avoid politically sensitive questions. When asked to answer questions regarding Xi Jinping, the 1989 Tiananmen Square Incident, Taiwan etc., the bot gave vague responses or reproduced Chinese-fed narratives, including the claim of Taiwan by the Chinese territory.

These risks are not unique to DeepSeek but stem from concerns about US-enabled bots like ChatGPT, Gemini, and Claude, which have been criticized for content moderation and political bias. This bias is driven by corporate policies, legal risks, and social norms.



CONCLUSION

As for any bot, the rise of DeepSeek's advanced AI-driven financial analysis could result in enhanced market efficiency, optimized trading strategies and improved risk management but also diminish human decision-making and agency in the already faltering human-AI relationship. Additionally, the rise puts into the center the geopolitical AI race particularly between China and the western countries. Without proper oversight, AI may prioritize short-term gains over long-term stability making it crucial for governments to strike a balance between the efficiency and convenience of AI and the need for transparency and fairness.

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THE ECONOMIC IMPACT OF ARTICLE 370 ABROGATION: PROGRESS, CHALLENGES, AND THE ROAD, AHEAD

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The Article 370 abrogated in 2019 brought a major economic shift in the now UT Jammu and Kashmir, with the aim of increased investment, industrial growth, and infrastructural development. In the last 5 years, the region has seen increased investment proposals, a tourism resurgence, and connectivity projects, marking economic development. Yet, employment issues, administrative inefficiencies and sectoral issues remain persistent challenges. The article critically examines J&K's post-abrogation economic trajectory, analysing development in agriculture, industry, tourism, and employment. While the initiatives have laid the ground, long-term progress depends on effective policy-making and execution

INTRODUCTION

The abrogation of Article 370 in 2019 aimed to bring major economic, political and social changes in the previous state of Jammu and Kashmir. The provision gave a special status to the state, which granted it the power to have a separate constitution, state flag, and autonomy of internal administration. The provision was supposed to be temporary and transitional. However, the constituent assembly dissolved without recommending the abrogation, thus, the provision was deemed permanent. Many believed that the provision caused the alienation of Jammu and Kashmir from the rest of the country. While others deemed it as an essential legal framework, suitable for the unique needs of the region. The provision imposed several economic restrictions, potentially hindering economic growth. The law restricted non-residents from purchasing land, thus limiting external investment. Consequently, the private sector remained underdeveloped leading to a heavy reliance on the government sector. After deliberations, the bill was passed to abrogate Articles 370 and 35A, stripping the state of Jammu and Kashmir from the special powers granted to it. The move was considered controversial, attracting positive and negative opinions all over. The decision was taken to fully integrate the state into the country, with the idea of one nation one constitution. The state was divided into two union territories, Jammu and Kashmir, and Ladakh. The newly formed union territories were under the president's rule to stabilise the governance until the next elections were held. The government aimed to promote economic growth, improve security, and achieve political and legal uniformity through revocation.

PRE-ABROGATION, ECONOMIC LANDSCAPE

Agriculture and Horticulture

As of 2016-17, about 70% of the state's population were rural residents, dependent on the agricultural sector for their livelihood, directly or indirectly. The food grain production was dominated by three crops- wheat, maize, and paddy, making over 90% of the output. Sericulture was an additional sector providing opportunities for economically weaker sections with little to no land holdings. The state was well-reputed for its Horticulture production both in terms of domestic consumption as well as exports. Fruits, subtropical fruits, vegetables, and other plantation crops formed the state's horticulture produce. The state was also known for its saffron and black zeera, cultivated only in certain pockets but revered for their quality. Almost 33 lakh people were directly or indirectly employed by the horticulture industry in 2016-17, with apples covering 48% of the area under horticultural cultivation. Roughly Rs. 6500 crores worth of apples were exported during 2016-17, showing the economic significance of the fruit.

Tourism

The state of Jammu and Kashmir enjoyed worldwide popularity for its lush beauty. The valley's natural landscapes attracted widespread recreational tourists with pilgrims visiting religious sites. It accounted for 6.98% of the state's Gross State Domestic Product (GSDP) in 2016-17. Tourism also paved the way for supporting industries of hospitality, transportation, and handicraft, supplementing direct revenue, and generating employment. However, security breaches, militancy, and political instability led to apprehension among tourists.

Handicrafts and Handlooms

Historically, the state was known for its handicraft and handloom industry, with elegant pashmina shawls and intricate carpets. This sector provided widespread employment to skilled artisans. However, diminishing productivity, rising costs and competition from machine-made goods caused the industry to face significant hurdles. In response, the government introduced several measures including the adoption of modern looms, imparting skill education among workers, accessible credit, and easier market access. In 2016-17, the handicraft and handloom industry generated a combined output worth Rs. 2650 crores, of which Rs. 1151.12 crores worth of goods were exported. Carpets had the highest share, followed by woollen shawls.

POST-ABROGATION, ECONOMIC DEVELOPMENTS

Article 370 was abrogated in August 2019, since then it has been the centre of discussion about its impact on previously the state and now the union territory of Jammu and Kashmir. Over the last 5 years, the region has witnessed economic and social shifts.

Macroeconomic Growth

The real GSDP for Jammu and Kashmir is projected to grow at the rate of 7.41% during the year 2023-24, while the nominal GSDP grows at 9.92%, to reach Rs. 2.46 lakh crores. This shows a Compound Annual Growth Rate of 5.13% from 2019-20 to 2023-24, which is higher than that of the period from 2011-12 to 2019-20, 4.81%. The per capita income of the region grew at a rate of 9.5%. This growth reflects improved economic well-being in the valley. Regarding sectoral contribution to the economy, the tertiary sector is the majority contributor at 61.06%, with primary and secondary at 18.24% and 20.7% respectively. J&K's GDP is projected to be at Rs 2,63,399 crore in FY25, growing 7.5 per cent over FY24. The UT is estimated to receive around Rs 67,133 crore from the Centre as grants in 2024-25. The fiscal deficit for the UT stood at 5.36% in 2023-24, with the aim of 3% for 2024-25.

Investment, Industrial Growth, and Infrastructure

As the restrictions on external investment and land ownership were lifted, the region began attracting private investment and development policies. The New Industrial Policy 2021 aims to provide incentives to existing and potential producers and manufacturers to expand in J&K, with an outlay of Rs. 28,400 crores. The policy aims to industrialise the region, improve socio-economic development and attract private investment in the region. However, bureaucratic, and procedural delays restrict the full impact of these policies. Major infrastructural developmental projects were taken up in the region, such as rail links, tunnels, and airport expansion to enhance connectivity. Efforts were made towards 4G and 5G penetration in the region to promote digital connectivity. However, rural connectivity continues to remain a challenge in the region. The over-dependence on the government sector further makes it crucial to promote industrial growth and private investment. Several developmental projects are ongoing or upcoming, despite that there is still a long way before the UT reaches the desired level of infrastructural and industrial development.

Tourism

Not long after the abrogation, the world was plagued by the COVID-19 virus, which led to shutdowns across the world. This had serious implications for the tourism industry as recreational travel was completely prohibited. However, the sector observed a rapid recovery in footfall after the restrictions were lifted. In 2022, 1.88 crore people visited the UT, for recreational and religious tourism. The scenic beauty of Kashmir and the pilgrimage near Jammu attract visitors from all over the world. Initiatives such as winter games in Pahalgam and G20 meet further try to promote the region. However, despite the resurgence in tourist footfall, the GSDP contribution of the industry remains to be 6%. Moreover, the recent spike in militant and terrorist activity could further hamper tourism posing security threats.

Agriculture sector continues to form the bulk of economy and employment within the region. The apple industry which was known as the major contributor, now faces serious challenges. Rise of imports within the last few years have increased competition, lowering the market prices. Further, inadequate storage and transportation facilities restrict the true potential of trade. Government intervention is necessary to support the declining, but crucial apple trade. Saffron, has been experiencing declining productivity due to climate change, lack of irrigation and imports since a long time. However, little effort has been made to preserve the industry till date. The handicraft and handloom industry continue to face the existing challenges, threatening the livelihood of rural artisans. However, determined efforts are being made to revive the traditional art of Pashmina shawls and woollen carpets, through digital branding for a revival of the industry. In 2023-24, the handicraft industry exported Rs. 1162.29 crores, worth of goods. In essence, the agricultural, handloom and handicraft industry continues to face the existing challenges. There have been some efforts in the past few years, but nothing has yielded results so far. The sector demands government intervention to support employment and income.

Employment

Owing to the lack of industrialisation and the private sector, Jammu and Kashmir face difficulties in terms of employment. Educated people are reliant on the government sector for their livelihood, due to the lack of opportunities elsewhere. According to official figures, medical professionals, engineers, postgraduates, and those with doctorates find fewer jobs in Kashmir. Data released in the 1st quarter of 2024 showed that out of 3.52 lakh people employed, about a third of them were youth graduates and post-graduates. In 2023, a report released by CMIE showed that the UT had among the highest rates of unemployment in the country at 23.1%. The official economic survey 2023 states that the quarterly urban unemployment rate declined to 13.5% in October-December 2022 from the previous 14.4%. However, the national average stands at 8.2% for the same period, showing a grim picture. Furthermore, the periodic labour force survey stated that among job seekers aged 15-29 in urban areas, there is unemployment of 32%. Female unemployment was recorded to be 53.6%, both the indicators highest in the country.

CONCLUSION

More than 5 years have passed since the abrogation of Article 370, the now union territory of Jammu and Kashmir shows a situation of progress with challenges. Growth in GSDP, investment prospects, and rise in tourism and infrastructural development indicate economic progress. However, lack of employment opportunities, administrative inefficiencies, resurging security threats and sector-specific challenges continue to obstruct economic potential. There have been efforts to bring investment and promote industrial growth, but the results have not been up to the mark. It is now crucial to promote industrial activity in the region to address the challenges of unemployment and public sector dependency. The abrogation of Article 370 aimed to revolutionise the economy of Jammu and Kashmir. While there are indicators of its positive economic impact, the outcome has been underwhelming as the region's economy continues to face serious challenges. Long-term policies to improve administration, ensure security and stability, generate employment, and promote industrial activity are crucial. Investor-friendly policies and support for local businesses are essential for generating economic activity to realise the true potential of Jammu and Kashmir.

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ANALYSING THE UNPAID WORK AND LABOUR IN URBAN INDIA

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INTRODUCTION

Women spend 4.1 times more in unpaid care work than men in the Asia Pacific region (4 hours 25 minutes per day) while men spend only 1 hour and 4 minutes as reported by the International Labour Organization (ILO, 2018). This statistic is surprising but not shocking as we see this disparity around us on a daily basis. Unpaid work is understood as all the activities carried out by women that remain unrecognized in the national accounting statistics and remain unremunerated.

The traditional role of men and women are so ingrained in the women psyche that often leads us to ignore the unpaid care done by women and how it is a crucial factor in their employment. The value of unpaid work has also become an important indicator towards gender equality.

India has one of the most unequal gender divisions of household work globally. Time Use Surveys, conducted by the Central Statistical Organisation of the Ministry of Statistics and Programme Implementation (MOSPI), offer a reference for evaluating CMIE data, though these data sources are not directly comparable. The earlier NSS survey conducted in 1998–1999 across six Indian states served as a pilot study, while the latest national survey, conducted in 2019, occurred after a two-decade gap. Although the statistics from these surveys are not directly comparable, they remain instructive. The 1998–1999 survey revealed that men devoted considerably more time to income-earning and personal care (including leisure) activities compared to women. This article will examine various factors influencing unpaid care work and employment among women in India.

MARITAL STATUS

One of the main reasons for women opting out of the occupation is marriage. Marriage penalty is widely discussed where women withdraw after leaving the labour force once they get married or get back into the labour market after a gap, due to changed expectations of family and community as well as the children's responsibility and elder care. It is important to note the ideological struggle the women are facing in this sphere is that women are struggling to acquire greater control over their sexuality and fertility. Despite the progress in the ideology of people it is popular belief that men are seen as the breadwinner and provider which withholds women's labour supply in the market structures. This is also reflected in the figures of overall employment as seen in the below. In the age group 15 to 60 years, the workforce participation rates for widowed or divorced/separated women are much higher than the currently married or unmarried women and the main reason for that is that they have less family responsibilities and hence unpaid work to do. While most currently married women are self-employed as it is more flexible, this is not the case for single women. It is also observed that if family income is high, women would have less incentive to work and that the rising incomes of Indian households have enabled

Indian women to withdraw from the labour market and focus on their role in “status production”. Complex socio-economic phenomena underlie this paradox. Explanations generally rely on some combination of structural and normative ideas: the disincentives from other family income, restrictive gender norms especially those that attribute higher social status to non-working women, greater emphasis on domestic duties and child-rearing in a newly competitive educational system, and the lack of “suitable” work for educated women. But it is difficult to test these explanations empirically with existing data. This is actually a major concern as the skilled labour force and resources are going unused.

EFFECT OF COVID-19

Every crisis impacts women and girls differently than men due to existing gender norms and inequalities. To build back better and more equally from the COVID-19 crisis, policies, investments, and actions must be shaped by women and girls, intentionally targeting their needs. Women are employed in some of the most affected sectors, such as accommodation, food services, and domestic work, rendering them particularly vulnerable to layoffs and loss of livelihood. According to the International Labour Organization (ILO, June 2020), an estimated 72% of domestic workers globally lost their jobs due to COVID-19. The pandemic has reinforced the persistence of gender bias in social and cultural norms. While only a small fraction of men acknowledge that their wives or partners are doing more around the house, two-thirds of women report that their husbands or partners are not contributing equally. Amid COVID-19, household chores and other domestic work have acquired new purpose and value, increasingly recognized as essential work. Tasks such as cooking, grocery shopping, and cleaning—particularly to prevent infection—are taking longer due to social distancing and sanitization efforts, significantly increasing unpaid labor predominantly performed by women.

Desai et al. (2020), based on their survey in the Delhi Metropolitan Area, found that the absolute loss of employment was greater for men compared to women. However, more than 28 million women over the age of 25 are estimated to have exited the labor market in 55 high- and middle-income countries over the last year, compared to 24 million men (World Economic Forum, 2020). This trend poses a major concern and threat to the economic status of women, reversing years of progress with lasting impacts.

EDUCATION

Theories of human capital predict that an increase in skills would provide women a greater opportunity to earn higher wages, and this in turn would increase women’s labour force participation. In most developed countries, increases in education cause an increase in women’s labour force participation, contrary to global and historical trends, Indian female labour force participation has remained persistently low over decades despite the rise in education. Education is very important for better employability and securing a job in the formal sector. In India’s case illiterate women are more likely to be employed than educated women due to financial constraints and more educated women leave the workforce after marriage or kids. There is also a gap in the skillset that is required to achieve employment as the recent job market trends have shown us which is Women are also more likely to pursue post-graduation which means that they join the workforce later than the men. This could be one of the reasons for less women in the workforce.

CHARACTERISTICS OF WOMEN IN ECONOMIC SECTORS

India has one of the fastest-growing economies in the world, with the International Monetary Fund (IMF) forecasting 6.8% growth for India this year, compared to just 1.6% for the United States (IMF, 2023). By 2030, India is projected to be the third-largest economy globally, following only the United States and China. Millions of Indians are emerging from poverty each year. Women, as a crucial element of any economy, play a significant role in accelerating economic development. Workforce status primarily concerns the distinction between self-employment and wage employment, the latter being

further divided into regular wage/salary employment and casual wage employment. The distribution of the urban workforce is notable: approximately 51.9% of women are self-employed, 31.7% are household helpers, 27% work as casual laborers, and 20.2% are own-account workers, as reported by the Periodic Labour Force Survey (PLFS, 2017–18).

Wage Employment and Informal Sector

The concentration of women in informal occupations is characterized by low wages, low capital intensiveness, lower educational requirements, and low energy, compounded by the pressure of unpaid care work. This fundamental issue with the sector highlights that most women work in informal employment not out of choice but out of necessity for survival. In addition to long working hours and poor working conditions, the burden of unpaid care work further exacerbates the challenges faced by women. In developing countries, 92% of women workers are informally employed compared to 87% of men workers, according to UN Women reports (UN Women, 2020). The problematic combination of informal work, poverty, and gender bias is prevalent in many developing nations but is particularly acute in India due to the structure of its economy and society. India has one of the world's highest rates of informal employment, which has been further exacerbated by the pandemic, leaving the vast majority of citizens outside the protection of labor laws or any social security net. Currently, an estimated 93% of the workforce, or 500 million people, work informally in India, compared to a global average of 61% (World Economic Forum, 2020). The pandemic has also exposed a growing digital divide in society, which must be addressed as a priority to ensure that the accelerated shift towards online working does not exclude millions of workers lacking the skills or resources to participate in very critical emerging sector like online platforms and e-commerce which further puts them in a vulnerable position economically and even more job insecurity. At the same time, unpaid care responsibilities surged with the demands of home-schooling, household sanitation, and caring for family members. Women, already juggling informal work, found themselves stretched even thinner as discussed earlier.

Regular Employment

The least share of women-work in this sector, women are increasingly engaged in health and education, which are among women concentrated industries but not dominated by self-employment or home-based work. Women often encounter challenges in securing employment opportunities which require hard skills. Positions in the core engineering sector or those involving extended working hours, night shifts or extensive travel are perceived as areas where women may face difficulties.

CONCLUSION

The gap in Indian women's work participation in relation to the world average remains quite wide and is also claimed to be the lowest among the South Asian countries, we must change this. We must acknowledge that the success of GDP is made on the backs of women as daughters, mothers and wives. The GDP fails to recognize the unparalleled work done and is ignored in the policy making procedure but its impact is very evident. The discourse of unpaid care has been strong since the 1970s but policy discussion has not shown any response. The unpaid work remains significant even after having house help engaged. Society at large needs to redefine and deconstruct the perspectives towards a working woman. The narratives that women should be the care-givers and home-makers should cease to exist. We need women of this country to achieve our dream.

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TO MITIGATE OR TO ADAPT: ANALYZING INDIA'S BUDGETARY PRIORITIES FOR CLIMATE ACTION

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ABSTRACT

Union budgets serve as more than mere accounting statements in policy analysis. This paper studies the Union Budget 2024-25 from a climate lens by conducting a budget tagging exercise to identify, estimate, and analyze the climate-relevant public expenditure on climate adaptation and mitigation to create India's Climate Budget Report for the year 2024-25 and thus understand the country's climate priorities. Using the Rio-Marker definition of climate adaptation and mitigation to define climate-relevant expenditures, the paper scrutinizes the demand for grants of each ministry and its associated policy documents to assess the key trends in mitigative and adaptive expenditure comparatively. We find a smaller overall share of adaptation-related spending, which increases as the primary objectives of the schemes shift away from climate change to development, thus highlighting a higher focus on mitigation expenditure.

JEL CLASSIFICATION CODES:

Q54, H5, H87

KEYWORDS:

Climate Policy, Union Budget, Climate Budget Tagging, Adaptation, Mitigation, Rio-Marker definition.

INTRODUCTION

As global temperatures continue to rise and the world grapples with the effects of weather-related disasters, the increasing vulnerability of the world to climate change and its impacts remain a significant policy concern, both nationally and globally. According to several climate vulnerability indices, India is currently ranked as the 7th most vulnerable region to climate change, with more than half of the population living in hazard-prone areas.

The country remains committed to achieving its Sustainable Development Goals. These goals directly or indirectly contribute to the adaptation and/or mitigation of climate change. (DMEO,2023) Moreover, under the Paris Agreement, the country also formulated the Nationally Determined Contributions which set clear targets to address economy-wide national emissions and reach the goal of net zero emissions by 2070. Another key policy document is the National Action Plan on Climate Change. Prepared in 2008, the plan encompassed 8 broad missions based on synergizing climate and development.

However, these missions and targets lack explicit measurable financial commitment or allocation. Therefore, it becomes pertinent to scrutinise whether climate considerations are adequately represented in the share of total public expenditure. The Union Budget is the largest source of public expenditure in the country. It accounts for more than 50% of total public expenditure. Given its fiscal significance, the budget serves as more than a mere accounting statement and helps to understand the country's policy priorities better, while also providing key information about the fiscal strategies to grapple with them.

To address the aforementioned issue, this paper quantifies and analyses India's focus on climate change by putting the Union Budget of 2024-25 through a climate budget tagging (CBT) exercise. It identifies, estimates, and analyses the relevant public expenditure on climate adaptation and mitigation measures, creates a methodological framework for the conduction of climate budget tagging in India, and uses it to understand the country's climate priorities.

1.1 Strategies to Address Climate Change:

Both mitigation and adaptation are essential and complementary measures (OECD, 2009) and have a significant potential to address climate change effectively. Mitigation strategies depend on understanding where, what kind, and how much greenhouse gas is emitted by economic sectors, while adaptation actions are guided by projections of how severely climate change will affect specific regions. (OECD, 2021).

Adaptation measures:

Adaptation reduces the impacts of climate stresses on human and natural systems.

These measures can be anticipatory or reactive. They help minimize the negative consequences of climate change. Examples of adaptation measures include changing crop varieties and altering farming practices, developing heat and drought-resistant crops, diversifying livelihoods, building flood defences, and land-use planning. (OECD, 2021)

Globally, India is one of the most affected countries by extreme weather events. It experienced over 400 extreme weather events between 1993 to 2022, leading to around 80,000 fatalities and \$180 billion in economic losses, underscoring the need for adaptation strategies.

Mitigation measures:

Mitigation measures address the root cause of climate change. It consists of activities that aim to reduce GHG emissions, directly or indirectly, by avoiding or capturing GHGs before they are emitted to the atmosphere or sequestering those already in the atmosphere by enhancing "sinks" such as forests. (IPCC,2001)

India has an ambitious net zero emissions target (2070) and it aims to cover all key sectors of the economy. Moreover, India has been ranked fourth globally in terms of renewable energy potential, with a significant installed capacity in both solar and wind power, making it a leading player in the clean energy transition. Hence, unlocking this potential & efficient allocation of resources is crucial.

1.2. Review of Expenditure on Climate Change:

The paper further conducts a review of public expenditure to answer the following questions:

Are the expenditures being directed toward adaptation and mitigation?

What are recent changes in the share of climate-relevant expenditure for 2022-23 Actuals, 2023-2024 Revised estimates, and 2024-25 Budget Estimates.

Comparison of the proportion of adaptation and mitigation measures in the government's total climate expenditure and across varying priorities and ministries.

Do revised spending on adaptation and mitigation schemes and heads differ significantly from budget estimates?

LITERATURE REVIEW

This literature review examines various climate budget tagging frameworks and defining criteria for adaptation and mitigation, along with other budget analysis strategies, with a focus on India's Union Budget for 2024-25.

Climate Budget Statement Framework:

Almudena Fernandez, Amitabh Tripathi, and Gcobisa Magazi's technical assistance report titled "Seychelles: Developing a Framework for Climate Budget Tagging" (2024) establishes a broad framework for conducting the Climate Budget Tagging exercise, including a section on the weighting system. It adopts the Rio-Marker definition for segregating Climate adaptation and mitigation strategies. This report assists in comprehending the structure of a Climate Budget statement and the guidelines for identifying climate-relevant schemes.

UNDP's extensive report "A Methodological Guidebook: Climate Public Expenditure and Institutional Review (CPEIR)" provides a step-by-step process, methodologies, and tools to conduct a CPEIR. It evaluates the methods used in the 19 CPEIRs and suggests a standardized framework for future CPEIRs. It provides essential components of a CPEIR, guidance on best practices, and practical advice for those implementing a CPEIR.

Kaushik Ganguly and Gyana Ranjan Panda's (Oxfam) working paper titled "Adaptation to Climate Change in India: A Study of Union Budgets" (2010) focuses on the identification, assessment & budgetary analysis of sectoral public spending on climate adaptation-based schemes of sectors suggested by NAPCC, based on India's Union Budget reports for the years 2006-07 to 2009-10.

Amandeep Kaur and Lekha Chakraborty's paper titled "Climate Change-responsive Public Expenditure in India: An Empirical Analysis" (2020) maps the NAPCC in India to the Demand for Grants across all the ministries and departments to arrive at an estimate for the public expenditure on adaptation, mitigation and regulatory spending relate to climate change.

Climate Mitigation and adaptation:

The previously mentioned IMF framework report also adopts the Rio-Marker definition for segregating Climate adaptation & mitigation strategies. It lays down the basic criteria for identifying these strategies & classifying them into part A, B & C. Richard J.T. Klein, E. Lisa F. Schipper, and Suraje Dessai's research on "Integrating mitigation and adaptation into climate and development policy: three research questions" (2005) provides valuable insights into the synergies between climate change mitigation and adaptation.

In the article "The mitigation-adaptation dichotomy and the role of spatial planning", G. Robbert Biesbroek, Rob J. Swart, and Wim G.M. van der Knaap (2009) also offer a similar explanation for synergies while focusing on its relation with spatial planning. Lekha Chakraborty, Ajay Narayan Jha, Amandeep Kaur, Jitesh Yadav, and Balamuraly B's study on "Climate Change, Public Spending on Adaptation, and Fiscal Marksmanship" (2023) provides the definition of fiscal marksmanship and suggests eight broad categories related to climate change adaptation, that align with the International Institute for Sustainable Development classification. It further helps in understanding India's Union Budget structure.

These works provide reliable templates for Climate Budget statements and clear definitions of Rio Markers, making it easier to identify climate-relevant schemes. CBT is a complex process that reflects a country's climate priorities and can be effectively utilized by future policy-makers (Klein et al, 2005).

Research Gaps:

Prior research in this field highlights the ambiguity in policy documents, which leads to the inclusion of solely development-oriented policies with little or no adaptation focus during budget analysis (Ganguly et al., 2010), resulting in an overestimation of expenditures. To limit this drawback, this paper divides all identified climate-relevant schemes into three sections, using a modified CPEIR model and assigns weights to each section. Amandeep Kaur and Lekha Chakraborty's paper, “Climate Change-responsive Public Expenditure in India: An Empirical Analysis” (2020), offers a strong framework for Climate Budget Tagging (CBT) in India by linking policy to budget allocations. However, we did not adopt this approach, as an increasing number of climate-related activities now take place outside mission plans. For instance, India’s 2021 Biennial Update Report highlights 39 mitigation actions, many of which extend beyond the missions (Dubash et al. 2024). A similar pattern is evident in state action plans.

METHODOLOGY

The Union Budget 2024-25, including the Ministry-wise Summary of Budget Provisions and the Notes on Demands for Grants, serve as the primary data sources for this paper. We analyzed all schemes in the 102 Demands for Grants documents, covering over 53 ministries, to identify climate-relevant expenditures, following the Climate Budget Tagging guidelines proposed by previous researchers. The identified schemes have been categorized and compiled to create our Climate Budget Report, which is included in the appendix. To clarify the reasoning behind identifying certain schemes as climate-relevant, a section titled Notes for Schemes has been added to the appendix. Identification of whether the schemes/head fall under mitigation or adaptation have been done subjectively through:

- Secondary Research on the scheme/head
- The Output-Outcome Budget Framework

Overview of the Structure of the Climate Budget Report:

A derivation of the CPEIR model for climate budget tagging, the budget report comprises three weighted sections of climate-relevant expenditure across different capacities. The sections are:

Section A:

This section consists of schemes that address climate change (and its implications like natural disasters) as a primary cause of concern in its mission, objective and/or vision.

Example:

(Table

1,

Appendix)

MINISTRY/DEPARTMENT	2022-2023 Actuals	2023-2024 Budget Estimates	2023-2024 Revised Estimates	2024-2025 Budget Estimates
PART A:				
Demand No. 1				
Ministry of Agriculture & Farmer's Welfare				
1.Pradhan Mantri Fasal Bima Yojana	10296.03	13625	15000	14600
2. National Mission on Natural Farming	...	459	100	365.64
3.Rashtriya Krishi Vikas Yojna	5247.43	7150.35	6150.35	7553
4. Soil and Water conservation	33.56	36.6	38.72	35.75
5.Capital Outlay on Soil and Water Conservation	8.1	37.02	64.6	71.84
Total:	15585.12	21307.97	21353.67	22626.23

Section B:

This section consists of schemes that address:

- Climate Change as a secondary objective, thereby having 50-65% share in total scheme expenditure.
- It also includes developmental schemes that have important climate co-benefits. This includes schemes that address goals of poverty alleviation, rural development etc.

Example: (Table 2, Appendix)

Table 2: Schemes under Part B				
PART B:				
Demand No. 1				
Ministry of Agriculture & Farmer's Welfare				
1. Protection of Plant Varieties and Farmers Rights Authority	5.34	56.44	37.6	50
2. Krishionnati Yojana	4715.95	7066.47	6378.47	7447
3. National Institute of Agricultural Extension Management (MANAGE)	4.8	5	7	6.5
4. Distribution of Pulses to State / Union Territories for Welfare Schemes	166.21	800	446.3	300
Total:	4892.3	7927.91	6869.37	7803.5

Climate Co-Benefit: It refers to the expenditure that has a developmental purpose but also contributes to achieving climate change objectives of either mitigation or adaptation. This paper does not distinguish between unintended and intended side benefits.

For example:

1. Pradhan Mantri Garib Kalyan Anna Yojana (PMGKY) provides free food grains to Priority Households (PHH) and Antyodaya Anna Yojana (AAY) households ensuring food security. As food security is predicted to aggravate in the future due to climate change related agricultural production losses, such schemes reduce the poor's exposure to them. Further incorporating more climate friendly grains like millets as part of free grains would reduce the carbon footprint[1] of the scheme, while serving an important adaptive role (for more: Abhijit Mohanty et al., 2023).

Section C:

This section consists of schemes where the share of climate relevant expenditure is 25-30% or the scheme has 'theoretical' climate co-benefits.

Example: (Table 3, Appendix)

Table 3: Schemes under Part C				
	2022-2023 Actuals	2023-2024 Budget Estimates	2023-2024 Revised Estimates	2024-2025 Budget Estimates
MINISTRY/DEPARTMENT				
PART C:				
Demand No. 9				
Ministry of Coal				
1. Research and Development	6.94	21	18	21
2. Conservation, Safety and Infrastructure Development in Coal Mines	48.64	92.5	92.5	92.5
Total:	55.58	113.5	110.5	113.5

The reason for including co benefits and theoretical links to climate change is to highlight the need for climate mainstreaming, that is, incorporating climate considerations into a policy or scheme.

Under Theoretical links:

- 1.*Promotion of Digital Payments*: The provision is for the promotion of digital payments in the country through different schemes and programmes. From a conceptual standpoint, digital payments and transactions are calculated to have reduced the carbon emissions of the financial services sector (For more: PwC, 2024). Digital payments also facilitate quick, cashless transactions, thus ensuring readiness of the impacted community to cope up with risks during periods of climate induced disasters.
- 2.*Pradhan Mantri Awas Yojana (PMAY)* serves as an important adaptation benefit of reducing vulnerability of those with kutchha homes in events like droughts and blizzards. Further incorporating the local climatic needs in the scheme would enhance the resilience of infrastructure to extreme weather events.

Weightage:

The IMF Framework for Climate Budget Tagging suggests using a simple weightage method to assign weight to different sections. The two suggested options are 100-60-30 and 100-50-25 for high relevance, medium relevance and low relevance projects respectively. Since the methodology employed in this paper is similar to the IMF framework, it is a reliable framework to replicate in this analysis. As the average expenditure relevant to climate change in each section corresponds most closely to the 100-50-25 (%) respectively; this weightage method is chosen.

Mitigation and Adaptation Expenditure Classification:

The identified schemes and heads from the above analysis are further divided into mitigation and adaptation expenditure using the OECD Rio Marker Definition. These identified schemes are compiled into section-wise tables and included in the Appendix.

Example: (Table 4, Appendix)

Table 4.1: Mitigation schemes under Part A				
MINISTRY/DEPARTMENT	2022-2023 Actuals	2023-2024 Budget Estimates	2023-2024 Revised Estimates	2024-2025 Budget Estimates
1. National Mission on Natural Farming	...	459	100	365.64

(Table 5, Appendix)

Table 5.1: Adaptation schemes under Part A				
MINISTRY/DEPARTMENT	2022-2023 Actuals	2023-2024 Budget Estimates	2023-2024 Revised Estimates	2024-2025 Budget Estimates
1.Pradhan Mantri Fasal Bima Yojana	10296.03	13625	15000	14600

OECD Rio-Marker Definition for Climate Mitigation and Adaptation

Climate Change Adaptation Marker

The activity is marked as climate change adaptation if it intends to reduce the vulnerability of human or natural systems to the current and expected impacts of climate change, including climate variability, by maintaining or increasing resilience, through increased ability to adapt to or absorb climate change stresses, shocks, and variability, and/or by helping reduce exposure to them.

An activity is eligible for the climate change adaptation marker if:
The climate change adaptation objective is explicitly indicated in the activity documentation
The activity contains specific measures targeting the definition above.

However, due to lack of clarity in the objective of schemes and heads with regard to climate centrality, this paper relaxes the ‘explicit mention of adaptation in scheme’ criteria and uses the eight broad priority classification done by (Lekha et al, 2023) to identify adaptation relevant schemes. The classifications are:

- 1. Crop Improvement and Research,
- 2. Drought Proofing and Flood Control,
- 3. Forest Conservation
- 4. Poverty Alleviation and Livelihood Preservation
- 5. Rural Education
- 6. Infrastructure
- 7. Health
- 8. Risk Financing and Disaster Management

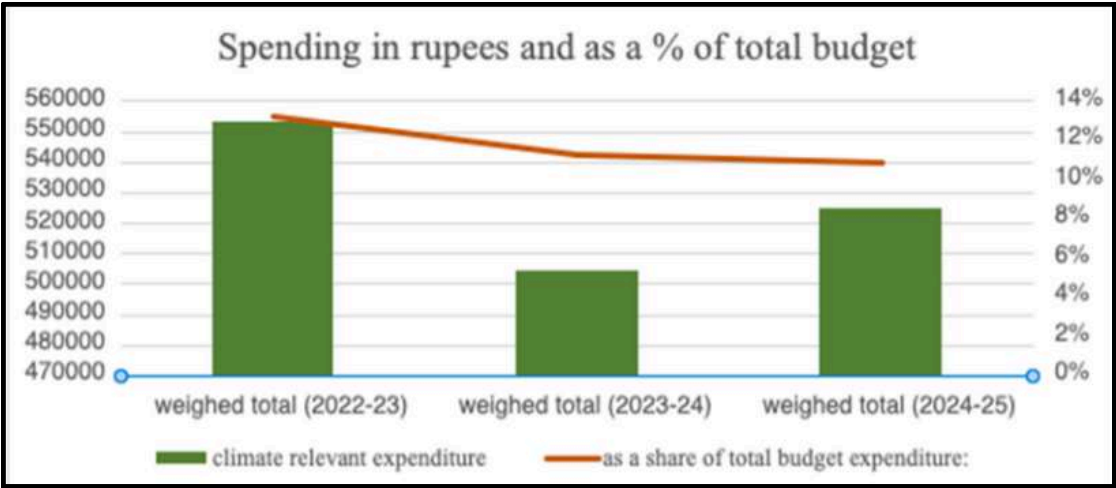
ANALYSIS

4.1. Overall Spending on Climate Change:

- 1. The overall trend in climate spending has largely remained constant, with a few minor changes.

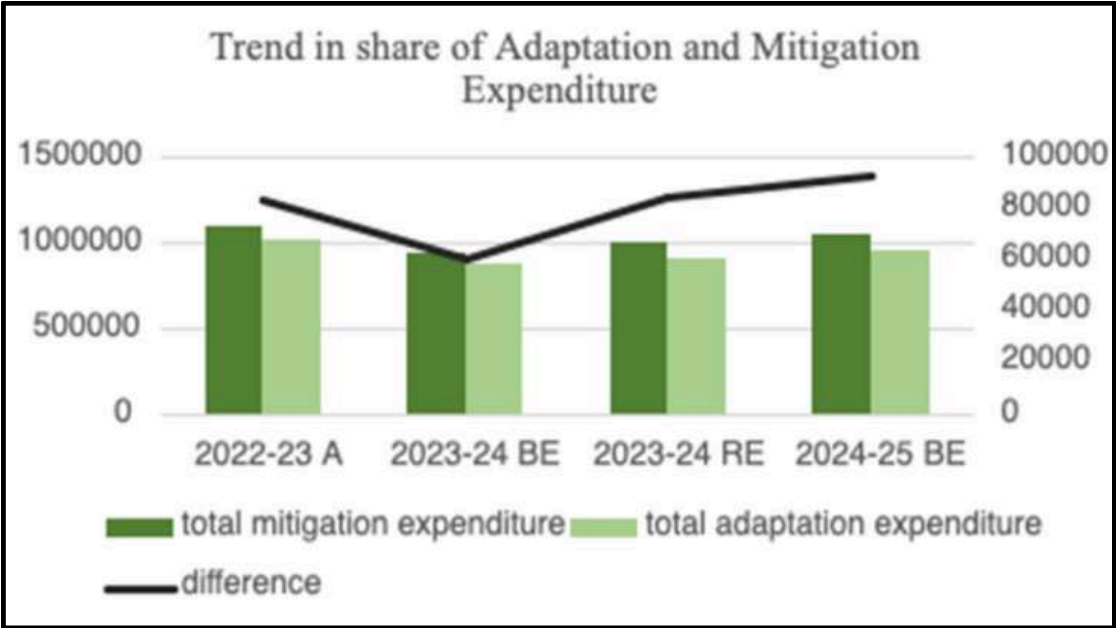
Section	2022-2023 Actuals	2023-2024 Revised Estimates	2024-2025 Budget Estimates
Part A:	217796.28	255519.84	276672.26
Part B:	588377.18	471782.08	460086.4
Part C:	161503.91	77707.15	114163.33
Total weighted spending	554130.318	504767.268	525287.303

Section B has received the largest (unweighted) expenditure for all three years. Both section B and Section C saw a decline in their spendings as a percentage of the total expenditure, while section A witnessed a minor increase in its expenditure; from 5.24% in 22-23 to 5.56% and 5.53% in 23-24 and 24-25 respectively. The overall spending as a percentage share of total budgetary expenditure was 13% for the year 2022-23. In the subsequent year (2023-24), this declined to 11% and remained at 11% for 24-25 as well.



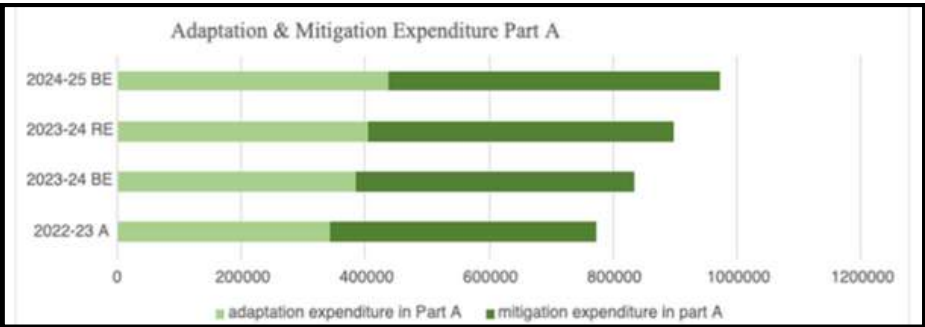
4.2.Trends in Adaptation and Mitigation Expenditure:

As hypothesized, the share of adaptation expenditure in total expenditure is less than the share of mitigation expenditure. The difference between the two had been the highest in 2024-25BE and lowest in 2023-24BE, but it sharply rises in the subsequent revised expenditure for the same year. The difference in spending on adaptation and mitigation lies between 80,000-90,000. This indicates a huge gap in adaptation funding.

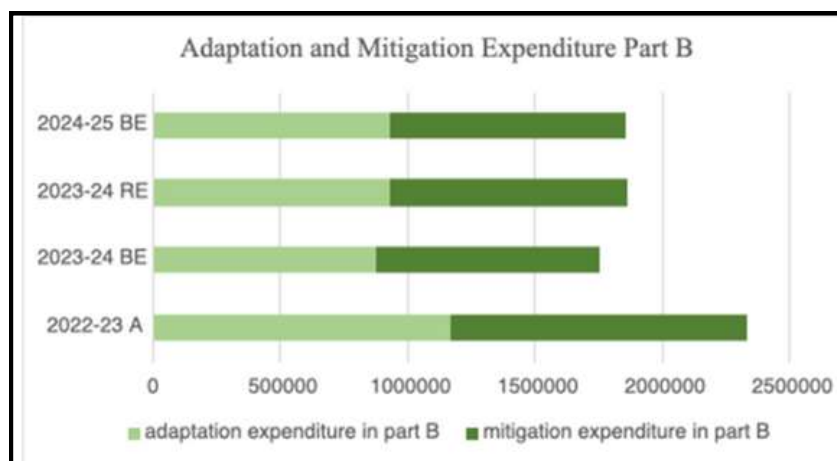


The graph below shows the adaptation and mitigation expenditure undertaken in part A. In FY 22-23, the mitigation expenditure exceeded the adaptation expenditure by Rs 86050.85 crores. Further, in the FY 24-25, mitigation and adaptation expenditure were separated by Rs. 96369.98 crores. A striking fact is that the adaptation expenditure has never exceeded the mitigation expenditure. From 22-23 to 24-25, the mitigation expenditure has always been more by a large margin.

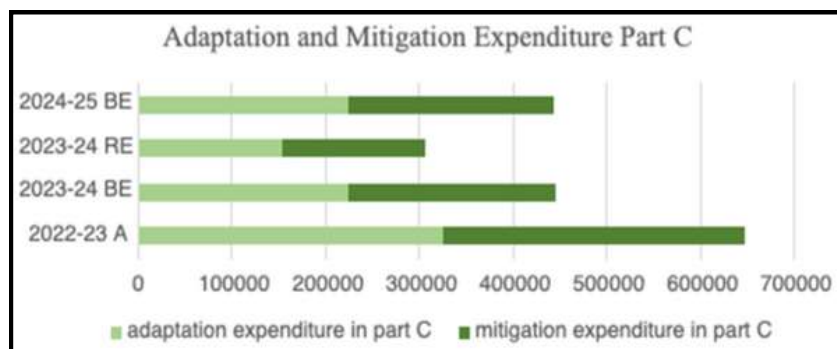
This is concerning because researches show that some effects of climate change are inevitable in nature and will further aggravate in the coming years. Hence, adaptation becomes important for dealing with this crisis.



In Part B, the expenditure on adaptation schemes is more, however the difference between the two is not as large as compared to section A. The difference lies between 2,000-4,000 crs. The largest difference is noted in 2024-25 and has been steadily increasing since 2022-23



Under Part C, the expenditure on adaptation schemes is more than the expenditure on mitigation. The difference, however, replicates the trend of part B, with the highest observed difference being merely 5,229.



The underlying reason behind domination of adaptation schemes under part b and part c is due to the focus on including development schemes that have climate co-benefits.

Synergy between climate adaptation and mitigation schemes

Due to the lag times in the global climate system, no mitigation effort, no matter how rigorous and relentless, is going to prevent climate change from happening in the next few decades (Wigley, 1998, Pittock and Jones, 2000, Dessai and Hulme, 2001). Adaptation is therefore a necessity (Parry et al., 1998). But until recently, national and international climate policy focused mainly on the climate mitigation approach. On the one hand this reflected the concern of some that a stronger focus on adaptation would weaken society's willingness to mitigate climate change, on the other hand it signified the belief of others that the “invisible hand” of natural selection and market forces will bring about adaptation without the need for policy intervention (Klein et al, 2005). Hence, an optimal mix of the two approaches is ideal. Although, estimation of this optimal mix is difficult to achieve. Hence, research is necessary to provide guidance on how to develop a socially and economically justifiable mix of mitigation, adaptation and development policy, as well as on which elements would be part of such a mix.

Most analyzed schemes in this paper, explicitly focus on one approach, although some incorporate elements from both, creating synergies. Schemes like CITIIS 2.0, National Ganga Plan and Solar power provision are few schemes that incorporate both mitigation and adaptation objectives into their goals. For instance, the solar power scheme not only provides a renewable source of energy for one's power needs; it also has dedicated provisions ensuring welfare of the tribal population, thereby reducing the vulnerability of the community to climate change.

4.3.Fiscal Marksmanship Indicator:

The indicator is used to analyse whether RE significantly deviates from BE for adaptation and mitigation schemes for the year 2023-24. It is calculated by finding the ratio between BE and RE.

A score over 1 implies overestimation of the variable. A score below 1 implies underestimation of the variable. (Chakraborty et al, 2023) Mitigation schemes under have been largely overestimated with schemes like Natural Farming having a BE/RE of 4.59. Surprisingly, the only correctly estimated scheme is the sovereign green fund.

Section	overestimated	correctly estimated	under estimated
mitigation schemes under part A	9	1	1
mitigation schemes under part B	3	0	2
mitigation schemes under part C	6	0	0
in total	18	1	3

For adaptation, the trend remains the same with schemes being mostly overestimated with support for flood moderation storage having a ratio as high as 9. Unlike mitigation schemes, many adaptation schemes have been correctly estimated.

section	overestimated	correctly estimated	under estimated
Adaptation schemes under part A	18	12	12
Adaptation schemes under part B	11	6	7
Adaptation schemes under part C	7	1	2
total	36	19	21

4.4.Major climate relevant ministries analysis:

Through the climate budget tagging exercise, 7 major ministries can be identified that have a significant proportion of climate relevant expenditure schemes. Following are the ministries:

- 1.Ministry of New & Renewable Energy
- 2.Ministry of Environment, Forest and Climate Change
- 3.Ministry of Petroleum & Natural Gas
- 4.Ministry of Agriculture & Farmer's Welfare
- 5.Ministry of Jal Shakti
- 6.Ministry of Housing and Urban Affairs
- 7.Ministry of Heavy Industries

The total climate relevant expenditure for these ministries, w.r.t Actuals 2022-23, RE 2023-24 and BE 2023-24, are then calculated by applying relevant weights for the three sections[3].

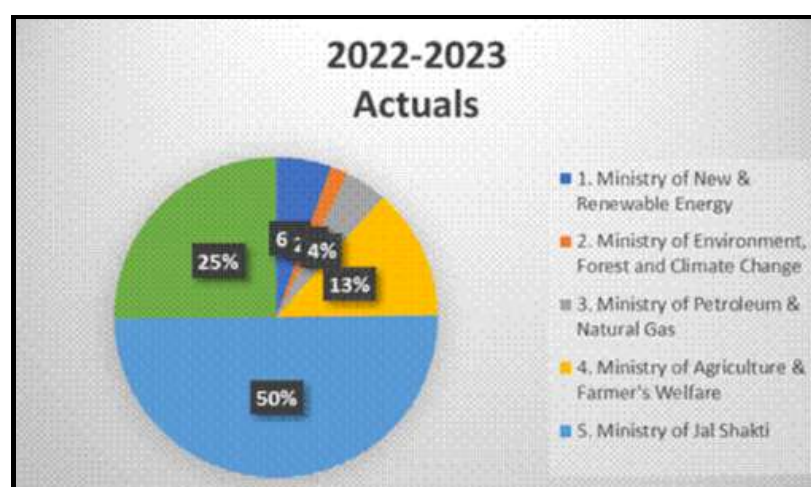
These major ministries are found to constitute 25% (2022-23), 33% (2023-24) and 36% (2024-25) of the entire climate relevant expenditure in the budget. Hence, this proportion is on an increasing trend through the years.

MINISTRY/DEPARTMENT	2022-2023 Actuals	2023-2024 Revised Estimates	2024-2025 Budget Estimates
1. Ministry of New & Renewable Energy	7563.37	7848	19100
2. Ministry of Environment, Forest and Climate Change	2389.3	3231.02	3330.37
3. Ministry of Petroleum & Natural Gas	5701.25	8711.99	9708.67
4. Ministry of Agriculture & Farmer's Welfare	18028.6	24769.555	26502.98
5. Ministry of Jal Shakti	68111.92	88530.66	92643.43
6. Ministry of Housing and Urban Affairs	34146.795	31587.3275	35379.1275
7. Ministry of Heavy Industries	2403.335	4813.405	3309.33
Total of all identified major ministries:	138344.57	169491.9575	189973.9075
total climate relevant expenditure:	551509.4	510087.15	534650.5675
% of major ministries in total climate relevant expenditure	25%	33%	36%

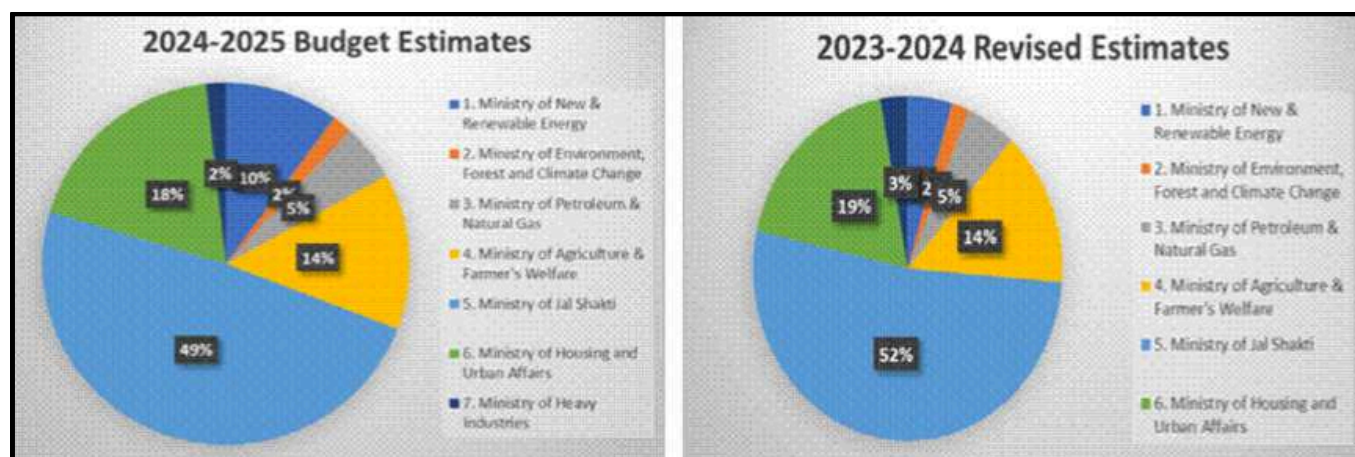
Subsequently, the percentage share of each ministry w.r.t. total expenditure of all identified major industries is calculated for each year and a pie chart is formed. This helps to identify the importance and weight of each major industry in the context of climate relevant expenditure.

MINISTRY/DEPARTMENT	2022-2023 Actuals	2023-2024 Revised Estimates	2024-2025 Budget Estimates
1. Ministry of New & Renewable Energy	5%	5%	10%
2. Ministry of Environment, Forest and Climate Change	2%	2%	2%
4. Ministry of Petroleum & Natural Gas	4%	5%	5%
6. Ministry of Agriculture & Farmer's Welfare	13%	15%	14%
7. Ministry of Jal Shakti	49%	52%	49%
8. Ministry of Housing and Urban Affairs	25%	19%	19%
9. Ministry of Heavy Industries	2%	3%	2%

Among the major climate-centric ministries, the Ministry of Jal Shakti has the highest proportion of expenditure allotted to climate relevant schemes for all the years. The underlying reason is the large number of climate relevant schemes as the ministry's primary focus.



This is followed by the Ministry of Housing and Urban Affairs and Ministry of Agriculture & Farmer's Welfare. The major contributors to this allotment are the Smart Cities Mission and AMRUT (Atal Mission for Rejuvenation and Urban Transformation) schemes. Although, the allocation is on a decreasing trend, falling from 25% (2022-23) to 19% in the subsequent years.



The Ministry of New & Renewable Energy, although fully devoted to climate mitigation schemes and constituting a variety of schemes, does not have a huge amount of allotted expenditure in the years 2022-23 and 2023-24. But the proportion of allotment of BE for 2024-25, has overwhelmingly increased to 10% with 19100 crores as the budget estimate. On the other hand, the climate relevant expenditure allocation for the Ministry of Environment, Forest and Climate Change has been noticeably constant at 2%.

LIMITATIONS OF SCHEMES/HEADS CLASSIFICATION

Due to the ambiguity of policy documents regarding their visions and goals and imperfection of the Rio-Marker definition, errors in categorization from our side are likely. We rely on a more subjective and theoretical understanding of schemes for analyzing the co-benefits instead of developing a consistent framework. Moreover, the clustering of schemes has decreased transparency in understanding expenditure at the sub-program level. Therefore, even after applying weighting methods, there is a risk of overestimating climate expenditure within some umbrella schemes.

CONCLUSION

The paper estimates climate-related spending in India through a modified budget tagging approach. To prevent overestimation, it employed a weighted sectional accounting model. The findings indicate that climate-related expenditure makes up 11% of the overall budget and 2.84% of GDP for the year 2024-25. These figures are consistent with earlier evaluations of climate-related spending. A study titled Climate Change-Responsive Public Expenditure in India: An Empirical Analysis estimates that specifically targeted climate expenditure is around 5–6% of the budget. Similarly, Section A of this paper, which encompasses programs that primarily aim to address climate change, represents roughly 5.8% of the budget. Lastly, our findings suggest that climate relevant expenditure is dominated by spending on mitigation, especially in schemes specifically meant for climate change. Thus, there is a need to bridge this gap between adaptation and mitigation expenditure to achieve a more equitable and balanced climate policy that addresses the vulnerability of diverse groups.

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[1] Current provision of rice and wheat is unsustainable in the long run, not only due to its large carbon footprint, but also the vulnerability of its production to extreme weather events like high temperatures.

[2] Refer Appendix

[3] Refer Appendix: Table 6

HEAT STRESS AND ECONOMIC PRECARITY: THE IMPACT OF CLIMATE CHANGE ON MARGINALISED WOMEN IN URBAN INFORMAL LABOR

Aditi Arya

ABSTRACT

Heat-related effects of climate change generate additional economic hardships for marginalised women who work in urban informal jobs. Researchers study the relationships between escalating temperatures and their effects on female labor output and healthcare costs while also analysing how poverty persists over time. The research discusses how margins of women experience more hardships than men through the analysis of Becker's Labor-Leisure Tradeoff Model in combination with Economic Loss Function Model and Gendered Vulnerability Theory when studying street vending and domestic work and construction. The research shows that informal workers encounter substantial productivity reductions amounting to 42.9% and their associated healthcare expenses rise by 83% mainly because women fulfil both financial and caretaking responsibilities.

Research findings advocate the implementation of gender-sensitive measures such as cooling facilities with flexible work systems and protective social programs because they help lessen these difficulties. This research achieves its goal by applying the Vasudhaiva Kutumbakam principle of global solidarity to demand solutions which combine community input and promote sustainable development and address economic precarity caused by climate changes. The research discoveries reveal essential implications for governmental agencies and city development professionals who must prioritise gender-based adaptation plans as part of their climate change mitigation strategies.

JEL CLASSIFICATION CODES:

Q54, H5, H87

KEYWORDS:

Heat Stress, Economic Precarity, Gender Vulnerability, Urban Informal Labour

INTRODUCTION

One of the most pressing issues of the twenty-first century is climate change, which disproportionately impacts underprivileged groups worldwide. Heatwaves are occurring more frequently and with greater intensity, particularly in metropolitan areas, as a result of global warming brought on by human-caused activities including industrialisation, deforestation, and the combustion of fossil fuels (IPCC, 2021). The risk of heat stress is enhanced by urban heat islands, which have higher temperatures in metropolitan areas compared to the nearby rural areas (Oke et al., 2017). Concentrated buildings, less greenery, and heat-absorbing surfaces like asphalt and concrete all contribute to urban heat islands, which trap heat and elevate local temperatures. Due to their socioeconomic vulnerability and lack of access to adaptation resources, disadvantaged groups—particularly women working in informal sectors—are disproportionately impacted by the wide-ranging economic and health repercussions of climate change (Rao et al., 2019).

Global consciousness about climate change underlines the fact that it faces differentiated consequences, with the most at-risk populations and developing states subject to the impacts. Regional hotspots are particularly sensitive in South Asia, Sub-Saharan Africa, and parts of Latin America—these subregions rely on climate-sensitive industries such as agriculture and informal employment (IPCC, 2021). These regions' urban areas, which are currently affected by high population densities, inadequate infrastructure, and economic inequality, are particularly vulnerable to the combined impacts of heat stress. Informal labor is a vital but so far neglected aspect of the economy that benefits in these metropolitan settings. These women, who already suffer in a gendered sense as a result of gendered discrimination, bear the combined weight of economic instability and climate stress. This intersection of climate, employment, and gender vulnerabilities draws attention to particular research and policy initiatives aimed at understanding and resolving the unique issues these women confront.

Jobs under informal work sector such as street hawking, domestic work, construction, waste picking, and many others, which constitute an important part of the urban economies of developing countries, are part of informal work. As a result, these industries are known for cheap labor, poor social protection and subpar working conditions and consequently such employees are very vulnerable to the external shocks (Chen, 2012). According to the International Labour Organisation (ILO), 60 per cent of the world's labor force is in the informal sector of which women constitute a considerable percentage particularly in poor countries (ILO, 2018). The informal sector women added to gendered disadvantages like unequal wage, restricted access to health care, and social norms that increase the women's exposure to climate related stressors (Srivastava and Srivastava 2010). They are experiencing reduced productivity, increased risk to health, and increased economic insecurity as heat stress rises, sustaining the cycle of poverty and inequality (Kjellstrom et al., 2016).

Considering the size of the problem demands that one realise the problem's demographic uniqueness. Headworkers in their families, informal labor women have a duty of income generation as well as household chores. However, this double role prevents them from coping with excessive heat especially because they have to go to work and take care of others. For example, home workers, mostly women, work in a setting where cooling facilities are absent, whereas street vendors are exposed to sunlight during most part (Rao et al., 2019). Their vulnerability is further amplified due to their denial of access which to healthcare and social safety nets as their inability to afford to lose income for going for medical care for heat related illnesses. The fact that women in informal work are highly vulnerable to such challenges underscores the need for interventions that are targeted at the specific problems of women in informal work.

1.1. Research Problem

Despite growing awareness of the economic impacts of climate change, there is limited understanding of how heat stress exacerbates economic precarity among marginalised women in urban informal labor markets. Existing research has primarily focused on formal employment and male-dominated industries, neglecting the unique vulnerabilities faced by informal female workers (Kjellstrom et al., 2016). This study aims to fill this gap by examining the mechanisms through which heat stress reduces labor productivity, increases healthcare expenditures, and perpetuates economic insecurity among women in informal labor.

1.2. Research Objectives

The study seeks to:

- To establish a theoretical economic model quantifying the effects of heat stress on labor productivity and income stability for marginalised urban informal labouring women.
- To explore how gendered economic inequities in informal labor markets get worse by heat stress.
- To evaluate the effectiveness of feasible policy measures to lessen the financial toll that heat stress takes on female unorganised labourers.
- To provide an empirical foundation for future research and data-driven policy creation for urban environments exposed to climate change.

1.3. Significance of the Study

This research is significant for several reasons. First, it highlights the intersection of climate change, gender inequality, and economic precarity, providing a comprehensive framework for understanding the challenges faced by marginalised women in informal labor markets. Second, it contributes to the growing body of literature on climate justice by emphasizing the need for inclusive, gender-responsive adaptation policies. Finally, the study aligns with the Vasudhaiva Kutumbakam principle of global solidarity, advocating for community-driven solutions that prioritize the needs of vulnerable populations. By addressing these issues, the research aims to inform policy and practice, promoting sustainable development and climate resilience.

LITERATURE REVIEW

The 21st century faces its most significant environmental challenge because vulnerable populations including informal-working women experience the heaviest impact of climate change. Heat stress intensifies because of global warming while also accelerating urban heat rise thus it damages labor productivity along with income security and economic stability. Street vendors alongside domestic workers and waste pickers along with construction workers experience recent vulnerability because they have economic fragility combined with no access to cooling systems and limited protection. The paper reviews previous research to understand how heat stress affects vulnerable women working in precarious urban settings. The analysis highlights the crucial need to support the three factors of heat stress exposure with gender inequalities and financial risks among workers in informal urban labor markets.

The need for gender-based climate policy solutions is established by the scientific integration of several studies, which also highlights the overwhelming difficulties encountered by underprivileged female communities. Concentration on gathering empirical data, testing theories, and developing workable policies to improve resilience in sectors of informal employment might be beneficial. In order to combat climate change, interdisciplinary solutions that combine social protection, gender equality, and climate adaption techniques are needed to build pathways for the most vulnerable groups at the bottom. The study arranges information through three main thematic parts starting with heat stress effects on productivity and moving onto gender-based vulnerabilities in informal work environments and ending with policy implications. The review uses diverse research findings to show the total situation of marginalisation faced by women while creating pathways toward policy solutions.

2.1. Heat Stress and Labor Productivity: Heat stress has been widely recognized as a significant factor affecting labor productivity, particularly in physically demanding occupations such as construction, agriculture, and street vending (Kjellstrom et al., 2016). Studies have shown that even moderate increases in temperature can reduce productivity by 10-15%, with informal workers being disproportionately affected due to their lack of access to cooling facilities and adaptive resources (Zander et al., 2015). For example, Sahu et al. (2013) found that factory workers in India experienced cardiovascular stress and reduced work efficiency under high temperatures, highlighting the physiological impacts of heat stress.

2.2. Gendered Vulnerabilities in Informal Labor: Women in informal labor markets face unique challenges due to the intersection of gender disparities and climate exposure. They are often concentrated in high-risk, low-protection jobs such as street vending and domestic work, where they are exposed to extreme heat with little or no access to cooling facilities (Rao et al., 2019). The additional burden of caregiving responsibilities further limits their ability to adapt to heat stress, as they have less time and resources to invest in adaptive strategies (Terry, 2009). Gendered Vulnerability Theory emphasizes the role of societal norms and structural inequalities in exacerbating women's exposure to environmental risks (Arora-Jonsson, 2011).

2.3. Economic Precarity and Adaptive Capacity: The economic impacts of heat stress are particularly severe for informal workers, who often lack access to social protection mechanisms and financial buffers. Studies have shown that heat stress leads to significant income losses, increased healthcare expenditures, and reduced adaptive capacity, trapping workers in cycles of poverty (Dasgupta et al., 2021). For example, street vendors in Mumbai and Dhaka have reported substantial income losses during heatwaves, as they are forced to reduce working hours or suspend work altogether to avoid heat-related illnesses (Zander et al., 2015). Social protection mechanisms, such as subsidized healthcare and cash transfers, have been shown to mitigate these impacts, providing a safety net for vulnerable workers (Lund & Srinivas, 2000).

2.4. Synthesis and Research Gaps

While existing research provides valuable insights into the impacts of heat stress on labor productivity and economic precarity, there are significant gaps in the literature. First, there is a lack of gender-disaggregated data on the economic impacts of heat stress, particularly in informal labor markets. Second, there is limited empirical evidence on the effectiveness of adaptation policies in reducing economic precarity among informal workers. This study aims to address these gaps by providing a comprehensive analysis of the gendered dimensions of heat stress and evaluating the role of gender-responsive adaptation policies in building resilience.

THEORETICAL FRAMEWORK

3.1. Labor-Leisure Tradeoff Model (Becker, 1965)

The Labor-Leisure Tradeoff Model, proposed by Becker (1965), provides a foundational framework for understanding how individuals allocate their time between work and leisure to maximize utility. In the context of heat stress, this model explains how rising temperatures force workers to reduce their working hours to avoid health risks, leading to a decline in income. The utility function can be expressed as: $U=f(C, L)$ [Where: U = Utility, C = Consumption (income-dependent), L = Leisure]

Under heat stress, the disutility of working increases due to the heightened risk of heat-related illnesses such as dehydration, heat exhaustion, and heatstroke. As a result, workers, particularly those in informal labor markets, are compelled to reduce their working hours L to protect their health, which in turn reduces their income C . This tradeoff is especially pronounced for women, who often juggle income-generating activities with caregiving responsibilities. The model highlights how heat stress exacerbates economic precarity by forcing workers to choose between health and income.

3.2. Economic Loss Function Model

The Economic Loss Function Model quantifies the economic impact of heat stress by considering three key factors: productivity loss, healthcare expenditures, and adaptation costs. The model can be expressed as: $EL=(\Delta P \times W) + HC + AC$ [Where: EL = Economic Loss, ΔP = Productivity loss due to heat, W = Average wage per unit of productivity, HC = Healthcare costs from heat-related illnesses, AC = Adaptation costs (e.g., cooling infrastructure)]

For informal workers, particularly women, the economic loss is severe due to their low wages and lack of financial buffers. Productivity loss ΔP occurs when workers reduce their working hours or take more breaks to cope with heat stress. Healthcare costs HC rise as workers seek treatment for heat-related illnesses, often paying out-of-pocket due to the lack of health insurance. Adaptation costs AC include expenses incurred by workers to mitigate heat stress, such as purchasing cooling equipment or working in shaded areas. The model underscores the compounding effect of these factors, which collectively deepen economic precarity among informal workers.

3.3. Gendered Vulnerability Theory

Gendered Vulnerability Theory, as articulated by Arora-Jonsson (2011) and Terry (2009), provides a critical lens for understanding why women in informal labor markets are disproportionately affected by heat stress. The theory posits that societal norms, cultural expectations, and structural inequalities exacerbate women's exposure to environmental risks. In informal labor markets, women are often concentrated in high-risk, low-protection jobs such as street vending, domestic work, and waste picking, where they are exposed to extreme heat with little or no access to cooling facilities.

The theory also highlights the double burden faced by women, who must balance income-generating activities with caregiving responsibilities. This dual role limits their ability to adapt to heat stress, as they have less time and resources to invest in adaptive strategies. Furthermore, cultural norms often discourage women from participating in decision-making processes related to climate adaptation, perpetuating their vulnerability. Gendered Vulnerability Theory emphasizes the need for gender-responsive policies that address the unique challenges faced by women in informal labor markets.

3.4. Climate Adaptation and Resilience Theory

Climate Adaptation and Resilience Theory, as discussed by Birkmann et al. (2016) and Jay et al. (2021), focuses on proactive measures to mitigate the impacts of climate change. The theory emphasizes the importance of adaptation policies, such as cooling infrastructure, flexible work arrangements, and social protection mechanisms, in reducing the economic and health impacts of heat stress.

For informal workers, particularly women, adaptation policies can play a crucial role in building resilience. Cooling infrastructure, such as shaded workspaces and cooling centers, can reduce exposure to extreme heat and improve labor productivity. Flexible work arrangements, such as adjusting work hours to avoid peak heat, can help workers maintain their income while protecting their health. Social protection mechanisms, such as subsidized healthcare and cash transfers, can provide a financial safety net for workers affected by heat stress. The theory underscores the importance of integrating adaptation policies with broader goals of social justice and economic resilience.

3.5. Vasudhaiva Kutumbakam as a Philosophical Framework

The principle of Vasudhaiva Kutumbakam, which translates to "the world as one family," provides a philosophical foundation for inclusive and equitable climate adaptation. This framework emphasizes global solidarity and shared responsibility in addressing the challenges posed by climate change. In the context of informal labor markets, Vasudhaiva Kutumbakam calls for community-driven solutions that prioritize the needs of marginalized groups, particularly women.

The framework aligns with the Sustainable Livelihoods Framework, which emphasizes the importance of human, social, financial, physical, and natural capital in building resilience. For informal women workers, interventions that enhance access to these resources can improve their adaptive capacity and reduce their vulnerability to heat stress. Vasudhaiva Kutumbakam also highlights the importance of participatory governance, where marginalized communities are actively involved in the design and implementation of adaptation policies.

METHODOLOGY

4.1. Research Design

This research adopts a mixed-methods approach, combining theoretical analysis with empirical data to examine the impact of heat stress on marginalized women in urban informal labor markets. The study integrates quantitative data on labor productivity, healthcare expenditures, and income loss with qualitative insights from ethnographic research conducted with informal women workers in Mumbai. This approach allows for a comprehensive understanding of the economic and gendered dimensions of heat stress.

4.2. Data Collection

The study relies on both secondary and primary data sources. Secondary data includes academic studies, official reports, and datasets from international organizations such as the International Labour Organization (ILO) and the Intergovernmental Panel on Climate Change (IPCC). Primary data was collected through ethnographic research, including interviews and focus group discussions with informal women workers in Mumbai. This data provides firsthand insights into the lived experiences of women facing heat stress in informal labor markets.

4.3. Analytical Framework

The analytical framework is based on the Heat Stress Impact Model, which examines the relationship between heat stress, labor productivity, healthcare expenditures, and economic precarity. The model incorporates the following key variables:

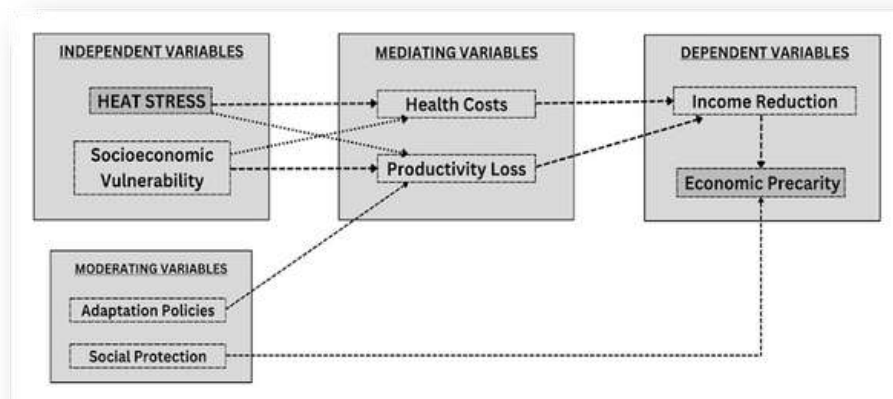


Figure:4.3: Theoretical Model: Heat Stress and Economic Precarity Model

Source: Author's Implementation

- Independent Variable: Heat stress (measured by temperature levels and urban heat island effects).
- Mediating Variables: Productivity loss, healthcare costs, and adaptation costs.
- Dependent Variable: Economic precarity (measured by income loss and financial instability).
- Moderating Variables: Adaptation policies (e.g., cooling infrastructure, flexible work hours) and social protection mechanisms (e.g., subsidized healthcare, cash transfers).

The framework is operationalised through the following steps:

4.3.1. **Data Preparation:** Secondary data on temperature levels, labor productivity, and healthcare expenditures was collected and organized. Primary data from ethnographic research was transcribed and coded for thematic analysis.

4.3.2. **Quantitative Analysis:** Productivity loss and income loss were calculated using the formulas:

$$\text{Productivity Loss (\%)} = \frac{(\text{Normal Working Hours} - \text{Heat Stress Working Hours})}{\text{Normal Working Hours}} \times 100$$

$$\text{Income Loss (\%)} = \frac{(\text{Normal Earnings} - \text{Earning during heat stress})}{\text{Normal Earnings}} \times 100$$

4.3.3. **Qualitative Analysis:** Thematic analysis of interview transcripts was conducted to identify key themes related to gendered vulnerabilities and adaptive strategies.

4.3.4. **Integration of Findings:** Quantitative and qualitative findings were integrated to provide a holistic understanding of the impact of heat stress on informal women workers.

4.4. Justification of Data and Tables

The data used in this study is justified by its relevance to the research objectives and its alignment with existing literature. Secondary data from reputable sources ensures the reliability of the findings, while primary data provides context-specific insights. Tables and charts were prepared to summarize key findings, such as productivity loss across different sectors and the financial burden of heat-related illnesses. These visual aids enhance the clarity and impact of the analysis, making the findings accessible to policymakers and stakeholders.

This theoretical framework and methodology provide a robust foundation for the research, ensuring that the analysis is both rigorous and relevant to the challenges faced by marginalized women in urban informal labor markets. Let me know if you need further refinements or additional sections!

ANALYSIS AND FINDINGS

5.1. Impact of Heat Stress on Labor Productivity

The analysis reveals that heat stress significantly reduces labor productivity, particularly in sectors wAith high physical labor demands, such as construction, street vending, and domestic work. The following table summarizes the productivity loss across different sectors:

Table 5.1: Labor Productivity Loss Due to Heat Stress

Sector	Normal Working Hours	Heat Stress Working Hours	Productivity Loss (%)
Construction	8	5	37.50%
Street Vending	10	6	40.00%
Domestic Work	9	6.5	27.80%
Agriculture	7	4	42.90%
Factory Work	8	5	37.50%

Analysis:

- Street vendors and agricultural workers experience the highest productivity losses (40% and 42.9%, respectively), as they are exposed to direct sunlight for extended periods.
- Domestic workers, who often work in poorly ventilated environments, face a 27.8% productivity loss, highlighting the impact of indoor heat stress.
- The findings align with the Labor-Leisure Tradeoff Model, as workers reduce their working hours to avoid heat-related health risks, leading to significant income losses.

5.2. Economic Precarity and Healthcare Expenditures

Heat stress not only reduces productivity but also increases healthcare expenditures, further exacerbating economic precarity. The following table illustrates the financial burden of heat-related illnesses on informal workers:

Sector	Normal Healthcare Expenditure (₹)	Heat Stress Expenditure (₹)	Increase (%)
Construction	500	800	60%
Street Vending	400	700	75%
Domestic Work	300	550	83%
Agriculture	600	1000	67%
Factory Work	450	750	67%

Table 5.2: Healthcare Expenditures Due to Heat Stress

Source: Author’s Implementation

Analysis:

- Domestic workers experience the highest increase in healthcare expenditures (83%), as they often lack access to cooling facilities and are more susceptible to heat-related illnesses.
- Street vendors and agricultural workers also face significant financial burdens, with healthcare costs increasing by 75% and 67%, respectively.
- The Economic Loss Function Model highlights how rising healthcare costs, combined with productivity losses, deepen economic precarity among informal workers.

5.3. Gendered Vulnerabilities in Informal Labor

The gender distribution in informal labor sectors reveals that women are disproportionately affected by heat stress due to their concentration in high-risk, low-protection jobs:

Table 5.3: Gender Distribution Across Informal Labor Sectors

Sector	Percentage of Women Workers (%)
Street Vending	65%
Domestic Work	90%
Construction	15%
Agriculture	50%
Factory Work	40%

Analysis:

- Women constitute the majority in street vending (65%) and domestic work (90%), sectors that are highly exposed to heat stress and offer minimal social protection.
- The double burden of income generation and caregiving limits women's ability to adapt to heat stress, as they have less time and resources to invest in adaptive strategies.
- Gendered Vulnerability Theory underscores the need for gender-responsive policies that address the unique challenges faced by women in informal labor markets.

5.4. Moderating Effects of Adaptation Policies and Social Protection

The analysis also examines the role of adaptation policies and social protection mechanisms in mitigating the economic impacts of heat stress. The following table summarizes the effectiveness of these interventions:

Table 5.4: Effectiveness of Adaptation Policies and Social Protection

Intervention	Expected Outcome
Cooling Infrastructure	Reduce heat-related illnesses by 30%
Flexible Work Hours	Reduce income loss by 25%
Social Protection Mechanisms	Reduce healthcare expenditures by 40%
Gender-Responsive Policies	Improve adaptive capacity and decision-making

Analysis:

- Cooling infrastructure, such as shaded workspaces and cooling centers, can reduce heat-related illnesses by 30%, improving labor productivity and economic stability.
- Flexible work hours allow workers to avoid peak heat, reducing income loss by 25%.
- Social protection mechanisms, such as subsidized healthcare and cash transfers, can lower healthcare expenditures by 40%, providing a financial safety net for vulnerable workers.
- Gender-responsive policies empower women to participate in decision-making processes, enhancing their adaptive capacity and resilience.

5.5. Key Insights

1. **Heat Stress as a Central Economic Shock:** Heat stress significantly reduces labor productivity and increases healthcare expenditures, leading to economic precarity among informal workers.
2. **Gendered Vulnerability:** Women in informal labor markets face a dual burden of heat stress and caregiving responsibilities, exacerbating their economic vulnerability.
3. **Mediating Effects:** Productivity loss and healthcare costs amplify the economic impacts of heat stress, particularly for workers with limited financial resources.
4. **Moderating Role of Adaptation Policies:** Cooling infrastructure, flexible work hours, and social protection mechanisms can mitigate the adverse effects of heat stress, improving economic resilience.
5. **Need for Gender-Responsive Policies:** Interventions must address the unique challenges faced by women in informal labor markets to achieve equitable and sustainable outcomes.

IMPLICATION AND DISCUSSION

6.1. Implications of the Analysis

The findings of this study have significant implications for policymakers, urban planners, and development practitioners. The analysis highlights the urgent need for gender-responsive adaptation policies that address the intersection of climate vulnerability, economic precarity, and gender inequality. The following implications emerge from the study:

1. **Economic Stability:** Heat stress undermines economic stability by reducing labor productivity and increasing healthcare expenditures. Without adequate adaptation measures, informal workers, particularly women, will continue to face chronic poverty and economic insecurity.
2. **Health and Well-being:** The rising incidence of heat-related illnesses poses a serious threat to the health and well-being of informal workers. Access to affordable healthcare and preventive measures is essential to mitigate these risks.
3. **Gender Equality:** The gendered dimensions of heat stress underscore the need for policies that empower women and address structural inequalities in informal labor markets.
4. **Climate Resilience:** Building climate resilience requires a holistic approach that integrates adaptation policies with broader goals of social justice and sustainable development.

6.2. Discussion

Heat stress operates as a multiplier for economic instability, especially among poor women working in the informal sector. The causal pathway model explains how the rise in ambient temperatures triggers a chain reaction of negative impacts starting from physiological strain and ending in poverty and economic susceptibility.

5.2.1. The Physiological Cost of Heat Stress: When temperatures exceed an acceptable level, the human body has difficulty controlling its core temperature. For the informal workers—particularly those with physically demanding work such as street vending, construction, domestic work, and waste picking—chronic exposure to high temperatures causes dehydration, heat exhaustion, and heatstroke. These illnesses cause cognitive impairment, decreased stamina, and elevated risk of chronic conditions like cardiovascular disease and respiratory conditions.

Women, more concentrated in the informal sector of work and often shouldering double burdens of job and domestic tasks, are similarly at higher risk. Their biologically determined vulnerabilities to heat stress, added to gendered environmental conditions at the workplace (i.e., absent cooling facilities within markets or substandard ventilation at homes where home-based work occurs), increase their risk.

5.2.2. The Productivity Decline and Healthcare Cost Burden: The immediate effect of heat stress is a dramatic reduction in productivity. Informal workers who suffer from heat exhaustion are unable to maintain regular working hours, resulting in reduced workdays, regular breaks, or even total work suspension during severe heatwaves. Because the majority of informal workers are paid on a piece-rate or daily basis, any decrease in working hours automatically means a loss of income.

Furthermore, heat stress also raises healthcare costs as a result of treatment for dehydration, fainting caused by heat, and long-term chronic diseases worsened by repeated exposure. Contrary to the formal sector workers who may receive health insurance benefits, informal workers need to finance medical treatment out-of-pocket, adding to their already limited incomes. It makes it a vicious circle—lower income from heat stress translates to less money available for medical treatment, and increasing medical problems further reduce their capacity to work.

5.2.3. The Economic Trap: Slipping into Precarity and Poverty: As productivity drops and medical bills skyrocket, informal workers get caught in an economic spiral downward. Without financial buffers, they are left to turn to desperate coping strategies—reducing necessary costs such as food, pulling children out of school to save money, or taking on riskier, exploitative work to make up for the lost earnings.

For poor women, the burden is compounded, since they are responsible for extra care within the household, which restricts them from the ability to adjust or move to less heat-dense work settings. Over time, this constant exposure to heat stress, coupled with financial insecurity and bad health, results in chronic poverty and long-term economic precariousness.

6.3. Policy Recommendations

Based on the findings, the following policy recommendations are proposed to address the challenges posed by heat stress in informal labor markets:

6.3.1. Cooling Infrastructure: Installing shaded workplaces, cooling centres, and water kiosks in cities can minimise heat stress to a great extent. Ahmedabad, India, implemented cool roofs and heat action plans, and as a result, heat-related illnesses decreased by 30% and worker productivity increased by 20% (Azhar et al., 2014).

6.3.2. Flexible Work Arrangements: Allowing informal workers to reschedule in hot weather can reduce exposure risks and prevent losses in productivity. Iceland's four-day experiment preserved or improved productivity while improving well-being (Haraldsson & Kellam, 2021). Similarly, Microsoft's Japan experiments also saw a 40% rise in productivity, demonstrating the benefit of flexibility.

6.3.3. Social Protection Mechanisms: Implementing subsidised healthcare, cash transfers, and heat-related insurance schemes can bring economic security to informal workers who are hit by climate-induced economic shocks. In India, the e-sharm portal was initiated to develop a national database of unorganised workers with the aim of providing social security benefits to this group (Press Information Bureau, 2021). These mechanisms can lower healthcare spending by 40% and improve overall financial stability.

6.3.4. Gender-Responsive Policies: Protecting women's interests in resource planning and policy making is important to ensure equitable economic growth. Developing the adaptive capacity of women through training and leadership participation helps them better manage change. For instance, linking health programmes with micro finance-based self-help groups in India made poor women's behaviour healthier (Saha et al., 2015).

6.3.5. Heat-Resilient Micro-finance Programs: Low-interest micro-finance loans to marginalised workers to invest in climate adaptation technology, such as cooling machinery and shaded buildings, can render the workforce more robust. Micro-finance institutions working with community cooperatives have managed to facilitate access to capital for climate adaptation (Agrawala & Maëlis, 2010).

6.3.6. Mobile Health Clinics & Awareness Campaigns: Use of mobile health centers in high-risk city areas to provide heat-related healthcare, hydration facilities, and prevention education can go a long way in stemming heat-related illness conditions. Hydration education, cooling techniques, and first aid instruction are some important aspects of the same. Programs of this sort have generated healthier behaviors and decreased illness rates in vulnerable populations (Saha et al., 2015).

6.4. Broader Implications for Climate Policy

The results of this study have wider ramifications for climate policy throughout the world. Heat stress disproportionately affects women who are marginalized in informal labor markets, underscoring the need for fair and inclusive climate adaptation measures. The needs of vulnerable groups, especially women, must be given top priority in international climate policy and funding structures in order to meet sustainable development objectives. As climate hazards increase, governments may foster climate justice and resilience by including social and gender issues into climate adaptation programs.

This study emphasizes how critical it is to implement inclusive, gender-responsive policies to address the problems caused by heat stress in informal labor marketplaces. The results underscore the significance of adaptation measures and social protection systems in fostering economic resilience by highlighting the twin cost of heat stress and gendered vulnerabilities experienced by women. Policymakers may build a more resilient and equitable future for underserved areas by using a comprehensive strategy that incorporates climate adaptation with more general objectives of social justice and sustainable development.

CONCLUSION

According to this study, one of the main causes of economic precarity for marginalized women in urban informal labor marketplaces is heat stress. The research has emphasized the ways in which rising temperatures lower labor productivity, raise healthcare costs, and prolong poverty cycles by combining theoretical frameworks like the Economic Loss Function Model, Becker's Labor-Leisure Tradeoff Model, and Gendered Vulnerability Theory. Due to their dual roles as caretakers and wage earners, women are disproportionately affected by the findings, which show considerable productivity losses (up to 42.9%) and increased healthcare expenses (up to 83%) among informal workers.

The study emphasizes how crucial gender-responsive adaptation strategies are to reducing the negative economic effects of heat stress. It has been demonstrated that social protection systems, flexible work schedules, and cooling infrastructure lower the risk of heat-related illnesses, increase worker productivity, and give vulnerable people financial stability. According to the Vasudhaiva Kutumbakam principle of global solidarity, the study advocates for community-driven, inclusive solutions that give marginalized women's needs in informal labor marketplaces top priority.

The results have important ramifications for development professionals, urban planners, and legislators. First, they draw attention to the pressing need for gender-sensitive adaptation measures that take into account the particular risks that women in informal labor confront. Second, they stress how crucial it is to combine climate adaptation with more general objectives of sustainable development and social justice. The paper concludes by urging more investigation to confirm these results in other urban settings and assess the long-term efficacy of adaptation measures.

In conclusion, this study advances our knowledge of how gender inequality, economic precarity, and climate change interact. The study lays the groundwork for future interventions targeted at reducing the effects of heat stress on the most susceptible urban populations by connecting theoretical models with real-world policy issues. Adopting comprehensive, focused, and inclusive policies that support economic security and climate resilience for all is more crucial than ever as global temperatures continue to increase.

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THE FLATTENING OF THE PHILLIPS CURVE IN THE USA: A COMPREHENSIVE EMPIRICAL ANALYSIS OF MACROECONOMIC SHIFTS IN THE POST-GLOBALISATION ERA

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ABSTRACT

The Phillips Curve, a fundamental concept in macroeconomics describing the inverse relationship between inflation and unemployment, has undergone significant transformations in the USA, particularly in the post-globalisation era. While existing literature acknowledges the flattening of the Phillips Curve, no single study has comprehensively examined all major contributing factors within a unified empirical framework. This research fills that gap by employing a multiple regression model over two distinct periods— 1970–1990 (pre-globalisation) and 1990–2021 (post-globalisation) —to assess structural changes in the inflation-unemployment relationship. The findings provide robust empirical evidence of a statistically significant flattening trend ($p\text{-value} < 5\%$), indicating that inflation has become increasingly unresponsive to changes in unemployment. In contrast to earlier research centred on specific determinants, this research brings together important macroeconomic forces— globalisation, changes in monetary policy, anchored inflation expectations, wage rigidity, and changing labour market structures —to provide a comprehensive understanding of the Phillips Curve's evolution. The significance of this study lies in its policy implications: as the Phillips Curve flattens, traditional demand-side policies become less effective in controlling inflation and unemployment simultaneously, necessitating a re-evaluation of the Federal Reserve's monetary policy strategy. By integrating piecemeal analyses into one single, systematic econometric research, this study not only contributes to the academic literature but also offers a platform for further research into post-globalisation inflation trends in developed economies.

JEL CLASSIFICATION CODES:

E31, E24, E52, F41, O11

KEYWORDS:

Phillips Curve, inflation-unemployment trade-off, macroeconomic policy, globalization and wage dynamics, labour market rigidities, monetary policy shifts, inflation targeting, expectations-augmented Phillips Curve, non-linearity in inflation dynamics, multiple regression analysis, structural economic shifts, Federal Reserve policy, wage stagnation, trade openness, empirical macroeconomics, post-globalisation economic trends.

INTRODUCTION

The Phillips Curve, one of the most fundamental concepts in macroeconomics, describes the inverse relationship between inflation and unemployment, serving as a cornerstone for monetary policy formulation. Traditionally, this trade-off guided the economic priorities of central banks, such as the Federal Reserve, as they sought to balance price stability with employment growth. However, in recent decades, empirical evidence suggests that the Phillips Curve in the USA has flattened, raising questions about its continued applicability and the effectiveness of traditional macroeconomic tools. While existing literature has explored the weakening inflation-unemployment relationship, these studies often focus on isolated factors rather than providing a comprehensive empirical assessment of all contributing variables. This research seeks to fill this gap by addressing the primary research question: Has the Phillips Curve in the USA flattened in the post-globalisation era, and if so, what macroeconomic forces have driven this transformation?

This research analyses the history of the Phillips Curve by segmenting the period into two phases: 1970–1990 (pre-globalisation) and 1990–2021 (post-globalisation). This segmentation is motivated by profound structural changes in the US economy. The 1990s were a time of increased global trade integration as a consequence of arrangements like NAFTA (1994) and the inauguration of the WTO (1995), which transformed labour market competitiveness and price-setting frameworks. Moreover, falling rates of unionisation, offshoring, and the creation of global supply chains severely undercut domestic wage pressures. At the same time, the Federal Reserve's implementation of inflation-targeting strategies during Alan Greenspan's 1987–2006 chairmanship greatly facilitated anchoring expectations of inflation and further helped flatten the Phillips Curve. Against these core changes, the post-1990 period provides a best-selling case study on which to gauge whether globalisation, monetary policy evolution, and changes in the labour market structure have irreversibly changed inflation-unemployment dynamics. Using a multiple regression model, this paper offers a statistically sound analysis of the shifting dynamics of the Phillips Curve in the USA, revealing the degree to which inflation has decoupled from unemployment movement across time. This study moves beyond the conventional focus on short-term trade-offs by examining the structural determinants of inflation dynamics in an increasingly interconnected economy. The findings not only inform contemporary debates on the declining efficacy of traditional demand-management policies but also highlight the need for a reassessment of monetary policy frameworks in an era where inflationary pressures may be driven by factors beyond domestic employment conditions.

LITERATURE REVIEW

This paper starts with the theoretical development of the Phillips curve from the original Phillips curve to the hybrid New Keynesian Phillips curve. This theoretical influence is based on the work of *Szabolcs Szentmihályi and Balázs Világi (2015)*, which started the journey in the development of the Phillips curve from *A.W. Phillips (1958)*, then the long-run critique of the original Phillips curve by *Friedman (1968)* and *Phelps (1968)*. The theory of rational expectation by *Lucas (1973)* introduced the short-run ineffectiveness of monetary policy, which was further challenged by *Fischer (1977)* and *Taylor (1980)*. Then we used the model of *Calvo (1983)* to derive the equation of the new Keynesian Phillips curve, but the problem with this equation was that it did not contain any backward-looking inflation term. *Smets and Wouters (2003)* solved this problem by introducing the hybrid New Keynesian Phillips curve, which we have used in this paper to show the reasons for the flattening of the Phillips curve in the USA. The next section of the paper uses time series data on inflation and unemployment to show the changes in the shape of the curve by using the models described in the previous section. Thereafter, we have factored in the reasons for the flattening of the curve. The first reason is the exposure to globalisation in 1991, based on the work of *Rohit Azad and Anupam Das (2015)*. Other reasons are the weakening of bargaining power (*Lombardi et al., 2020*), anchored expectations (*Coibion and Gorodnichenko, 2015; Bernanke, 2007*), supply shocks, and wage rigidities (*Albuquerque and Baumann, 2017*). This paper also examines the structural and macroeconomic shifts contributing to the flattening of the Phillips Curve in the USA, drawing from *Gagnon and Collins (2019)* to analyse the role of low inflation environments and policy credibility in muting inflation's response to economic slack.

Additionally, it incorporates insights from the Federal Reserve's monetary policy reports and empirical findings from the Bureau of Labor Statistics (BLS) to assess how labour market dynamics, wage stagnation, and inflation expectation anchoring have influenced inflation-unemployment trends over the past three decades. The study further evaluates post-globalisation shifts in employment structures, trade openness, and sectoral wage rigidity to present a holistic view of the Phillips Curve's transformation in the USA. The paper ultimately concludes by emphasising the relevance of studying the Phillips Curve's slope for contemporary macroeconomic policymaking, particularly in the context of monetary policy effectiveness and labour market adjustments (Szabolcs Szentmihályi and Balázs Világi, 2015; Rohit Azad and Anupam Das, 2015).

METHODOLOGY AND DATA

To empirically assess the evolution of the Phillips curve in the USA context, we estimate multiple linear regression models for two distinct periods using *inflation as the dependent variable* and a set of macroeconomic determinants, including *unemployment, trade openness, crude oil prices, and interest rates*. A comparative analysis of the unemployment coefficients across these periods reveals important structural insights. We have also given the reasons for choosing these variables.

After deriving the regression equations for both periods, we will check the slope of the equations, which is the coefficient of unemployment, and calculate the extent to which the slope has changed with the help of hypothesis testing to check whether the slope change is statistically significant.

The dataset on inflation and unemployment is based on the reports of the International Monetary Fund (IMF) and International Financial Statistics (IFS), while the dataset on unemployment is based on ILOEST (International Labour Organisation Modelled Estimates and Projections Databases). The dataset of trade proportions as a percentage of the USA's GDP is based on the data files of World Bank and OECD data accounts. The dataset on international crude oil prices has been taken from the macrotrends. All the datasets are time series data, primarily from 1970 to 2021.

THEORETICAL INFLUENCES

7.1 The Idea of the Phillips Curve

The idea of the Phillips Curve was first introduced by New Zealand-British economist at the London School of Economics. He found an inverse relation between the unemployment rate and inflation in the UK between 1861 and 1957, and the following equation was devised:

$$\pi_t = (\mu + z) - \alpha u_t \quad (1)$$

where π_t is the rate of inflation at time t , μ is the markup that firms charge over their cost, z is the catchall variable that positively affects the wage rate, α is the slope of regression, and u_t is the rate of unemployment at time t . He found an inverse relation between the unemployment rate and change in the money wage rate, i.e., if the government tries to reduce inflation by contractionary monetary and fiscal policy, then it has to face a period of excess unemployment. The original Phillips curve suggests that the government can reach any level of inflation by adjusting fiscal policies. However, as inflation became persistent, people started noticing last year's inflation before putting their expectations of prices in place. Hence, a new form of equation was derived based on the previous year's inflation.

$$\pi_t = \theta \pi_{t-1} + (\mu + z) - \alpha u_t \quad (2)$$

Here, the θ parameter shows how much proportion of last year's inflation people are expecting to continue this year also. Initially, when inflation fluctuates between positive and negative numbers, the expected value is zero, hence $\theta = 0$. But when inflation becomes persistent, the value of θ lies between 0 and 1.

7.2 Classical Criticism

Milton Friedman (1968) and Edmund Phelps (1968) criticised the theoretical approach of the Phillips curve, which states that the government can reach any level of employment by increasing inflation. They argued that the government can do so because workers are underestimating inflation in their expectations and thus overestimating real wages. This means that inflation grows faster than nominal wages; therefore, firms will produce more output by doing additional work for their workers because the cost of production, which is the wages they pay to the workers, is less than the price of the product. Hence, monetary policy is effective in the short run. But gradually workers will increase their expectations and nominal wages will increase, and hence real output returns to its original position. This level of unemployment is called the natural level of unemployment (also called NAIRU—Non-Accelerating Inflation Rate of Unemployment). Therefore, monetary policy is ineffective in the long run. Now, the Phillips curve becomes the relation between the change in inflation and the difference between the current rate of unemployment and the NAIRU (u_n).

$$\pi_t - \pi_{t-1} = -\alpha(u_t - u_n) \quad (3)$$

However, Robert E. Lucas (1968) argued that monetary policy is ineffective in the short run. He argued that if workers form their expectations based on rational expectations, then they can reach the same level of nominal wage as the change in inflation; thus, real wages will not change in the short run either because expected prices are equal to the actual prices and the economy will stay at the original level of output. Thus, it is impossible to deviate from NAIRU even in the short run, and therefore the monetary policy is ineffective. This leads to the neoclassical Phillips curve:

$$\pi_t = \pi_t^e + \beta y_t + \varepsilon_t \quad (4)$$

where π_t is the inflation at time t , π_t^e is the expected inflation, y_t is the output gap from the natural level, and ε_t is the random error. He argued that only random components that are independent of monetary policy can deviate the economy from its natural level.

7.3 The New Keynesian Phillips Curve

The theory of rational expectation is valid only when prices and wages are fully flexible, but if they are sticky, then they will not change even if demand or supply changes, and hence the economy will deviate from its natural position, which implies that monetary policy will be effective in the short run. Calvo (1983) used the same logic to prepare a model that became the basis of the new Keynesian Phillips curve, which has the following form:

$$\pi_t = \beta \pi_{t+1}^e + \frac{(1-\gamma)(1-\gamma\beta)}{\gamma(1+\beta\gamma)} \omega [\kappa(1-\alpha)y_t + \alpha p_t^m] + \varepsilon_t \quad (5)$$

Here, β is the discounting factor used to calculate the present value of the future cost of a firm so that it can calculate the total cost of a unit of production for the period for which prices are going to be fixed before setting its optimal price, and $0 < \beta < 1$. γ is the probability that the prices are going to be fixed for a given period. ω is the degree of strategic complementarity—a positive parameter that shows the extent to which the optimal price of a firm depends on the aggregate variable and to what extent on the competitors' price, and $0 < \gamma < 1$. If the optimal price depends primarily on the aggregate variables, then the value ω is large. κ is a positive parameter that relates real marginal cost with the output gap, and it depends on the preferences of the representative household and the wage elasticity of labour supply. α is the proportion of inputs imported for the other economy, and $0 < \alpha < 1$.

Here, the output gap depends on the difference between current inflation (π_t) and expected future inflation (π_{t+1}^e), and this may be different in the short run even with rational expectations; therefore, this suggests that monetary policy is effective in the short run even with rational expectations. But in the long run, the effect of inflation on real output is neutral as both π_t^e and π_{t+1}^e converge to the same value, hence the long-run Phillips curve is vertical. But this Phillips curve is a problem in that it does not take into account the backwards-looking inflation term (π_{t-1}), and if the previous inflation has a pattern, it might not take into account the pattern. This problem was solved by the hybrid new Keynesian Phillips curve in Smets and Wouters (2003). In the earlier model of Calvo, the firm can either change its price to the new optimal level or leave it unchanged, but here Smets and Wouters argued that a firm can either choose the optimal point, but determining that cost could be costly so it can index the new price with the help of adaptive expectation.

$$\pi_t = \frac{\beta}{1+\beta} \pi_{t+1}^e + \frac{v}{1+\beta v} \pi_{t-1} + \frac{(1-\gamma)(1-\gamma\beta)}{\gamma(1+\beta v)} \omega [\kappa(1-\alpha)y_t + \alpha p_t^m] + \varepsilon_t \quad (6)$$

Here, v is the degree of indexation and the stickiness of prices, $0 < v < 1$. This equation gives the theoretical reason for the flattening of the Phillips curve after globalisation. With the advent of globalisation, the proportion of imported input increases as firms are now able to find cheap and better quality products from different economies, and hence α , which is the proportion of import, increases and will reduce the coefficient of Y_t which is the slope of the Phillips curve and hence flatten the curve. Similarly, due to the opening up of the economy, consumers now have more options to purchase their food from, either from the domestic market or from abroad, which has increased the competition among the firms. Now, firms have to focus more on their competitors' prices, which is examined in Sbordone (2007) [30], in deciding the optimal price of their product as compared to aggregate factors; therefore, the value ω falls and thus leads to a flatter curve.

Apart from globalisation, another reason for the flattening of the curve is anchored expectations, which we will see in more detail further in the paper. Theoretically, if expectations are anchored due to credible monetary policy, then prices will be relatively stable as workers will not change their expectations frequently, which means that there is a stable and predictable price in the economy. Therefore, it is not important to index prices to past inflation; therefore, v will be smaller, and hence the curve will be flatter. Now we will see some of the empirical evidence to show the change in the slope of the Phillips curve in the USA after 1990.

EMPIRICAL EVIDENCE

To empirically assess the evolution of the Phillips curve in the USA context, we estimate linear regression models for two distinct periods using inflation as the dependent variable and a set of macroeconomic determinants, including unemployment, trade openness, crude oil prices, and interest rates. A comparative analysis of the unemployment coefficients across these periods reveals important structural insights.

In the first period (1970-1990), the regression equation is:

$$\pi_t = 7.040741 - 0.94227 * U_t + 0.02149 * T_t + 0.09982 * O_t - 0.51631 * I_t$$

Where; π_t : Inflation

U_t : Unemployment

T_t : Trade to GDP ratio

O_t : Oil prices

I_t : Real Interest Rate

The summary of the regression is as follows:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	7.40740558	3.53185264	2.09731445	0.05220761
U	-0.94227325	0.33663889	-2.79906241	0.01286623
X	0.02149237	0.21533474	0.09980911	0.92173577
O	0.09981989	0.01785298	5.59121767	4.0558E-05
I	-0.51631171	0.17061577	-3.02616645	0.0080288

Residual standard error: 1.722 on 16 degrees of freedom
Multiple R-squared: 0.7565 , Adjusted R-squared: 0.6956
F-statistic: 12.43 on 4 and 16 DF, p-value: 8.714e-05

Here, the coefficient on unemployment is -0.94227 , statistically significant at the 5% level ($p = 0.01287$), indicating a strong negative relationship between unemployment and inflation, consistent with the traditional Phillips curve hypothesis.

In contrast, for the post-1990 period, the estimated model is:

$$\pi_t = 6.96591 - 0.25295 * U_t - 0.14825 * T_t + 0.01125 * O_t - 0.04881 * I_t$$

The summary of the regression is as follows:

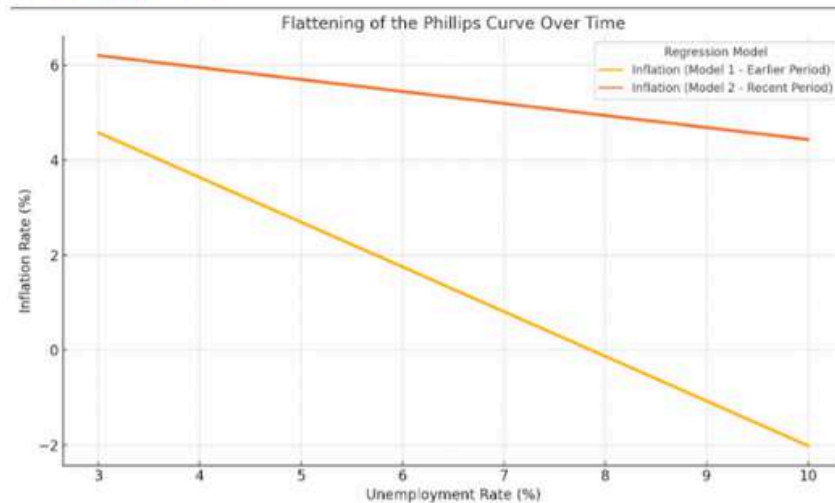
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	6.96590554	2.86599769	2.43053425	0.02228071
U	-0.25295308	0.15686228	-1.61258064	0.11890951
X	-0.14824542	0.10502234	-1.41156082	0.16993527
O	0.01125429	0.01019626	1.10376628	0.27980574
I	-0.04881072	0.1225251	-0.39837324	0.69360772

Residual standard error: **1.09** on 26 degrees of freedom

Multiple R-squared: **0.1215**, Adjusted R-squared: **-0.01363**

F-statistic: 0.8991 on 4 and 26 DF, p-value: **0.4787**

The unemployment coefficient, while still negative, is reduced in magnitude to -0.25295 , and is no longer statistically significant ($p = 0.1189$). This suggests a weakening of the inverse relationship between inflation and unemployment in the more recent period.



There is a decline of 73.16% in the slope of the curve. To statistically validate the reduction in slope, we perform a z-test comparing the absolute values of the unemployment coefficients across the two periods. The test yields a z-score of 1.856 and a one-tailed p-value of 0.0317, allowing us to reject the null hypothesis at the 5% level. This provides statistically significant evidence of a flattening Phillips curve.

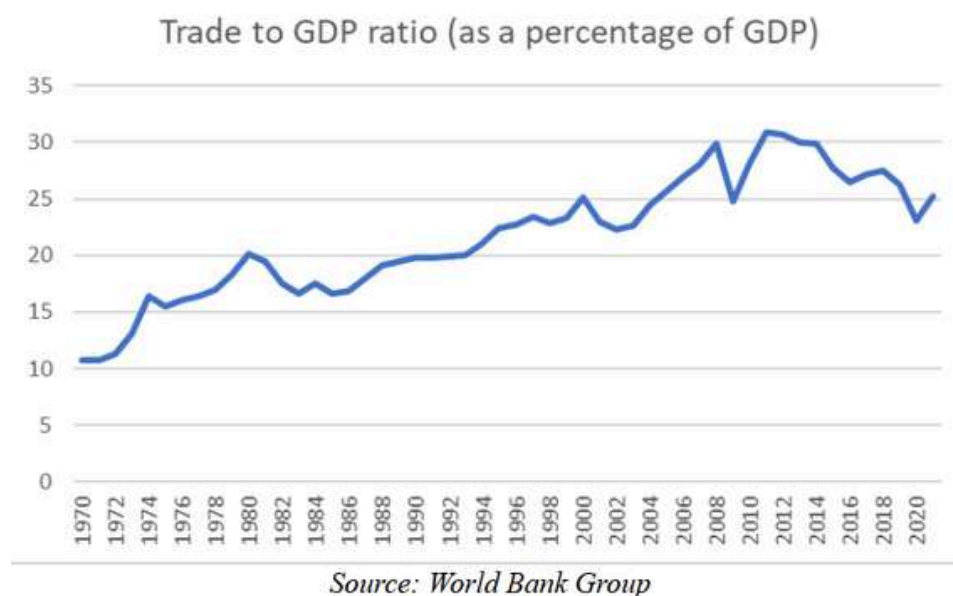
Comparison	1970-1990 vs 1991-2021
Slope 1970-90.	-0.94227325
Slope 1991-21.	-0.25295308
Z-score	1.856
P.Value	0.031
Conclusion	The slope has significantly decreased

(At a significance level of 5%)

FACTORS INFLUENCING THE FLATTENING OF THE PHILLIPS CURVE

9.1 Globalisation

The advent of globalisation changed the relationship between wage rate and unemployment dramatically (Rohit Azad and Anupam Das, 2015). With the opening up of the economy, companies no longer depend upon domestic labour for their production process; rather, they can now import cheaper and better quality goods and services from other countries. With access to the international labour market, they outsource their production activity to a country where they can find a cheaper labour market. This reduction in reliance on domestic labour weakens the bargaining power of the workers because now they have to keep in mind the wages in the foreign market. If they ask for higher wages, firms will move towards cheaper labour abroad. Hence, they cannot negotiate in the same way as they were able to do when the economy was closed. Now they have to accept some lower wages because if they don't, then they might lose their jobs as firms will have cheaper labour availability abroad. Similarly, the unionisation of workers is also weakened by globalisation. Workers also have more job opportunities abroad, so they can now shift to other countries where they can find higher wages, thus reducing the power of workers' unions in the domestic country. Therefore, with globalisation, the collective bargaining power of the workers has weakened, and hence they cannot negotiate with firms for higher wages. So even if there is a situation of lower unemployment, inflation would not rise so much because workers cannot ask for higher wages, thus prices will not increase much. Unlike in the earlier case, when there was a situation of lower unemployment, the bargaining power of workers was higher so that they could ask for higher wages because if firms did not accept their request, they would move to the other firms. Therefore, the weakening of bargaining power (Lombardi et al., 2020) is one of the most important reasons for the flattening of the Phillips curve because, as we saw earlier, the change in unemployment will now have a smaller impact on inflation. After all, wages cannot change accordingly, so the curve becomes flatter.

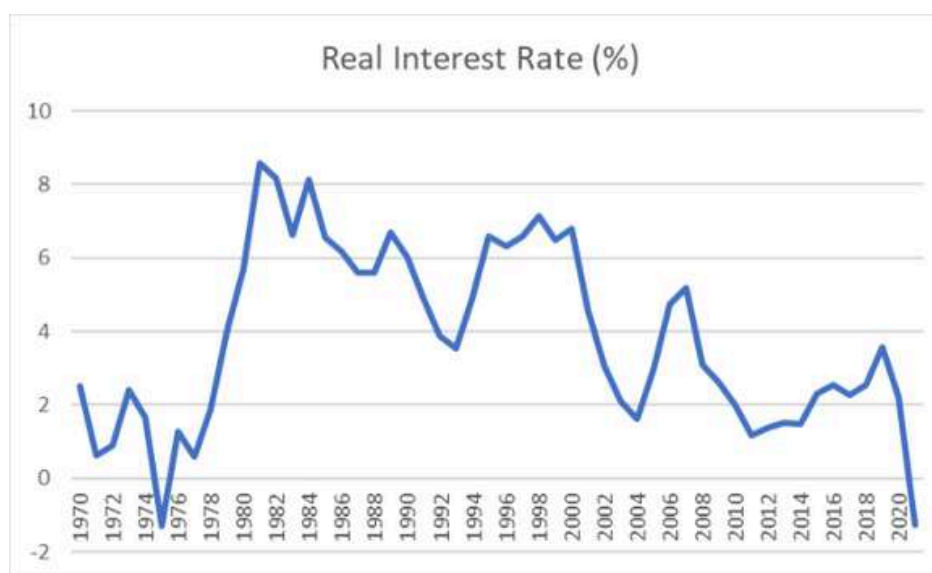


To show the impact of globalisation, we used the trade-to-GDP ratio as an independent variable in our model because, as the economy becomes more integrated with the other economies, it changes, showing the impact of globalisation. Hence, it is a good variable to show the extent of globalisation. Also from the graph of trade, we can see that there is a growing trend in trade from 1991 onwards. The proportion of trade in GDP has risen from 10.75 % in 1970 to 25.25% in 2021, and hence the slope has fallen by 73.16 %, i.e., from 0.942 to 0.252 (in absolute terms).

9.2 Anchored Expectations

The second reason for the flattening of the slope is anchored expectations (Coibion and Gorodnichenko, 2015; Bernanke, 2007). When the public trusts the central bank to stabilise inflation, they modify their behaviour appropriately. This may be done if workers expect inflation at around 4% (RBI's target) and demand only a little above this as a wage increase, or if businesses' prices assume the same inflation target. This stability "anchors" inflation expectations; that is, inflation doesn't fluctuate wildly even when unemployment changes.

With anchored expectations, even if unemployment falls, firms and workers do not overreact by driving the prices or wages sharply upward, leaving the Phillips curve less steep. With a less steep curve, inflation is less volatile since people anticipate that the central bank will intervene if it becomes too far away.



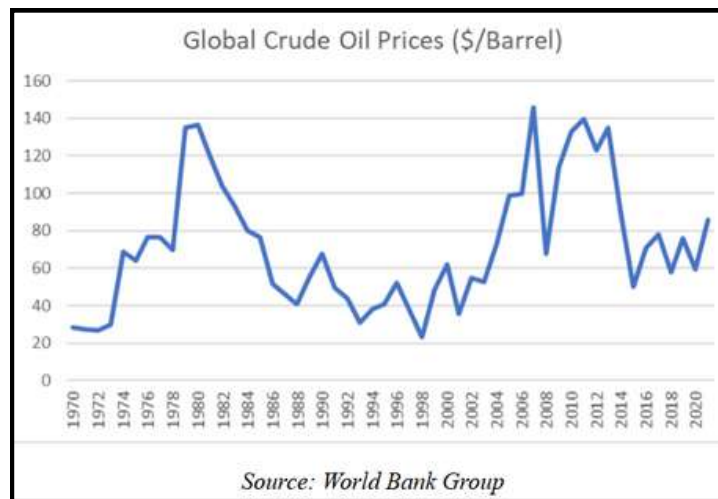
Source: World Bank Group

9.3 Supply Shock

A supply shock is when there is an unexpected change in the availability or cost of goods and services that will influence inflation by a considerable degree. Shocks can either be negative (cost-push), for example, in terms of increasing oil prices, poor harvests, or disruption in supply chains, or positive (cost-reducing), for instance, due to technological advancement or lowering global commodity prices, which reduce costs.

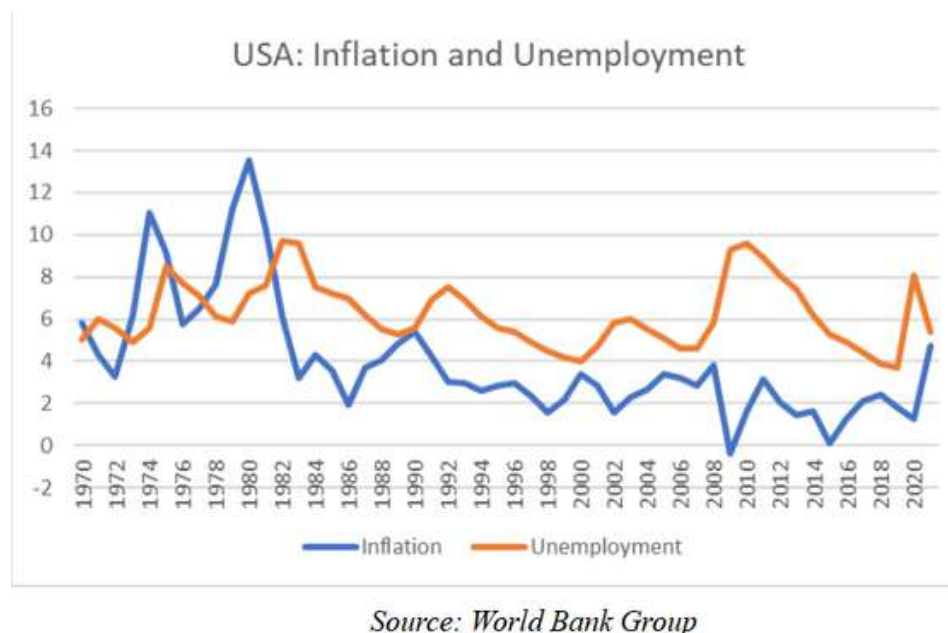
Traditionally, the Phillips Curve assumes that inflation depends primarily on demand-side factors (like unemployment). However, supply-side shocks break this link because they raise inflation independent of unemployment (*Albuquerque and Baumann, 2017*). That is because inflation is now less responsive to demand. When demand remains the same or when unemployment increases, supply shocks such as oil price increases could raise inflation further. As such, it drives inflation away from its conventional connection with unemployment. If the shocks are supply shocks, such as food price volatility in the USA, inflation becomes more erratic and less responsive to unemployment levels. People and firms begin to pay more attention to these shocks than to the demand pressures. This tends to flatten the Phillips curve in response to changes in external inflation expectations.

These supply-driven price changes are independent of demand or unemployment levels. This decoupling of inflation from unemployment has, over time, flattened the Phillips curve, as inflation becomes more influenced by external shocks than by the domestic labour market. To measure the impact of a supply shock, we have taken an example of the prices of crude oil.



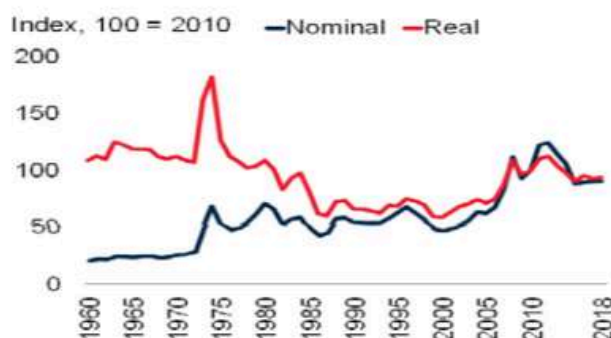
9.4 Non-Linearities

Traditionally, the curve depicted a linear relationship between unemployment and inflation. However, the relationship in practice is non-linear. It is found that in extreme cases, the Phillips curve does not perform as usual (Gagnon and Collins, 2019).

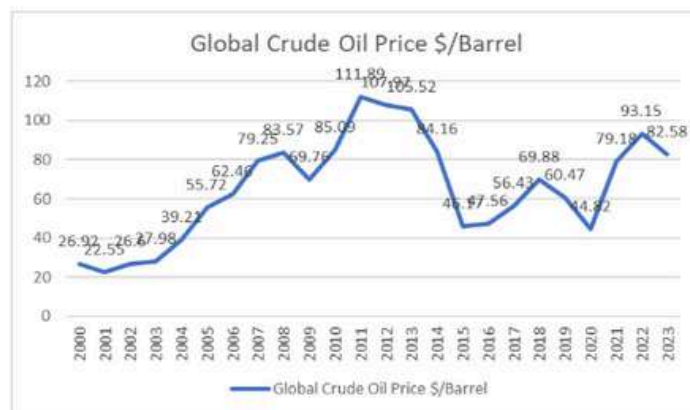


As mentioned above, in extreme cases, the Phillips curve fails to perform the inverse relation between inflation and unemployment; rather, it might be the situation that both inflation and unemployment rise at the same time. For example, during the financial crisis of 2008–09, both inflation and unemployment were rising. Here, we will try to give some arguments for the upward-sloping Phillips curve. We will divide the reasons for high inflationary pressure into two parts: supply-side inflation and policy-induced inflation.

Supply-side inflation was the cost-push inflation where overall prices rose due to an increase in the cost of production. In this period, there were two factors responsible for this cost-push inflation: the Food Price Shock and the Global Oil Price Surge. In the early 2000s, the world economy was facing a period of substantial fluctuation in global food prices, which is evident from the Food Price Index of FOA (Food and Agriculture Organisation), which indicates that the value of the index increased from 91.1 in 2000 to 229.9 in 2011. At the same time, the world was also facing a period of Global Oil Price surge. According to a report by the ADB Institute, global oil prices rose from \$30/barrel in the early 2000s to \$100/barrel by 2008. Both of these factors resulted in a huge hike in inflationary pressure in the USA.

A. Global food prices, annual

Source: ADB Institute



Source: World Bank

At the same time, there was also a growing unemployment rate in the same period. Due to the financial crisis of 2008–09, there was a global economic slowdown throughout the world. Although the USA was not much affected by the economic slowdown, there was a decline in export demand, a reversal of capital flows, and a deceleration of GDP growth. Similarly, the Eurozone crisis between 2011–2015 and China's economic slowdown at the same time weakened global demand, affecting export-driven industries and resulting in an increase in the unemployment rate. Hence, we can see that both inflation and unemployment were rising, creating an upward-sloping Phillips curve in the same period.

9.5 Wage Rigidity

The Phillips curve, at low unemployment levels, tends to be steeper, and at higher levels of unemployment, flatter. This results from a basic scarcity of resources at low unemployment, especially of labour. Competing with firms to attract such workers leads them to hike wages quite sharply, leaving the curve rather steeper than it might be otherwise. On the other hand, at higher levels of unemployment, several reasons cause the curve to become relatively flatter. These include the minimum wage laws, labour union regulations, and the efforts of firms to maintain employee morale. This occurs because of the concept of wage rigidity. It is the resistance of wages to vary freely according to prevailing economic conditions. Wage rigidity is most commonly visible as downward wage rigidity, in which wages do not adjust downwards even in situations of high unemployment. These factors give the fundamental explanation for the flattening of the Phillips curve. These factors prevent wages from falling sharply even as the rate of unemployment increases. Thus, at a higher level of unemployment, the rise in wages is limited, and hence, there is this flatter Phillips curve (*Albuquerque and Baumann, 2017*). This is a very important part of the non-linear relationship between unemployment and inflation. For the USA, in particular, the flattening of the Phillips curve has intensified in recent times.

The widening participation in the formal sector is the major aspect contributing to this trend. Long-term contracts, labour laws, union activities, and firm concerns about maintaining morale amongst workers characterise the formal sector. Such features create downward wage rigidity. Thus, even in the organised sector, which otherwise displays high levels of unemployment, an increase in the former does not translate to a sharp reduction in the level of inflation and hence further explains the flat Phillips curve. Within the informal sector, traditionally noted for wage flexibility, there is also increasing rigidity on the part of wages. And this in turn reinforces the flakiness of the relationship between unemployment and inflation.

Another contributing factor is structural unemployment, which remains an important issue in the USA. Structural unemployment, particularly among unskilled labourers and those migrating from rural areas, prevents many workers from demanding higher wages even at lower unemployment levels. For instance, unskilled labourers often remain in low-paying jobs, unable to negotiate better wages regardless of economic conditions.

POLICY IMPLICATIONS

The reason for studying the degree of the slope of the Phillips curve and the size of its coefficients is that it has very important economic policy implications (*Szabolcs Szentmihályi and Balázs Világi, 2015; Rohit Azad and Anupam Das, 2015*). For instance, suppose the economy of the USA is facing a situation with a low inflation environment and the USA faces a flat Phillips curve. Then, due to the small coefficient of its slope, a given increase in output growth or consequently a fall in the rate of unemployment will have a very small increase in the rate of inflation in the economy. Thus, the government can stimulate economic growth while inducing negligible additional inflation. In contrast, if the economy is hit by a negative shock, that is, an economic slowdown, it does not lead to a deflationary spiral. Similarly, if there were a high inflation environment with a flat Phillips curve, the government's desire to cut inflation would not be able to succeed in reducing inflation expectations; rather, it would lead to a major reduction in real economic activity, that is, the sacrifice ratio of disinflation is very high. Therefore, policymakers need to know the shape and the slope of the Phillips curve for better decision-making.

CONCLUSION

This paper provides a comprehensive empirical assessment of the flattening of the Phillips Curve in the USA, revealing a statistically significant decline in the inflation-unemployment trade-off over the past three decades. By analysing two distinct periods—1970–1990 and 1990–2021—our findings confirm that inflation has become increasingly unresponsive to changes in unemployment, fundamentally altering the traditional macroeconomic framework. The study identifies globalisation, declining worker bargaining power, anchored inflation expectations, supply-side shocks, and monetary policy shifts as key drivers behind this transformation. Unlike previous research, which often examines these factors in isolation, this paper integrates them into a unified econometric framework, providing a holistic perspective on the Phillips Curve's evolution in a post-globalisation world.

The implications of these results are significant. The erosion of the inflation-unemployment trade-off has implications that argue that traditional demand-side policies need not be so effective in regulating inflation and employment at the same time. Monetary policymakers will increasingly have to review the role played by interest rate changes and inflation targeting in keeping prices stable while not disproportionately affecting employment levels as economic structures shape up globally. In addition, the research highlights the necessity of addressing labour market policies in a more sophisticated manner by acknowledging that structural wage rigidities, automation, and sectoral employment shifts might necessitate policy interventions beyond macroeconomic models.

Although this work offers important perspectives, it also leaves room for further research. Subsequent works could investigate how technological progress, demographic developments, and financial market evolution influence inflation dynamics. As economies continue to integrate, the question remains: Has the Phillips Curve permanently flattened, or are we merely witnessing a transitional phase in macroeconomic policymaking? The answer to this will define the trajectory of economic strategy in the decades to come. If the Phillips Curve has indeed flattened for good, then economic theory must adapt, and so must the policies that shape the global economy.

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BOOK REVIEWS

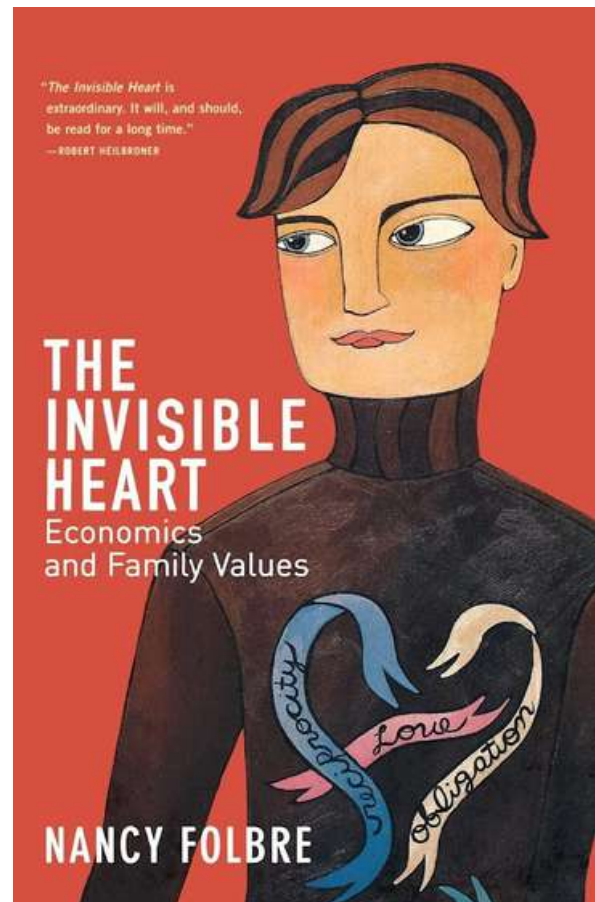
THE INVISIBLE HEART – ECONOMICS AND FAMILY VALUES

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The Invisible Heart (2001), authored by feminist economist Nancy Folbre, is a book that offers fresh perspectives on old ideas. Most economics students are familiar with the 'Invisible Hand'- the notion that competitive markets are the most effective way to organise an economy. However, these structures would be unsustainable without the caregivers and nurturers of the families and communities behind the scenes. These unsung heroes comprise the 'Invisible Heart' - a force largely ignored by the dismal science. By comparing government administration to the decisions made while running a family, the author makes a strong case for why we need to start taking the 'Care Economy' seriously. The conversational writing style, personal anecdotes, and witty humour will keep even casual readers invested from start to finish.

A major takeaway was that problems in the economy are seldom as straightforward as our textbooks may suggest. Fascinating examples are provided throughout the book.

Notably, there is the paradox of women's role in the economy. Not too long ago, the patriarchy enforced a strict dichotomy between the breadwinner and the caregiver - a stifling arrangement for women, who were expected to be 'inherently' altruistic.

But now, women have more career options, and the opportunity cost of staying home is higher. They are likely to enter the workforce, especially with government support. However, society failed to encourage men to enter traditionally female occupations like caregiving due to the threat of low status and pay. While dual-income couples might be great for the GDP, they also make child-rearing more expensive. Fertility rates decline, and senior citizens are left without next of kin to provide for them. America introduced systems like Social Security to combat this, but once again, flawed provisions like spousal benefits ended up discouraging married women from paid employment.

Another case is that of capitalism and climate change. Corporations' eagerness to cut corners often causes disasters like oil spills. When this happens, the expenditure on cleaning positively affects the GDP. Aquatic life that perishes "has no 'value' to be subtracted from accounts". Even when the government does try to intervene, results can backfire. Hoping to encourage regulation in fishing practices, America once banned tuna-fish imports from Mexico. However, they soon had to backtrack since the WTO laws interpreted the move as "enforcing domestic laws on a foreign country". Put simply, such problems can get complicated.

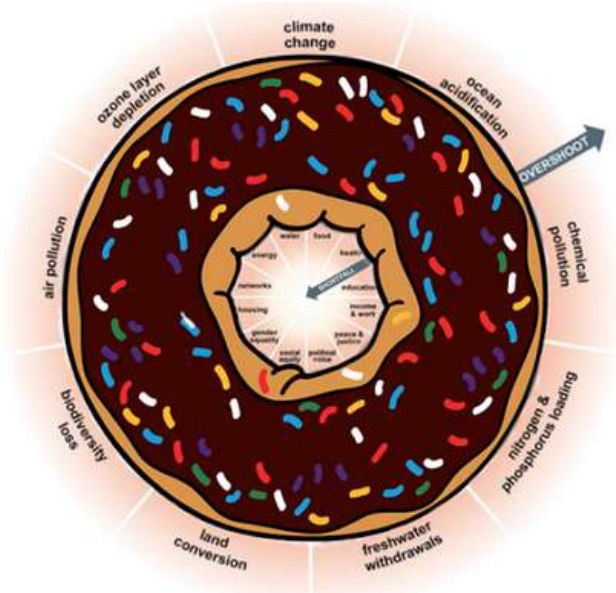
Folbre acknowledges that there are no clear-cut answers to many of these questions, but maintains that we must continue asking them. Economists' blind faith in market forces often undermines basic human tendency towards empathy. She urges both men and women to defend the family values of obligation and reciprocity against the mindless pursuit of self-interest. Broader definitions of ideas like 'standard of living' are necessary for a holistic understanding of growth. Most importantly, we need to improve the ways in which our society rewards the work of care. Overall, 'The Invisible Heart' is a thought-provoking read that challenges its readers to think beyond conventional interpretations of economics.

A SWEET REVOLUTION- A BOOK REVIEW ON “DOUGHNUT ECONOMICS: SEVEN WAYS TO THINK LIKE A 21ST-CENTURY ECONOMIST”

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Imagine if your economics textbook was thrown into a blender with a coloring book and a revolutionary TED Talk. The result? Doughnut Economics, this audacious, brain-tingling book by Kate Raworth doesn't just critique traditional economic thinking but drags it out of its neoclassical cave while forcing it to face the modern climate crisis, social justice, and the messy reality of human existence.

The core idea is deliciously simple: Instead of obsessing over endless GDP growth, the aim should be a “doughnut”—a balanced space where everyone has enough resources to thrive without trashing the planet. The “hole” represents deprivation, such as poverty and lack of healthcare, while the “outer crust” represents ecological overshoots, like climate breakdown, deforestation, and pollution. The goal? Stay in the sweet, sustainable zone between the two.



Source: “Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist” by Kate Raworth.

Raworth doesn't just poke holes in classical economic theory and calls out the dangerous myths we've been fed for centuries, like the rational, self-interested human consumer (spoiler: humans are irrational and emotional beings who don't always choose to be rational consumers) and the obsession with supply-demand curves (every economics student has dealt with this obsession firsthand).

Her arguments are visual- including diagrams, metaphors, and storytelling that make you feel economics in a way that no dry academic paper ever could. You'll start seeing doughnuts everywhere. Your morning bagel? Economic metaphor. That roundabout near your house? Economic metaphor. The moon? Probably an economic metaphor.

This book might not get a seat at the table of old-school economics books. It challenges the very foundations of the discipline, advocating for a shift from mechanical, growth-obsessed models to something living, dynamic, and regenerative. The book isn't just a critique; it's an alarm, a guidebook for reimagining economics and its study.

This book is a perfect read for someone who has ever felt that traditional economics is detached from reality. If you're passionate about climate justice, inequality, or sustainability, or If you just love books that make you question everything, this should be next on your TBR.

Reading Doughnut Economics is like getting hit by a wave of realization: Oh. So we've been doing it all wrong. It's radical yet practical. Will it solve everything overnight? No. But it plants ideas that, once thought of, are hard to unsee. So, is the future doughnut-shaped? Maybe, maybe not. But one thing's certain, the reader can't look at economics the same way again.



INTERVIEWS

INTERVIEW WITH DR. BORNALI BHANDARI

Dr. Bornali Bhandari is a Senior Fellow at the National Council of Applied Economic Research (NCAER), where she leads research on labor markets, macroeconomic policy, and regional development. With over two decades of experience in evidence-based policy research, she has contributed extensively to shaping discourse on employment, skilling, infrastructure, and the evolving platform economy in India. Known for her analytical depth and clarity, Dr. Bhandari frequently engages with academia, government, and civil society to drive inclusive and sustainable economic development.

Question 1: NCAER has done an analysis on the socio-economic conditions of food delivery platform workers. As more and more such platforms emerge and their demand increases, will the conditions of these workers get better in the long run?

Answer:

The rise of food delivery platforms has undoubtedly opened new avenues for informal employment in India. These jobs have low entry barriers—often requiring just a smartphone, a two-wheeler, and basic navigation skills—which has made them attractive for a wide range of workers, especially those seeking flexible or supplementary income. However, the situation on the ground reveals a more nuanced reality. While these jobs are accessible, they are also marked by high attrition rates, with workers typically staying no more than 12 to 14 months. The nature of the work is not inherently aspirational for most; instead, it serves as a stop-gap arrangement. Although the platforms promise flexibility and autonomy, research has shown that algorithmic control often limits real freedom in work hours and decision-making. Earnings, too, can be inconsistent, and full-time delivery workers frequently report incomes that fall short of supporting long-term financial security. Given these challenges, improving their conditions in the long run requires a serious policy push. Social security, including health insurance and pension coverage, is vital, particularly as these workers spend extended hours on the road and remain outside traditional labor protections. The government's recent initiatives, such as extending the Ayushman Bharat scheme and proposing a contributory pension plan for platform workers, are promising. Yet, for these efforts to truly enhance worker well-being, they must be institutionalized and supported by light-touch yet effective regulations that uphold the rights of gig workers while still enabling platforms to function efficiently. The road ahead is complex, but with collaborative action from governments, platforms, and civil society, the working conditions of platform workers can certainly.

Question 2: In light of U.S. President Donald Trump's reciprocal tariff policies and the resulting global trade turbulence, how will India's imposition of higher tariffs (like a 25% tariff on Venezuelan oil) impact its economic stability? What proactive measures can be taken?

Answer:

Tariff escalations, such as those triggered by the U.S.'s shift toward protectionism under President Trump, have disrupted the global trading landscape in a significant way. When India responds with countermeasures, such as imposing higher tariffs—like the proposed 25% duty on Venezuelan oil—it becomes part of a broader climate of economic uncertainty that can potentially destabilize growth trajectories. At a theoretical level, economic principles like comparative advantage remind us that trade barriers hurt consumers and producers alike, as countries are unable to specialize in sectors where they are most efficient. For instance, when the U.S., which does not produce bananas or coffee, imposes tariffs, it ultimately forces consumers to pay more for goods they cannot produce domestically. This logic applies globally. For India, higher tariffs may temporarily protect domestic industries, but they also raise costs for downstream sectors, reduce export competitiveness, and limit access to critical resources. Over time, these dynamics can dampen investment, slow down growth, and undermine long-term economic stability. Moreover, the erosion of the post-war international trade system means that countries now operate in a far less predictable global economic order. To mitigate these risks, India must prioritize strategic trade partnerships, diversify its supply chains, and strengthen internal production capabilities in sectors with high export potential, such as pharmaceuticals and textiles. Additionally, enhancing domestic logistics and improving ease of doing business can help make Indian exports more competitive without resorting to excessive tariff measures. In essence, while global trade turbulence is unavoidable, India's response must be rooted in foresight, diplomacy, and robust internal reform to safeguard economic resilience.

Question 3: The World Bank reports that India needs to sustain an average growth rate of 7.8% over the next 22 years to achieve high-income status by 2047. What structural reforms are essential to meet this target?

Answer:

Achieving a sustained growth rate of 7.8% until 2047 is an ambitious but feasible goal for India—provided that comprehensive structural reforms are strategically implemented. Four key areas—trade, technology, investment, and human capital—stand at the heart of this transformation. On trade, India must work to increase its low share in global merchandise trade by reducing internal barriers and nurturing sectors where it holds a comparative advantage. In the realm of technology, while the development of digital public infrastructure like Aadhaar and UPI has been commendable, its uptake on the producer side, especially in agriculture and small enterprises, remains limited. Without the foundational digital and financial literacy to utilize these tools, much of the technological potential remains untapped. This links directly to the third pillar: investment in human capital. India's education system must evolve beyond degree-centric models to emphasize cognitive, digital, and communicative competencies. Employers

consistently cite the lack of job-ready graduates as a critical bottleneck. From primary schooling to higher education, the focus must be on quality and functionality. Health, too, is an underappreciated factor in productivity. Malnutrition, stunting, and dual burdens of obesity and hunger continue to plague large sections of the population. Early childhood interventions, improved public health delivery, and greater nutritional security are non-negotiable elements for a healthy, productive workforce. Complementing these are the long-standing but slow-moving reforms in land and labor, where decentralization and state-level implementation are critical. India's startup ecosystem, R&D capacities, and innovation hubs must also be integrated more closely with academia and industry to generate a virtuous cycle of growth. If these interconnected systems align and implementation gaps are bridged, India can realistically aspire to transition into a high-income economy within the next two decades.

Question 4: India's GDP growth is projected at 6.3%–6.8% for FY 2025–26. How should India balance fiscal consolidation with public investment to sustain growth momentum?

Answer:

India's projected GDP growth rate, though respectable, falls short of the 8% threshold required for a transformative leap into high-income status. This brings to the fore the delicate challenge of balancing fiscal consolidation with the need for robust public investment. On one hand, fiscal prudence is essential to maintain macroeconomic stability, especially in the post-pandemic era marked by rising global debt levels and tighter monetary conditions. On the other, public capital expenditure is a critical lever for stimulating economic activity, crowding in private investment, and enhancing long-term productivity. The government must therefore engage in strategic spending—directing resources toward infrastructure, health, education, and green technology—where the returns are maximized both economically and socially. As highlighted in recent commentary by economists like Dr. Mandal, smart fiscal management involves not merely cutting deficits, but reorienting expenditure toward high-multiplier areas. Enhanced efficiency in public procurement, transparency in budgeting, and timely project execution can enable India to get more from every rupee spent. Furthermore, the use of public-private partnerships (PPPs) can help offset fiscal constraints without compromising on development goals. It is also essential to institutionalize fiscal rules that are both flexible and credible, allowing for countercyclical support during slowdowns while adhering to medium-term consolidation targets. Ultimately, India's fiscal strategy should not be a binary choice between austerity and expansion, but a calibrated blend that aligns short-term growth impulses with long-term structural transformation.

Question 5: The Economic Survey 2024–25 highlights a 7.3% growth in Private Final Consumption Expenditure, driven by rural demand. Based on your work on skilling, infrastructure, and district planning, what structural interventions would you prioritize to sustain rural consumption momentum?

Answer:

The resurgence in rural demand, reflected in the rise in Private Final Consumption Expenditure, presents both an opportunity and a responsibility. While favorable monsoons and temporary income support schemes such as PM-Kisan may boost consumption in the short run, sustaining this momentum requires long-term structural planning. First, rural infrastructure must be expanded—not just in terms of roads and connectivity, but also in irrigation systems, warehousing, and digital access. Investing in irrigation, for instance, reduces dependence on erratic monsoons and stabilizes agricultural productivity. Second, we must enhance the ability of farmers and rural workers to adopt and adapt to new technologies. Micro-irrigation systems, solar pumps, and agri-tech tools can be game changers—but only if accompanied by localized training, extension services, and behavioral change programs. Additionally, promoting Farmer Producer Organizations (FPOs) and cooperatives can improve bargaining power, market access, and income security. On the employment side, rural skilling programs should be better aligned with regional needs—focusing on both farm and non-farm sectors. Bridging the gap between rural labor and employment opportunities in platform economies or MSMEs through digital literacy and job-matching platforms is crucial. Equally important is addressing volatility and vulnerability through robust social security systems. Much like platform workers, farmers face unpredictable incomes. To this end, insurance coverage, minimum support prices, and price stabilization funds play a critical cushioning role. Lastly, incentive structures need to be carefully designed to avoid ecological stress—subsidizing groundwater-intensive crops, for example, must be phased out in favor of climate-resilient agriculture. In essence, the goal is to build a rural economy that is not only productive and connected but also resilient and inclusive—capable of sustaining its own growth cycle even in the face of external shocks.

INTERVIEW WITH MS. MITALI NIKORE

Ms. Mitali Nikore is a renowned economist, gender policy specialist, and the Founder of Nikore Associates, a youth-led economic policy think tank. With prior experience at the World Bank and UNDP, she has worked extensively on infrastructure, gender-responsive policy design, and urban development across South Asia. She was the lead author of the World Bank's toolkit on gender-responsive urban mobility and continues to shape discourse on inclusive growth. Her work bridges academic insight with pragmatic solutions for equitable development.

Question 1: As an economist with experience at the World Bank, you've seen how sustainable infrastructure can transform societies. Looking ahead, what groundbreaking policies or innovative strategies do you believe will be pivotal in addressing the dual challenges of rapid urbanization and climate resilience in South Asia?

Answer:

Tackling the dual challenges of urbanization and climate resilience requires integrated planning that is both locally grounded and globally informed. In South Asia, cities are growing rapidly, often in haphazard ways that exacerbate environmental vulnerabilities. What's needed are long-term urban plans that are climate-proofed from the start—meaning infrastructure investments must consider future climate risks, not just current needs. One pivotal strategy is nature-based solutions, like green roofs, permeable pavements, and urban wetlands that absorb rainwater and reduce urban heat. Alongside this, smart governance structures that empower city-level institutions to access finance, plan proactively, and engage local communities are essential. Climate resilience can't be achieved through infrastructure alone; it also requires social infrastructure—like early warning systems, local capacity-building, and risk insurance for the most vulnerable. Financing mechanisms such as green bonds and climate funds must be made more accessible to city governments. If we can blend innovation, inclusivity, and resilience into how we build cities, South Asia can lead the way in sustainable urban transformation.

Question 2: Based on your research on the significant challenges Indian women face in participating in trade—such as restrictive social norms and limited digital literacy—what kinds of gender-responsive policies can be pursued to involve more women in trade and related services?

Answer:

Women's participation in trade is constrained not just by market forces, but by deep-rooted social norms that restrict their mobility, access to digital tools, and financial independence. To truly involve more women in trade, we need to rethink the ecosystem from the ground up. First, digital skilling initiatives must be tailored to women, especially in rural and semi-urban areas, ensuring they are not only literate but confident in navigating digital platforms. Second, trade facilitation policies should include incentives for women-led MSMEs, such as preferential procurement or lower compliance burdens. Additionally, infrastructure like women-centric marketplaces, shared logistics hubs, and mobile-based trading platforms can bridge critical access gaps. Most importantly, social behavior change campaigns must run in parallel to shift mindsets around women's roles in the economy. By combining policy with grassroots action, we can create a trade environment that is truly inclusive.

Question 3: What policy interventions have been most effective in addressing barriers for women in the informal sector, and how can strategies for India's care economy enhance their workforce participation at scale?

Answer:

The informal sector remains a dominant employer for Indian women, yet it's fraught with vulnerabilities. Effective policy interventions must begin with recognition—acknowledging the value and economic contribution of informal women workers. One major barrier is the absence of social protection. Expanding access to maternity benefits, insurance, and pensions for informal workers would mark a huge shift. Legal reforms that simplify registration and compliance for home-based or self-employed women can also formalize parts of the sector without burdening it. When it comes to the care economy, India is still at a nascent stage of policy development. To mainstream care work, we need targeted investments in child care, elder care, and community health infrastructure. Publicly funded or co-funded care centers can free up women's time, allowing them to seek better-paying jobs. Additionally, professionalizing care work and ensuring decent wages will create employment while simultaneously addressing one of the biggest constraints on women's workforce participation—unpaid care burdens.

Question 4: As the lead writer of the World Bank's toolkit on "Enabling Gender-Responsive Urban Mobility and Public Spaces," what were the primary challenges you identified in integrating gender considerations into urban transport systems, and how can policymakers effectively address these issues?

Answer:

One of the biggest challenges in integrating gender into transport planning is the lack of disaggregated data. Most transport surveys fail to capture the distinct needs and travel patterns of women, such as short, frequent trips or off-peak travel. Without data, policy remains gender-blind by default. Another issue is infrastructure design—many public spaces and transport nodes lack proper lighting, seating, and safety mechanisms. The toolkit highlights how integrating women's perspectives from the planning stage can result in safer, more accessible systems. Policymakers must institutionalize gender audits of transport projects, mandate the inclusion of women in decision-making forums, and ensure budgets are allocated for gender-sensitive design elements. Training frontline transport staff on gender sensitivity and creating robust grievance redress systems are also key. Ultimately, gender-responsive transport isn't just about safety—it's about enabling freedom of movement and economic participation for all.

Question 5: The global economy is currently facing several headwinds, including inflation, rising interest rates, and geopolitical tensions. How do you see these factors impacting developing countries, and what strategies can help them navigate this challenging economic environment?

Answer:

The current global economic environment is incredibly volatile, and developing countries are feeling the heat. High inflation erodes purchasing power, while rising interest rates make borrowing for infrastructure and development more expensive. Add to that the uncertainties of geopolitical conflicts, and countries face a triple bind. For developing economies like India, resilience will come from three directions: diversifying supply chains, boosting domestic demand, and investing in social safety nets. Macroeconomic stability must be maintained through prudent fiscal and monetary policies, but growth cannot be sacrificed. That's where targeted public spending—in green infrastructure, skilling, and MSME support—can stimulate demand without widening deficits. Moreover, trade diversification toward South-South cooperation and regional blocs can reduce dependency on global economic centers facing slowdowns. Lastly, building buffers—be it forex reserves, digital public infrastructure, or decentralized social delivery systems—will help absorb future shocks. The key lies in adaptive, data-driven governance.

Question 6: Given your work on infrastructure and economic resilience, how do you see digital transformation influencing regional inequalities in India, and what role can public policy play in ensuring equitable growth?

Answer:

Digital transformation has the potential to reduce regional inequalities—but only if access is universal and inclusive. Currently, India's digital divide reflects broader social and regional inequalities, with rural and marginalized communities lagging behind in internet penetration, device ownership, and digital literacy. Without targeted policy, digital transformation risks deepening these divides rather than bridging them. Public policy must prioritize rural broadband expansion, local language content, and digital skilling programs tailored to the needs of marginalized groups. Government schemes should support digital entrepreneurship in tier-2 and tier-3 towns, offering subsidies or incubation support for youth-led startups. Simultaneously, integrating digital infrastructure into public service delivery—from telemedicine to e-learning—can reduce the geographic disadvantages of rural regions. Equitable growth in the digital era will require active redistribution—not just of wealth, but of access, skills, and opportunities.