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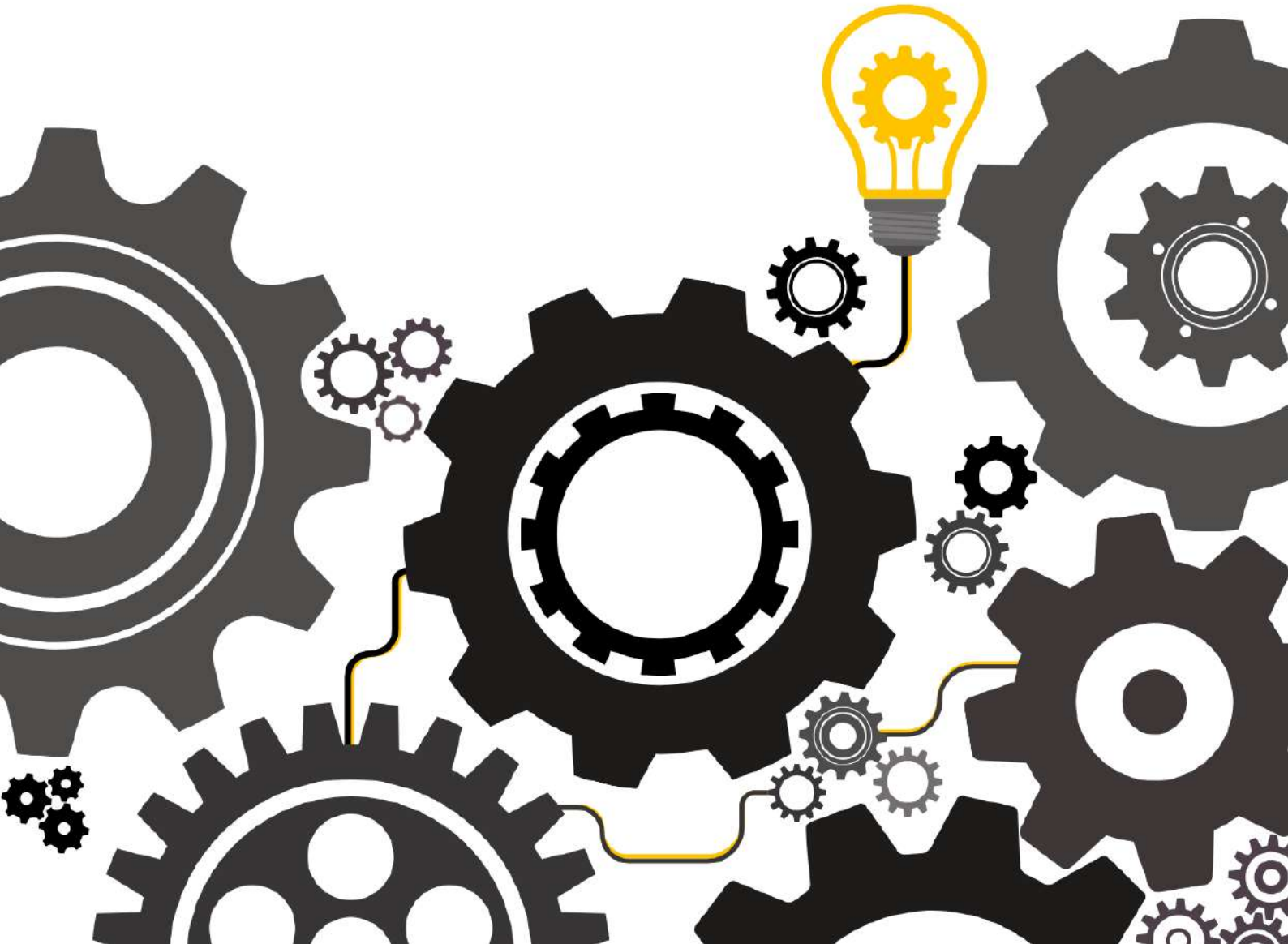
ARTHNITI

The Research Journal of the
Department of Economics

∫NTEGRATION



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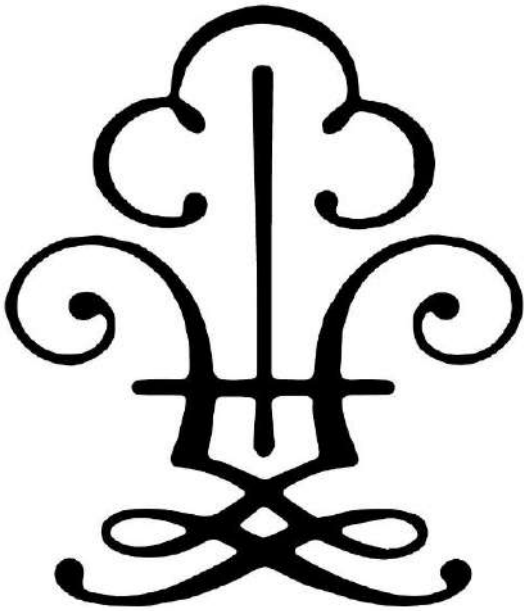

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INTEGRATION

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Department of Economics,
St. Xavier's College (Empowered Autonomous),
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From the Head of Department's Desk

Dear Readers,

As you may know, Arthniti is the official student-led, peer reviewed Economics research journal of the Economics Department of St Xavier's College (Empowered Autonomous). Over the years, we have witnessed how students have added their own insights to wide-ranging complex economics phenomenon, engaging in academic enquiry and rigorous methodologies to present their findings.

Each year, Arthniti aims to embody the spirit of its chosen theme through a diverse collection of academic papers. This year, the theme was "Integration," which seeks to explore the possibility of blending of concepts within Economics and beyond. Some papers delved into the intricacies of globalisation, while others examined the impact of public policy and infrastructure, and some investigated capital markets.

The student writers have explored academic research with the constant support from the Economics faculty and the editorial team. The writers chose topics that they found interesting, adapted their methodologies when they faced obstacles, developed a significant understanding of the topic and contributed insightfully to academic literature. Every paper in this issue represents not only the intellectual efforts of the students, but also the dedication and collaboration of those who helped them constantly refine and sharpen their analysis. I would like to thank the editorial team, who backed up the student researchers and helped them deliver high quality academic work.

This Arthniti issue of 2024-25 is the outcome of months of hard work and efforts from the Arthniti Team and its writers.

I sincerely hope you have an insightful and reflective read.

Regards,
Ms. Manali Pawar
Head of Department

Editorial

Since its inception, The Arthniti has served as a platform for undergraduate writers to engage with economics and showcase their incredible ideas. It was an honour to receive the opportunity to carry forward the incredible legacy of this journal. Since then, this year's editorial team has worked diligently to do justice to its rich history.

India's economy underwent a significant transformation in 1991, when it opened up to the world with its LPG policies. This move globalised India's economy and enabled it to recover from a near economic crisis and chart a path of substantial growth.

Today, the global economy is going through a similar upheaval. There are many events occurring all over the world that can be described as shocks to globalisation. Donald Trump, a known proponent of trade tariffs, is back in the White House; Brexit has caused shocks to U.K.s economy; and Russia has effectively been kicked out of the global supply chain. These developments indicate the importance of analysing both globalisation and its counterforces. Keeping this in mind, the editorial team feels reaffirmed in choosing Integration as the theme for this year's edition.

The writers have done a brilliant job in researching a diverse range of topics under this theme. From analysing the integration of the public and private sector through Public-Private Partnerships, to examining globalisation and international integration in China's Belt and Road Initiative, and even exploring interdisciplinary studies such as the integration of economics and psychology in "Loss to Lesson," the articles in this edition showcase thoughtful research and insightful perspectives.

This edition would not have been possible without the help of many individuals. Firstly, I would like to thank my editorial team – Ansh, Aarti, Joanne, Jonathan, and Neelanjana. Your hard work, passion, and commitment have been integral in bringing this edition to life. I would also like to extend my gratitude to the writers for their patience and unwavering effort throughout the process.

I am also deeply grateful to Dr. Aparna Kulkarni, our managing editor and staff-in-charge, for all her support. Additionally, I would also like to thank the members of our review board for their valuable insight, which have definitely enhanced the quality of the papers in this journal.

With that, the editorial team is proud to present Arthniti 2024-25: Integration. We hope that you enjoy reading it as much as we experienced putting it together.

Kushagra Patawari
Editor-in-Chief

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Concept Note

Integration

The colossal avian-human Garuda is a testament to synergy's might. His mystical journey mirrors our modern world's quest for harmony. It's a tale that echoes the boundless potential of integration, despite being fraught with challenges. Merging both the intellectual prowess of man, and the avian freedom to roam both heaven and earth, the Garuda inspires us to integrate our diverse principles and fields so we can soar to greater heights. The trials and tribulations of this mythical creature teaches us that through integrating varied perspectives, we can navigate tensions, reconcile differences and build bridges towards economic sustainability

In the modern world, the concept of integration has never been more relevant. From the intricate webs of international trade to the seamless flow of information through the internet, integration is at the heart of modern economic dynamics. This year, The Arthniti invites you to explore the theme of Integration.

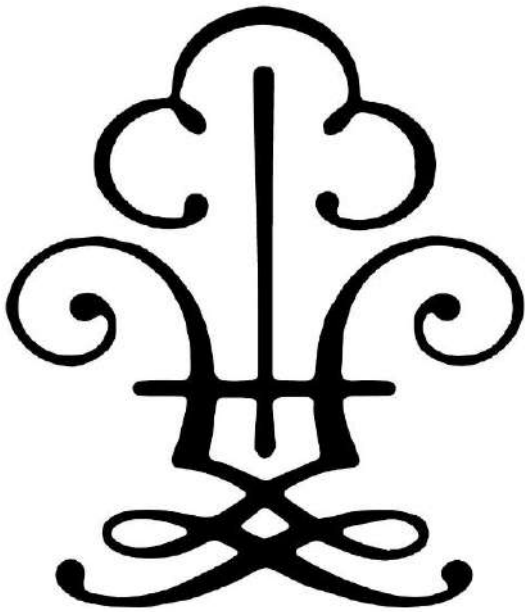
The theme **Integration** refers to the unification of individual systems, entities, processes, and disciplines. It explores the interconnectedness of various elements, creating a whole that is greater than the sum of its parts.

Integration spans across countries, societies, and technologies, shaping the entire modern economy. The integration of global economies can have positive outcomes, as evidenced by the Liberalisation, Privatisation, and Globalisation policies of 1991 in India. While it engenders opportunities to develop and capitalise, it may also harbour and exacerbate pre-existing complications. Take for example the merger of Vodafone and Idea, which amplified their operational challenges further.

While integration forms a crucial part of our economic landscape, it is equally important to explore its opposite. The trend of deglobalization is rising as protectionist policies reemerge, highlighted by trade wars between major economies like China and the USA. Economic sanctions on countries like Russia for geopolitical reasons further stress global supply chains.

Beyond economics, Integration is also a multidisciplinary phenomenon. The integration of psychological insights into economic models enhances our understanding of consumer behaviour, environmental integration highlights the need to balance economic growth with sustainability, while political economy examines how politics shapes national and global economic landscapes. The universal nature of this year's theme allows it to be explored across disciplines ranging from sociology and psychology to political science and statistics.

Editorial Team



RESEARCH PAPERS

ISSN 2277-1344

Analyzing the Impact of Tax Havens on Corporate Taxation and Assessing the Implications of Implementing the Global Minimum Tax Rate Policy

KANAK TANDON[*] & JYOTIRADITYA UDHAN[Δ]

This paper analyzes the impact of tax havens on corporate taxation and assesses the implications of implementing a global minimum tax rate. Tax havens, jurisdictions offering low or zero tax rates, attract multinational corporations seeking to reduce their tax burdens through profit shifting. These tax avoidance strategies undermine global tax systems, leading to substantial revenue losses. The introduction of a global minimum tax rate aims to curb this issue by establishing a standardized tax threshold for corporations, regardless of their operational base. The study utilizes a combination of quantitative and qualitative methods, including Spearman's rank correlation analysis, to evaluate the relationship between tax as a percentage of GDP and corporate tax collection in countries with varying levels of tax haven utilization. The paper identifies the potential challenges and benefits of global minimum tax implementation, considering the influence of tax havens on wealth inequality and economic imbalance. The findings suggest that while the global minimum tax rate could reduce the advantages of tax havens, its effectiveness depends on the rate's setting and the ability to enforce compliance.

***JEL Classification**: F23, H26, K34*

1. Introduction

A tax haven refers to a country or territory where taxes are much lower for foreign investors. Through time, such countries have become significant components of the global financial system. Such countries attract multinational firms and ultra-high-net-worth individuals because, besides a tax benefit, they also guarantee financial privacy, political stability, as well as lenient regulatory conditions. On the face of it, tax havens come across as objective mediators in international business and investment. However, they are usually linked to wide-ranging planning of tax avoidance amounting to some $500 to $600 billion in foregone tax revenues worldwide annually (Crivelli et al., 2023). Further, those losses are worsened by the secrecy laws that allow profits and assets to be hidden from home country authorities, hence unable to trace and recoup the lost revenue. Among the reforms at the global level is the introduction of the standard minimum rate of tax, thereby requiring corporations to pass only one tax threshold irrespective of whether they base themselves locally or in tax havens. As damage recognition about tax havens continues to increase, so have international reforms such as the global minimum tax rate aim to curb tax avoidance by ensuring all corporations, regardless of location, pay a standard rate of tax.

Most importantly, several key factors drive the persistence and growth of tax havens. These include globalization and capital mobility, which have effectively made it easier to shift profits across borders by taking advantage of holes in various countries' tax systems (IMF, 2020). Financial

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innovation and the digitalization of commerce have further exacerbated this by allowing quick capital transfers to tax-friendly locations (Alstadsæter et al., 2019). Competing in tax rates among countries has been another reason for this "race to the bottom," where nations have competed in presenting progressively lower tax rates to attract foreign investment. This, however, meant tax revenues dwindling, but more importantly, decreased the fairness of global tax systems (Zucman, 2015). Third, secrecy on the financial information of the tax havens and weak regulatory frameworks allow businesses and individuals to operate with little oversight, making these places perfect for hiding the wealth from the tax authorities' eyes. Most jurisdictions feature legal frameworks that protect account holders' confidentiality and limit the exchange of financial information with other countries, further complicating the efforts to enforce such policies (OECD, 2022). Today, multinational firms have to adapt to become very sophisticated in their strategies to exploit tax havens and to reduce their tax burden by engaging, for instance, in activities such as profit-shifting through transfer pricing of intellectual property, setting up shell companies, or utilizing offshore accounts.

An attempt to reduce the incentive of using tax havens is perhaps shown in the introduction of a global minimum tax rate. The idea is to achieve a minimum rate that all multinational corporations would pay worldwide, irrespective of their respective headquarters or where the firms record their profits. The global minimum tax, setting a floor on corporate tax rates, aims to neutralize any competitive advantage that tax havens offer corporations. Then again, to neutralize this competitive advantage, the regulation might push corporations harder to avoid their fair share of taxes (Mintz, 2023).

The study is highly relevant in the greater international tax policy discourse as it attempts to delve into the reasons for tax haven durability and endeavours to analyze the implications of the global minimum tax rate.

2. Objectives

1. To empirically establish the presence of tax havens by analyzing the relationship between Foreign Direct Investment (FDI) and critical determinants, including corporate size and tax rates.
2. To assess the impact of tax havens on economic disparity by analyzing how their existence and utilization contribute to wealth inequality and disrupt balance within global economic systems.
3. Assess the implementation challenges and potential global impact of minimum tax policies on corporate behaviour and tax revenue.

3. Review of Literature

Corporate tax avoidance is beginning to attract public interest and more attention from researchers continuously (Desai & Dharmapala, 2006; Hanlon & Heitzman, 2010; Huang, Ying, & Shen, 2018; Putra et al., 2018). Tax avoidance activities result from the privileges and reliefs provided by the government to the companies. Companies use strategies such as increased investment in fixed assets, shifting profits to tax haven countries, base erosion, thin capitalization, and IP structuring, among others, in a bid to lower their tax liability (Ey, 2014).

Corporate tax avoidance is influenced by a range of factors, including corporate governance mechanisms and firm-specific characteristics. Ownership structure, particularly in family-owned firms,

tends to lead to higher tax avoidance due to increased control and profit-seeking incentives, while state-owned firms are more focused on long-term goals and less likely to avoid taxes (Ying, Wright, & Huang, 2017; Bradshaw, Liao, & Ma, 2019). Though large boards may raise it due to the complexity of their decision-making processes, effective board composition, such as gender diversity and the participation of independent directors, minimizes tax evasion through improved monitoring (Francis et al., 2014; Zemzem & Ftouhi, 2013). By improving accountability, audit quality—especially when it involves the Big Four auditors—also reduces tax evasion (Gaaya et al., 2017).

Tax planning involves strategies to reduce tax liabilities, either legally through tax avoidance or illegally via tax evasion (Frank et al., 2009). Corporate tax aggressiveness reflects a company's efforts to minimize taxes using both methods. While the act of reducing tax burdens is not inherently problematic, concerns arise when tax planning shifts into illegal practices like tax evasion (Kim et al., 2018). Companies often engage in unlawful tactics such as earnings management, income smoothing, and transfer pricing to reduce their tax liabilities beyond legal limits.

Companies are further encouraged to engage in aggressive tax planning since India has some of the highest corporate tax rates in the world, matching those of the United States and Japan (Vethirajan et al., 2014). According to studies, these high rates impede the expansion of the corporate sector in addition to encouraging tax fraud. Lowering corporate tax rates may promote compliance, accelerate company expansion, and eventually result in more tax receipts for the government (Vethirajan et al., 2014). These issues are especially important in light of the global minimum tax rate policy, which attempts to establish a uniform corporate tax rate for all nations to stop profit-shifting and guarantee that multinational firms pay their fair share of taxes wherever they do business. The example of India emphasizes how crucial it is to balance tax rates to reduce evasion and preserve competitiveness.

It is really in taxation that the concept of Nash equilibrium becomes most critical to explain the global dynamics of tax policy, particularly concerning tax havens and non-havens. In other words, it is predicted that tax havens will fix the rate to zero if not subject to a minimum global tax, whereas non-havens will balance their rates in setting the willingness to pay for public goods against the loss of tax income from profit-shifting (Johannesen et al., 2022). The three conclusions follow, leading to a Nash equilibrium. All havens keep their tax rates at zero and no haven can improve its revenue by moving its tax rate; the competitive scenario illustrates the modes in which havens and non-havens engage in strategic interaction and is also useful as a framework for understanding how tax law changes may influence those dynamics

This equilibrium is altered by the implementation of a global minimum tax. According to this theory, tax havens cannot set rates below a minimum tax rate, which stabilizes their income and lessens the motivation for aggressive tax evasion. As a result, non-havens might modify their tax rates in reaction to the global minimum tax, which might increase global tax income and improve welfare. These theoretical predictions are supported by empirical data from studies like Bilicka (2019) and Johannesen et al. (2020), which show how profit-shifting behaviours adapt to changes in tax laws and offer useful insights into how tax reforms affect multinational corporations and government revenue.

Implementing a global minimum tax at a low rate compels tax havens to raise their rates, but may inadvertently impose a greater tax burden on non-haven countries without fully eliminating profit

shifting. If the minimum tax rate is high enough to completely stop profit shifting, the outcome is positive, as it prevents havens from offering lower tax rates and ensures fairer tax revenue distribution. Therefore, a low global minimum tax might be ineffective, potentially benefiting tax havens more than non-havens.

To guarantee that multinational corporations pay a minimum rate of tax, more than 140 nations have agreed as of February 2024 to enact a new global tax accord. The goal of the strategy is to eliminate the advantage of tax havens protecting multibillion-dollar profits. Additionally, it aims to eliminate the motivation for countries that serve as tax havens for multinational corporations. The OECD forecasts that the Global Minimum Tax (GMT) will cut under-taxed gains by 80% across geographies, national income limits, and tax haven structures (*What Does a "Global Minimum Tax" Mean for Global Cooperation?* 2024).

Under the 15% global minimum tax, developing countries with tax incentives below this rate risk losing tax revenue to the MNE's home jurisdiction, which collects the difference. To prevent this it is essential that developing countries should promptly review and adjust their tax and investment frameworks to align with the new rules. Since tax incentives are often safeguarded by stabilization clauses in laws, contracts, and regulations, these changes require time, political effort, and possibly amending existing investment agreements, making early action essential.

4. Research Question

How does the existence of tax havens, influenced by factors such as corporate size and tax rates, affect global economic disparity, and what are the challenges and potential impacts of implementing global minimum tax policies on corporate behaviour and tax revenue?

5. Methodology

We employ both qualitative as well as quantitative methods:

5.1. Quantitative Analysis

The quantitative analysis will use a Spearman's rank correlation test using:

Tax as a percentage of GDP

This variable is a key indicator of the overall tax efficiency and the extent to which a government is able to mobilize revenue through taxation relative to its economic size. In the context of the study, this measure provides a macroeconomic perspective on the impact of tax havens. A lower percentage might indicate the presence of significant tax avoidance mechanisms, including the use of tax havens, as corporations shift profits to low-tax jurisdictions, thereby reducing the taxable base of their home countries. The relationship between this metric and tax haven activities can offer insights into how these jurisdictions influence national tax revenues.

Net corporate tax collection

This variable captures the absolute value of corporate tax revenue collected by a government. It reflects the direct contribution of corporate entities to public finances. A decline in net corporate tax collections could signify tax base erosion caused by profit-shifting strategies or aggressive tax planning through tax havens (e.g., OECD, 2023). Furthermore, analyzing this metric alongside tax as a percentage of GDP allows the study to differentiate between absolute and relative impacts, strengthening the argument for global minimum tax rate policies to curb these practices.

By using Spearman's rank correlation, the study investigates the direction and strength of the relationship between these two variables. The test is particularly suitable as it accounts for non-linear relationships, making it appropriate for analyzing complex economic interactions influenced by diverse factors such as tax haven utilization. This approach directly aligns with the study's objectives, offering quantitative evidence on how tax havens affect national tax revenue and providing a basis to evaluate the potential effectiveness of global minimum tax rate policies in mitigating these impacts.

5.2. Qualitative Analysis

Following the quantitative confirmation of tax haven presence, the qualitative section will explore the potential impact of the global minimum tax rate on investment decisions, with a focus on its ability to prevent the concentration of investable funds in specific regions. Additionally, the paper will examine the challenges related to implementing this tax policy. For the qualitative analysis, secondary data in the form of research articles and publications from the World Economic Forum, Centre for Economic Policy Research, OECD, and Klynveld Peat Marwick Goerdeler, will be utilized.

6. Analysis

6.1. Quantitative analysis

India

Coefficient	0.76969697
Sample Size	10
T stat	3.410087246
DF	8
P-value	0.009221953

The results of the Spearman's rank correlation test, with a coefficient (ρ = 0.7697) and a statistically significant p-value of 0.0092, provide a nuanced understanding of the relationship between Tax rate as a % of GDP and Net Corporate Tax Collection and serve as evidence for India's non-tax haven status. This strong positive correlation indicates that as the share of corporate tax in GDP increases, the absolute value of corporate tax revenue rises proportionally. The observed relationship reflects a stable and predictable fiscal structure, which is critical in understanding how corporate taxation contributes to economic growth and supports the broader objectives of the research topic.

The statistical significance of the results is evident from the p-value of 0.0092, which indicates there is less than a 1% probability that the observed correlation is due to random chance. This allows us to reject the null hypothesis of no correlation, thereby affirming the existence of a meaningful relationship between the variables. The high correlation coefficient of 0.7697 further underscores the strength of this relationship, revealing that fluctuations in net corporate tax collection are closely tied to corresponding changes in the share of tax revenue relative to GDP. This proportionality suggests that India's corporate tax system functions as an integral component of the national economy, with corporate tax revenues directly contributing to fiscal sustainability.

When analyzed in the context of the research problem, the results provide critical insights into the impact of tax havens. Tax havens typically exhibit weak or inconsistent correlations between corporate tax collection and GDP contributions. This is because they attract substantial profits from multinational corporations but impose minimal or no taxes, leading to a mismatch between economic activity and revenue collection. In contrast, the strong positive correlation observed in India's case indicates that corporate tax revenues are closely aligned with the country's economic output. This alignment demonstrates that India does not function as a tax haven, as it does not facilitate the diversion of taxable income through artificially low corporate tax rates or other preferential tax practices. Instead, the data reflects a system where corporate tax revenues contribute meaningfully to the overall tax-to-GDP ratio, highlighting India's commitment to a fair and transparent tax regime.

The findings also emphasize the vulnerability of this relationship in the presence of tax havens. When corporations shift profits to low-tax jurisdictions, the net corporate tax collection in the home country diminishes, weakening the tax-to-GDP ratio and undermining fiscal stability. For countries like India, where corporate tax revenues form a substantial portion of government revenue, such practices could disrupt the observed proportionality, resulting in revenue losses and broader economic implications. The strong correlation observed in the analysis further underscores the importance of policies like the Global Minimum Tax Rate, which aims to counteract the profit-shifting strategies facilitated by tax havens. By establishing a baseline global tax rate, this policy would help ensure that corporations contribute equitably to the countries where their economic activities occur, preserving the relationship between tax revenue and GDP contributions.

The interpretation of the results also highlights India's non-tax haven status through its alignment with global norms on corporate taxation. Tax havens are characterized by minimal taxation and revenue collection despite substantial economic activity, which disrupts the proportionality between net corporate tax revenue and GDP contributions. India's strong correlation between tax rate as a % of GDP and Net Corporate Tax Collection in India, combined with the statistical significance of the results, indicates that corporate tax revenues are collected in line with the country's economic size, demonstrating an effective taxation framework. This strengthens India's position as a nation that prioritises fiscal transparency and fairness in its corporate tax policies.

In conclusion, Spearman's rank correlation test provides robust evidence of the strong, statistically significant relationship between Tax as a % of GDP and Net Corporate Tax Collection in India. This relationship underscores the importance of corporate taxation in supporting fiscal stability and economic growth while simultaneously providing evidence that India is not a tax haven. The results highlight the disruptive potential of tax havens on fiscal systems, emphasizing the need for policies like the global minimum tax rate to protect and enhance the proportionality between tax revenues

and GDP. These findings align closely with the research objectives, offering quantitative validation for the role of corporate taxation in ensuring economic resilience and countering the adverse impacts of profit-shifting practices.

Luxembourg

Coefficient	-0.837955755
N	10
T stat	4.342919193
DF	8
P-value	0.002468672

The results of the Spearman's rank correlation test for Luxembourg, with a coefficient (ρ = -0.8379) and a statistically significant p-value of 0.0025, reveal a strong negative correlation between Tax as a % of GDP and Net Corporate Tax Collection. This means that as the net corporate tax collection increases in Luxembourg, the proportion of tax revenue as a share of GDP decreases. This counterintuitive result is emblematic of Luxembourg's status as a tax haven and is directly aligned with the research topic.

The negative correlation signifies a structural anomaly in the relationship between corporate tax collections and their proportional contribution to the economy, which is typically positive in non-tax-haven countries. In Luxembourg's case, as corporate tax revenue rises, the tax-to-GDP ratio diminishes. This is indicative of a phenomenon where the absolute value of corporate tax collection increases due to profit shifting by multinational corporations. Still, these profits do not correspond to genuine domestic economic activity. As a result, corporate tax revenues appear inflated, while their proportional contribution to the economy remains disproportionately low.

The statistical metrics provide further clarity on the robustness of this result. The p-value of 0.0025 confirms the statistical significance of the observed correlation, indicating that there is less than a 0.25% chance that the result occurred by random chance. This ensures that the negative correlation is not coincidental but reflects a real and systematic distortion in Luxembourg's fiscal dynamics. Additionally, the t-statistic of 4.34 and the degrees of freedom (DF = 8) further validate the strength and reliability of the correlation, emphasising the magnitude of the divergence caused by Luxembourg's tax practices.

In the context of the research topic, these results are particularly significant in demonstrating the role of tax havens in distorting global fiscal patterns. Tax havens like Luxembourg attract substantial profits from multinational corporations by offering exceptionally low effective tax rates, special exemptions, and loopholes. These incentives encourage corporations to shift profits artificially, often unrelated to the actual economic activity taking place in the jurisdiction. The result is an inflated Net Corporate Tax Collection that does not reflect the real productive contributions of these corporations to the domestic economy. Consequently, the Tax as a % of GDP metric declines, as the artificially high tax revenues are a result of external profit inflows rather than sustainable domestic economic growth.

This negative correlation sharply contrasts with the positive correlation observed in non-haven economies like India. In India, a strong and statistically significant positive relationship between Tax

as a % of GDP and Net Corporate Tax Collection demonstrates a proportional and predictable fiscal structure, where corporate taxes are closely tied to genuine economic activity. The divergence in Luxembourg's case underscores how tax havens operate on fundamentally different principles, prioritizing the attraction of external corporate profits at the expense of stable and proportional tax regimes.

The implications of this finding extend directly to the research question. By demonstrating how tax havens like Luxembourg disrupt the traditional relationship between tax revenues and GDP, the results highlight the urgent need for global tax reforms. The Global Minimum Tax Rate Policy is designed to address precisely this issue by reducing the incentives for profit shifting. By establishing a baseline tax rate, such policies would mitigate the ability of tax havens to artificially attract profits, thereby restoring balance to the fiscal systems of both tax havens and non-haven economies. In Luxembourg's case, implementing a global minimum tax rate would likely reduce its attractiveness as a destination for profit shifting, forcing corporations to pay taxes more equitably in jurisdictions where their economic activities occur.

The analysis also sheds light on the broader economic implications of Luxembourg's tax haven status. While the country benefits from high net corporate tax collections in absolute terms, these revenues are inherently unstable and dependent on the willingness of multinational corporations to exploit its tax advantages. This creates fiscal vulnerabilities, as any global policy changes—such as the introduction of a minimum tax rate—could significantly reduce the inflow of profits, exposing Luxembourg's reliance on unsustainable tax practices. Furthermore, the distortion caused by profit shifting undermines global tax equity and deprives non-haven countries of their rightful tax revenues, exacerbating economic inequalities.

In conclusion, Spearman's rank correlation test for Luxembourg reveals a statistically significant negative relationship between Tax as a % of GDP and Net Corporate Tax Collection. This finding is emblematic of Luxembourg's status as a tax haven and provides quantitative evidence of how such jurisdictions disrupt traditional fiscal dynamics. The results highlight the disproportionate and artificial nature of tax revenues in tax havens, driven by profit-shifting practices rather than genuine economic activity. These insights emphasize the importance of policies like the global minimum tax rate to counteract the distortions created by tax havens, restore fiscal equity, and ensure a more stable and proportional relationship between corporate tax revenues and GDP contributions. By addressing the challenges posed by tax havens, such policies would not only stabilize global tax systems but also protect the fiscal sovereignty of nations impacted by aggressive tax avoidance strategies.

6.2. Qualitative analysis

The global minimum tax aims to create a fairer system by closing loopholes that allow corporations to avoid paying taxes through tax havens. Tackling these gaps, enables countries to secure the revenue needed for public services and addresses disparities in tax contributions. However, its success depends on broad cooperation, making it both an ambitious and challenging endeavour.

The move toward a global minimum tax (GMT) seeks to end the "race to the bottom," a competition in which countries lower taxes to attract business at the cost of essential revenue for rising budgets. This race often sacrifices quality and rational decision-making in favour of competitive advantages or lower manufacturing costs. A global tax framework aims to curb the diversion of

income, especially from intangible sources like patents and software, to tax havens that allow companies to bypass higher taxes in their home countries. The initiative is crucial for governments whose budgets have been strained by COVID-19 and who wish to prevent multinational profit-shifting to low-tax regions. Building on the OECD's Base Erosion and Profit Shifting (BEPS) program, which includes 15 action items to address tax avoidance, the GMT proposal represents another stride toward tax reforms that counter global inequality. By enforcing a minimum tax, the GMT hopes to prevent large corporations from exploiting tax havens, thus stabilizing public finances and addressing widening economic disparities.

However, the proposal for a global minimum tax rate also faces several issues: the threat of tax competition serves as a check on governments that might otherwise impose heavy taxes to fund excessive spending. Additionally, this initiative raises concerns over national sovereignty, as it limits a country's ability to set independent tax policies tailored to its needs. Critics, including organizations like Oxfam, question the deal's effectiveness, arguing it lacks the enforcement power needed to truly eliminate tax havens. The OECD, an intergovernmental organization founded in 1961 to promote economic progress and trade, leads this initiative but has faced challenges. Although not a member, India is a significant partner of the OECD. Moving forward, the plan's success is uncertain, as countries within and outside the "global tax cartel" may still lower taxes to attract businesses, thus undermining the initiative and maintaining the structural challenge of tax competition (*Global Minimum Tax*, n.d.).

7. Limitations

1. *Data Availability*: The availability and quality of data for tax havens and non-havens may vary, affecting the reliability of the analysis, particularly for smaller jurisdictions with limited publicly available information.
2. *Generalizability*: The results, especially from the case studies (India and Luxembourg), may not be applicable universally across all countries or industries, as tax policies and economic conditions differ widely.
3. *Exclusion of Informal Economies*: The study primarily focuses on formal economic transactions and may not capture the impact of informal or underground economies that could also be influenced by tax avoidance mechanisms.
4. *Complexity of Corporate Behaviour*: The motivations behind corporate tax avoidance are multifaceted, involving factors such as political influence, international trade agreements, and industry-specific tax policies, which may not be fully accounted for in the study's scope.
5. *Changes in Global Tax Policies*: The evolving nature of international tax regulations, including changes in the global minimum tax rate, could result in shifting trends in corporate tax behaviour, making it difficult to predict long-term effects based on the study's timeframe.

8. Conclusion

The persistence of tax havens highlights significant challenges for global tax systems, exacerbating economic disparity and undermining fair taxation. The introduction of a global minimum tax rate presents a promising solution to address these issues, but its success depends on international cooperation and effective enforcement. This study underscores the need for coordinated policy reforms to ensure equitable tax contributions from multinational corporations, promoting fairness in global economic systems.

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Beyond the World Bank: A Comprehensive PPP Analysis

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This study examines the nuances of Purchasing Power Parity (PPP), focusing on its practical implications for individuals rather than entire economies. By comparing two distinct baskets of goods – essential (non-tradable) and luxury (tradable) – this research highlights disparities in PPP across different economic strata based on the two baskets of goods. Furthermore, the study explores PPP-adjusted disposable incomes for MBA graduates, on both pre- and post-tax incomes. In addition, a correlation analysis of PPP trends from 2014–2023 shows the relationship of India's PPP with emerging and developed economies. This research emphasises the value of customized PPP analysis to provide nuanced insights into migration decisions and international economic comparisons. It also highlights the need for individuals to consider consumption patterns and income distributions in assessing economic mobility and cost-of-living dynamics.

***JEL Classification**: F31, F41, J61*

1. Introduction

Purchasing Power is the amount of goods or services a currency can buy, reflecting its real value. Parity is the state of being equal or equivalent in value or status. Together they help define an economic concept called Purchasing Power Parity or PPP. PPP measures the total amount of goods and services that a single unit of a country's currency can buy in another country (World Bank, 2017). The 'Law of One Price' (LOP) is the basic building block of PPP. According to the WTO, The LOP states that without barriers like tariffs or transport costs, similar goods should have the same price across countries when values are stated in a unified currency. For example, under PPP, a white T-shirt from the same brand should cost the same in Canada and India after adjusting for exchange rates, reflecting the relative value of their currencies. Ideally, the ratio of the price levels between two economies should equal the exchange rate between their currencies. While PPP is traditionally applied to entire economies, this research focuses on its relevance for individuals, particularly prospective migrants. The study focuses on Indian undergraduate students aiming to pursue post-graduation studies abroad to earn in stronger currencies like the US dollar. However, the assumptions that higher dollar wages translate to better economic outcomes, often overlook factors like consumption patterns, taxation, and cost-of-living adjustments between the two countries. Such assumptions have inevitably left India in a conundrum like 'Brain Drain.'

Most PPP data is typically calculated for the economy as a whole which becomes an issue as most prospective Indians aspiring to migrate for better economic opportunities do not represent an average Indian with a Per Capita income of $2700 (IMF). Their consumption habits & price sensitivity are certainly different from the average Indian. To ensure PPP figures don't hide this inequality, this paper presents two distinct PPP calculations based on consumption baskets: one for essential and non-tradable goods representing basic needs, and another for luxury, tradable goods. By comparing the

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PPP-adjusted incomes of post-graduates from Tier-1 business schools of India and US, the study investigates whether earning in dollars is a valid argument for these students.

In an increasingly globalized world, economies all around the world are intertwined, not only in their forex markets but increasingly in their financial markets and economies as a whole. Under the weak-form approach, exchange rates might diverge from PPP in the short term because of market inefficiencies, the majority of economic theories assert that PPP tends to hold in the long run. This approach is vital to empirically understand whether this concept holds for India and the USA. By analyzing the correlation between exchange rate movements over time, we assess whether a weak-form approach holds.

2. Objectives

1. Comparing differences in PPP considering 2 separate baskets of goods, the first basket contains necessary (non-tradable) goods while the second contains luxury (tradable) goods.
2. Comparing the Net Disposable Income (in PPP adjusted terms) for postgraduate (MBA) students using employment reports. Exploring why the differences (if any) exist in these incomes and how they potentially impact individuals.
3. Analyzing how PPP across developed and developing nations has changed over the years in relation to India by exploring the long-term weak form PPP between the two economies.

3. Literature Review

Purchasing Power Parity (PPP) is a widely used macroeconomic concept, used to determine relativistic values of currency by comparing the prices of a standardized basket of goods across countries. PPP, as introduced by Cassel (1916), posits that the nominal exchange rate reflects the relative price levels of two countries. Cassel's theory proposed that the exchange rate between two currencies would self-adjust to ensure that the purchasing power of both currencies, in the absence of trade restrictions, remains equal. To summarize, the price of a standardized basket of goods should remain the same across the countries when expressed in a common currency.

Empirical testing accelerated as the countries began to shift to a system with flexible exchange rate, after the collapse of the Bretton-Woods system. Rogoff (1996) identified persistent short-term deviations from the theoretical expectations of PPP, which were attributed to factors such as sticky prices, shipping costs and other trade barriers. These were identified through time-series data analysis. Rogoff concluded that while PPP is a useful tool, its short-term applicability is limited by such practical frictions.

Adding on to this, Diebold et Al. (1991), through unit root testing and cointegration analysis, demonstrated that real exchange rates exhibit mean-reverting behaviour, implying long term convergence of exchange rates towards PPP. These findings were reinforced by Abuaf & Jorion (1990), who used panel data techniques to solidify that PPP holds in the long term, strengthening the claim that while the deviation of the real exchange rates from the theoretical expectation of PPP is significant in the short run, its validity holds in the long run.

While there is empirical evidence for the overall validity of PPP in the long run, the weak form of PPP, which focuses on the relative price changes over time rather than strict parity, offers a more flexible and practical way to analyze price changes and exchange rates over time.

The weak form of PPP focusses on long term trends rather than short term parity, and thus can have major implications on the global labor migration. Rogoff (1996) and Diebold et al. (1991) suggest that economic disparities can be neutralized by long term PPP trends. These findings lead us to evaluate both economic and non-economic factors, in the context of labour mobility, such as Government policies and cost of living in the respective countries.

Structural breaks have been one of the key points to improve the accuracy of the PPP models. Structural breaks, simply put, are events that alter the economic paradigm of a country in such a way that exchange rate, price levels and PPP are significantly affected. For instance, the liberalization of the Indian economy in 1991 led to severe alterations in trade policies. This led to a disruption in the exchange rate and price levels, becoming a key reason for the deviations from PPP. Such breaks deem to be crucial in order to understand long-term trends of PPP, especially in the context of developing countries. Perron (1989) highlighted that accounting for structural breaks is key to understanding the deviations from parity. For example, currency crises or trade policies being altered can temporarily disrupt PPP relationships. Perron's methodology revolved around extending the traditional unit root test by introducing a dummy variable to account for the breaks in data. His approach demonstrated that many time-series datasets that appeared to have unit roots, showed stationary once the structural breaks were incorporated. Nusair (2003) built on this study, by specifically targeting Asian economies. By including the structural breaks in unit root and cointegration analysis, Nusair demonstrated that these breaks significantly improved the PPP models, particularly in capturing the long-term parity of exchange rates.

Despite the theoretical robustness of PPP, it faces some notable challenges in practical application. The Balassa-Samuelson Effect, proposed by Balassa (1964) highlights how productivity differences between countries affect PPP. The effect explains that developed countries would generally have a lower price level for tradable goods, since high-income countries are more technologically advanced, and thus more productive. While developing nations exhibit lower price levels for non-tradable goods, since these are benefitted from government subsidies and competitive local markets. For example, the prices of staple food remains low in developing economies like India due to Government subsidies, luxury goods are disproportionately expensive, highlighting the dependence on imports. This duality in pricing impedes the practical applicability of PPP.

India exhibits this duality in pricing very well where the luxury goods reflect global pricing trends due to import dependencies, while essential goods are priced nominally. This duality in the pricing of goods forces us to analyze PPP by segregating the goods/services into the category of tradable (luxury) and non-tradable (essential).

Iksandar (2016) explored the validity of PPP across developed and developing economies. His analysis concluded that the differences in PPP validity between these groups is statistically insignificant, but his study did not delve deeper into the quantitative relationships of PPP. Our study addresses this gap by using Karl Pearson's Correlation to quantify the relationship of PPPs of these groups, thus offering a more precise assessment of global economic dynamics.

4. Hypothesis

1. There is a difference between the PPP-based exchange rate arising from comparing tradable and non-tradable goods, with the World Bank prescribed measure.
2. There is no significant difference between PPP-adjusted disposable incomes in graduate employment wages in India and the USA.
3. There is a considerable correlation between PPP in time series data of within developed and developing economies with respect to India.

5. Methodology

In this research study, a three-pronged approach is used for the methodology tackling both the income and expenditure sides.

5.1. ICP Regression model

Input Datasets: The ICP typically uses annual national average price and expenditure data. However, due to dataset limitations, this study examines two distinct baskets of goods. By focusing on these two baskets of goods, this study offers insights into PPP comparisons between essential and luxury items. (Data Collected on: October 26, 2024)

1. Essential Non-Tradable Goods

Includes items like produce (fruits and vegetables), FMCG products, milk, and bread. Closest substitute products with similar functions were used when exact matches were unavailable. Prices for necessary goods were taken from Amazon India and Amazon US. (www.amazon.in). This approach ensures a consistent and comparable measure of prices. Farmer's market prices were excluded due to infeasibility of collecting data from diverse regional markets and the risk of introducing severe regional price disparities (See Appendix A).

2. Luxury Tradable Goods

Includes items like an iPhone 16, Air Jordans, and IKEA furniture. Exact matches (including color, size, and make) were used to calculate price relatives. Prices for luxury goods were sourced directly from their official websites (See Appendix A).

List of all goods under consideration:

Table 1

Necessary (Non-Tradable)	Luxury (Tradable) Goods
Bread, Cereals, Cheese, Chicken, Milk, Eggs, Oil, Fruits, Vegetables (Note: Multiple types of each category were considered)	Absolut, Air Jordan, AirPods 4, H&M Basic T-shirt, Canvas Jacket, Cargoes, Cargos, C-Class, IKEA Ekedalen Table, Galaxy S24, Galaxy Tab, Galaxy Watch, iMac, iPhone 16, Jackdan, Jeep Compass, IKEA Kivik Sofa, Linen Blazer, Linen Shirt, IKEA Malm Bed, Mini Skirt, Nike Air Force, Nike Air Max, Nike Pegasus, Zara Sweatpants, Zara Velvet Dress.

Our dataset contains of the heading's country, basic headings 'bh', item, price and imp which represent detailed expenditure categories in the ICP framework. For example, the basic heading 'Oil' includes various items like 'oil_1', 'oil_2', and 'oil_3'. Each country reports the average price of these items in their local currency ('price') and their relative importance ('imp'). Countries assign a weight of 3 for items deemed important and 1 for items considered unimportant, following ICP guidelines. Importance is determined based on either:

- Market share: More significant items have greater market share.
- Price: Cheaper items often have a higher market share.

In practice, the ICP classification includes 155 basic headings, and the 2023 Basic Heading values were sourced from the World Bank for this paper. PPP Estimation Process (Source: ICP, World Bank)

- **Step 1**

PPPs are initially estimated at the basic heading level. This involves averaging price relatives across countries for each basic heading using the weighted country product dummy (CPD-W) regression method. The CPD-W regression takes the logarithm of observed country item prices and regresses it on Items and Countries (excluding the base currency, USD)

- **Step 2**

Basic heading-level PPPs are aggregated using national accounts expenditure values (reported by countries in local currency). The process includes:

1. Calculating Laspeyres-type bilateral PPPs for each country pair, using expenditure weights.
2. Calculating Paasche-type bilateral PPPs.

Taking the geometric mean of the two to derive Fisher-type bilateral PPPs.

- **Step 3**

The Gini-Éltető-Köves-Szulc (GEKS) method is applied to the matrix of Fisher-type bilateral PPPs. The GEKS method ensures the Fisher-type bilateral PPPs are transitive and base country-invariant.

- Transitivity: The PPP between two countries is consistent, whether computed directly or via a third country.
- Base Country-Invariance: The PPP between any two countries is unaffected by the base country choice.

To compute GEKS PPPs:

1. Divide the Fisher-type PPPs for a target country by the PPPs of the base country.
2. Each row in the resulting matrix contains direct PPPs for the target and base countries.
3. This gives the GEKS Purchasing Power Parity for each pair of countries.

5.2. One-Way ANOVA

While discussing the expenditure side of PPP it is also paramount to discuss the income side as well. Pre-Tax MBA program employment income figures are sourced from the 10 official reports published by top business schools in the respective countries, i.e., Wharton in the US, and Indian Institute of Management (IIM) Ahmedabad. The time period of these reports is 2019-2023. Two separate one-way ANOVA tests are conducted to examine the differences in incomes between the graduates in Wharton (US) and IIM A (India) under two conditions: PPP adjusted pre-tax incomes and post-tax income. The treatment is the institute / country classification (Wharton, US vs. IIM A, India), which categorizes the groups for comparison of income levels. The rationale for selecting pre-tax MBA employment incomes of these institutes lies in their reliability as a data source for comparing the incomes of college-educated graduates from different countries. Furthermore, the employment income data is publicly self-reported by universities and often subjected to audits. The PPP conversion rates are sourced from the ICP website and are further employed to obtain pre-tax PPP adjusted incomes. Additionally, PPP can be significantly affected by the tax rate of a nation, often diminishing or exasperating existing PPP differences. To incorporate this aspect, Talent.com's (https://in.talent.com/tax-calculator) income tax calculator was utilized to compute post-tax incomes for India and the USA. While India has a uniform tax structure across states, the USA levies state-level income tax in addition to the federal tax which can range from 0% in states like Texas to upwards of 12% in states like California. To give the benefit of doubt, the highest tax regime is considered for the analysis. This is purely done to level the playing field between India and USA as California's effective tax rate is still lesser than India's by a significant margin. This tool does not represent legal authority and shall be used for approximation purposes only.

5.3. Correlation

The International Comparison Program (ICP) by the World Bank determines purchasing power parities (PPPs) for over 170 participating economies. PPPs translate various currencies into a shared currency while adjusting for disparities in price levels across economies, offering a metric of the purchasing capacity of one economy's local currency in another. PPP data from G7, a group of 7 developed economies and BRICS countries, a group of 5 emerging economies has been studied for correlation amongst or between the groups taking a decade's worth of PPP data from 2014-2023. The US dollar is taken as a baseline for comparison as it is the global reserve currency; therefore, the PPP for the US is always 1. A strong positive correlation between G7 and BRICS nations would suggest inter-group correlation and a high level of economic integration or global synchronization in price level adjustments.

6. Analysis

6.1. ICP Regression Model

Table 2

Commodity	PPP Rate (1 USD = INR)	Interpretation
Basic Goods	Rs. 33.852	Rs. 33.852 is required for a dollar worth of essential goods.
Luxury Goods	Rs. 82.697	Rs. 82.697 is required for a dollar worth of luxury goods.

The results indicate that the purchasing power of 1 USD is equivalent to the purchasing power of Rs 33.8 for a basket of essential goods. Subsequently, the purchasing power of 1 USD is equivalent to the purchasing power of Rs 82.967 for a basket of luxury goods. A PPP of Rs. 82.967 suggests that the relative value of the rupee for purchasing this basket of luxury goods is very similar with the market exchange rate. The disparity between the prices of luxury and essential goods in India is more than the disparity between the prices of luxury and essential goods, in USA. With a PPP of 82.967, the basket for luxury goods indicates that India has a much higher cost for luxury goods than the US, relative to essential goods. Thus, in comparison with the US, the extreme disparity in the PPPs for both baskets reflects lower cost of living with respect to essential commodities, in comparison to luxury goods, in India.

The lower conversion rate of essential goods highlights the relatively lower costs of essential goods in India compared to the luxurious basket of goods. This can be explained by looking at the per capita income in India which is much lower than the US. Income inequality in India is also much higher, the relative expensiveness of luxury goods in India as compared to essential goods, indicates that USD demands for a higher purchasing power for the same standard of living when it comes to luxury goods and this makes it much less affordable.

This stark contrast in the PPPs demonstrates a lower cost of living with respect to essential goods. This can be reasoned through India's subsidies, labor costs and import duties.The Indian government doles out lucrative subsidies on essential goods like staple foods and utilities, in order to ensure that it stays within the grasp of the general public. Additionally, the low production cost for non-tradable goods could be driven from the cheap labor costs in India (Masiero, 2020). Conversely, luxury goods (tradable goods) are not impacted to that extent by these localised factors and instead reflect the import duties and premium markups. Local production of luxury goods is still scarce in the context of the Indian and thus attracts a lot of import duties which drive up the costs. Further, due to the luxury market being a niche market, this allows for the retailers to command the premiums on luxury goods (Ramanathan, 2014).

6.2. One-Way ANOVA

Table 3

Pre-tax PPP-adjusted Income ANOVA

Source of Variation	df	SS	MSS	F	PR(>F)
School	1	6.17E+11	6.17E+11	6.164709	0.037941
Residual	8	8.00E+11	1.00E+11		

Note: N= 10, df = Degrees of Freedom, SS = Sum of squares, MSS = Mean sum of squares

The above ANOVA table suggests a statistically significant difference in the pre-tax PPP-adjusted income levels of post-graduate students in India and the US, with the P-value (0.037941) being less than the level of significance of 5%. In the case of US MBA graduates, their employment often involves roles in high-productivity sectors with global reach. Prior research corroborates that developed economies tend to pay significantly more for similarly skilled labor than developing economies due to differences in productivity and economic output per worker (Freeman & Oostendorp, 2000).

Table 4

Post-tax PPP-adjusted Income ANOVA

Source of Variation	df	SS	MSS	F	PR(>F)
School	1	3.66E+11	3.66E+11	10.24634	0.012594
Residual	8	2.86E+11	35695150000		

Note: N= 10, df = Degrees of Freedom, SS = Sum of squares, MSS = Mean sum of squares

After accounting for the income tax in both countries, we can see that the disparity between the PPP-adjusted income levels of post-graduate students becomes more robust, as indicated by the drop in the P-value. This implies that the income levels of similar skill-set positions vary notably, with individuals in the US enjoying higher disposable income, even after accounting for the high tax rates. This holds for the fact that India's tax regime, although progressive, has fewer deductions and exemptions at the higher-income brackets, resulting in a higher effective tax rate for Indian graduates. State-wide differences in US tax policy further contributes to this difference in disposable income.

Figure 1

Pre-tax PPP-adjusted Income

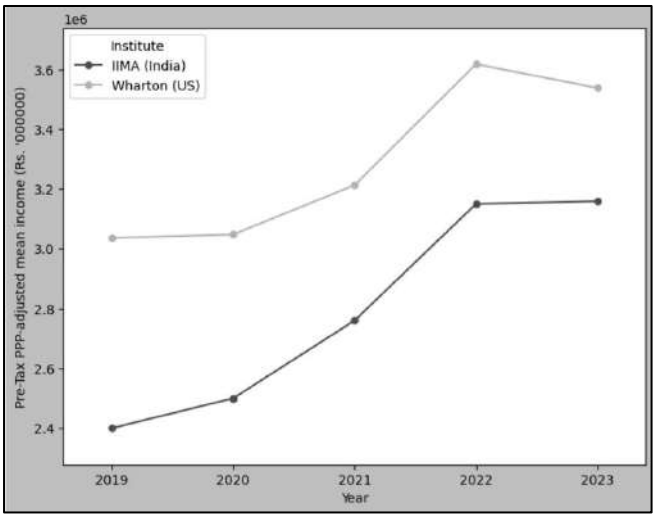
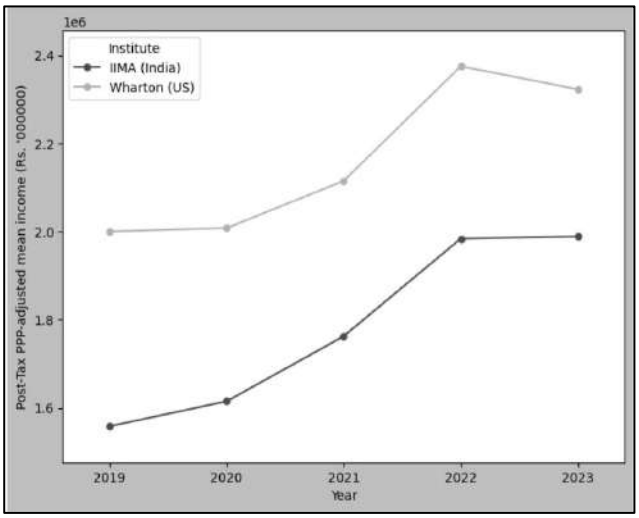


Figure 2

Post-tax PPP-adjusted Income



The distance between the IIMA and Wharton lines increases in post-tax income as compared to pre-tax income further supporting this point.

6.3. Correlation

The following results were obtained after conducting correlations between both the group (developed and emerging) nations with India:

Table 5

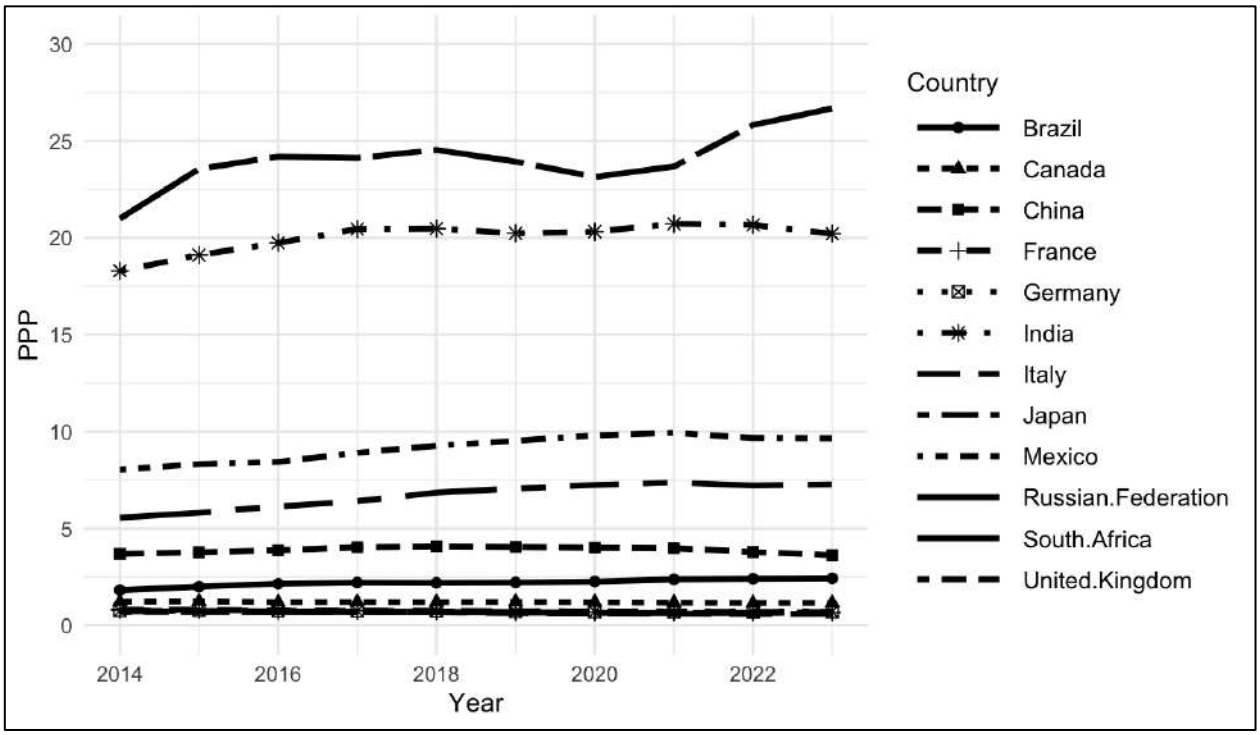
Correlation Coefficients

Country	Brazil	China	Mexico	SA	Russia	Canada	France	Germany	Italy	Japan	UK
Correlation with India	0.8982	0.5531	0.8591	0.8723	0.665	-0.7037	-0.7483	-0.7995	-0.7094	-0.3692	-0.7906

The similar PPP trends of India with emerging economies (BRICS) can be attributed to the fact that all emerging economies tend to face similar challenges like high inflation rates and volatile exchange rates. Additionally, the structural similarities and stages of development of these economies result in a strong positive correlation (Balassa, 1964). Economies like the G7 have a relatively stable industrial sector with respect to India's volatile and labor intensive economy. Further, India's economy is highly dependent on several countries, whereas G7 interdependence is significantly lesser (OECD, 2018).

Figure 3

PPP from 2013 to 2023



- **PPP Trend Analysis**

India's Purchasing Power Parity (PPP) has exhibited a relatively stable trajectory, characterized by only minor fluctuations over time. This stability contrasts sharply with the trends observed in developed countries, where the PPP tends to decline steadily. This divergence highlights the negative correlation between India's PPP trends with those of developed economies, possibly reflecting the differing economic structures, growth trajectories, and cost-of-living adjustments in these regions. Meanwhile, emerging markets such as Brazil and South Africa display slight upward trends in their PPP values, underscoring a positive correlation with India's trends. These upward movements may indicate shared economic dynamics among developing nations, such as growing consumer markets, improving productivity, and rising income levels. Together, these observations suggest that India's economic positioning as far as PPP is concerned, aligns more closely with emerging economies than with developed nations.

7. Limitations

1. Scope and Representation

This study primarily focuses on post-MBA employment outcomes and associated salaries, driven by the availability of reliable, self-reported secondary data from two top MBA schools in India and the United States. The decision to focus exclusively on these institutions was necessitated by the lack of standardized and comparable secondary data across other job roles or sectors within the broader economy. This narrow scope therefore leads the paper's findings to lack broader applicability and are therefore not reflective of national employment trends.

2. Taxation Assumptions

The Tax Calculator at talent.com, though presents a reasonably accurate reflection of how a basic income tax would be calculated, it is unable to include the nuances of deductions and non-taxable income. Tax structures in both India and USA are complicated and highly specific to an individual. Therefore, the discretion of the authors was exercised to get a true and most accurate tax under the given constraints.

3. Simplification of Basket of Goods

Consumption patterns for individuals are highly specific and simplifying it into two buckets of "luxury" and "essential" goods required discretion of the authors. The choice of including certain goods into either buckets might represent an oversimplification of nuanced consumption patterns. Additionally, the ICP basket of goods included significantly more products and services covering a wider range of products. No services were added to our research due to lack of accurate price data.

4. Overstating Essential Product Prices

There is potential overstating of essential goods prices on Amazon due to factors like dynamic pricing algorithms, vendor mark-ups, shipping costs, and geographical price variations. Additionally, Amazon's prices often reflect convenience premiums and may not represent local in-store prices. Promotional discounts or regional tax differences can further skew the data, making it less representative of typical market conditions for essential goods in various locations.

8. Conclusion

This paper evaluated the validity and implications of Purchasing Power Parity (PPP) for individuals rather than entire economies, addressing whether PPP-adjusted incomes and price levels across India and the USA justify the economic rationale for migration and how PPP trends align between developed and developing nations. The analysis revealed significant findings. First, it identified a stark divergence in PPP for luxury versus essential goods. India has a significantly higher cost for luxury goods compared to the U.S., relative to essential goods, which indicates a lower overall cost of living for basic commodities. The lower PPP conversion rate for essential goods highlights their affordability in India compared to the more expensive luxury basket. This contrast throws light on the economic challenges associated with high-value goods in India, highlighting the affordability gap in luxury consumption. Second, the study demonstrated pronounced disparities in PPP-adjusted incomes of Indian and US MBA graduates, both pre-tax and post-tax. US graduates enjoy significantly higher purchasing power even after accounting for tax rates, driven by differences in taxation policies, and sectoral opportunities. This finding emphasizes the economic advantage of a US-based MBA. Third, the correlation analysis revealed a strong positive alignment of India's PPP trends with emerging markets like Brazil, Mexico and South Africa and a negative correlation with developed economies like Canada, Germany and France. This divergence reflects India's unique position as a developing economy leading to important implications.

For individuals, particularly prospective migrants, this analysis offers a more nuanced perspective on the economic benefits of moving abroad. While earning in dollars appears lucrative, the relative costs of luxury goods and tax burdens must be considered when evaluating the financial advantages

of migration. This research, by focusing on PPP at an individual level rather than in aggregate, provides a more detailed lens through which to assess economic mobility-related migration. Future studies could build on this work by expanding the scope to include a broader array of goods, services, and demographic profiles.

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Appendix

Appendix A

Table 6

List of Basic Items

India				USA			
Item	Price	Item	Price	Item	Price	Item	Price
oil_1	₹ 140	cheese_slice	₹ 141	oil_1	$4.125	cheese_slice	$4.05625
oil_2	₹ 858	cheese_mozarella	₹ 106	oil_2	$7.25	cheese_mozarella	$2.49
oil_3	₹ 142	chicken_tender	₹ 120	oil_3	$2.35	chicken_tender	$7
bread_1	₹ 48.45	chicken_breast	₹ 249	bread_1	$3.411	chicken_breast	$13.93
bread_2	₹ 369.60	fruit_1	₹ 96	bread_2	$6.49	fruit_1	$1.19
cereal_frootloops	₹ 400	fruit_2	₹ 56	cereal_frootloops	$6.29	fruit_2	$3.65
cereal_cheerios	₹ 785	fruit_3	₹ 149	cereal_cheerios	$5.99	fruit_3	$4.4
cereal_honey_nut	₹ 699	veg_1	₹ 47	cereal_honey_nut	$5.99	veg_1	$1.06
eggs_brown	₹ 260	veg_1	₹ 109	eggs_brown	$5.29	veg_1	$2.24
eggs_white	₹ 99.60	veg_1	₹ 50	eggs_white	$2.69	veg_1	$2.618

Table 7

List of Luxury Items

India				USA			
Item	Price	Item	Price	Item	Price	Item	Price
basic_tshirt	₹ 1,850	imac	₹ 1,74,900	basic_tshirt	$31.4	iphone_16	$902.57
linen_blazer	₹ 10,950	iphone_16	₹ 79,990	linen_blazer	$166.95	airpods_4	$194.89
cargos	₹ 4,950	airpods_4	₹ 17,900	cargoes	$73.4	galaxy_s24	$777.59
velvet_dress	₹ 3,550	galaxy_s24	₹ 62,999	velvet_dress	$51.98	galaxy_watch	$544.32
linen_shirt	₹ 1,990	galaxy_watch	₹ 59,999	linen_shirt	$31.49	galaxy_tab	$1079.99
mini_skirt	₹ 1,899	galaxy_tab	₹ 90,999	mini_skirt	$31.49	kivik_sofa	$815
canvas_jacket	₹ 5,499	kivik_sofa	₹ 35,990	canvas_jacket	$83.99	malm_bed	$618
sweatpants	₹ 999	malm_bed	₹ 33,980	sweatpants	$18.89	ekedalen_table	$718.56
air_jordan	₹ 16,995	absolut	₹ 2,250	air_jordan	$189	absolut	$24.99
nike_pegasus	₹ 12,795	jackdan	₹ 3,250	nike_pegasus	$157.5	jackdan	$24.99
nike_air_force	₹ 9,695	cclass	₹ 69,00,000	nike_air_force	$120.75	cclass	$48450
nike_air_max	₹ 15,995	jeep	₹ 19,00,000	nike_air_max	$178.5	jeep	$25900
		ekedalen_table	₹ 58,690	imac	$1849		

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Can Economic Integration Be the Force to Achieve Gender Inclusivity? A Study on How Globalisation Has Affected the Female Labour Force Market

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The effect of economic globalisation on the overall economy of any country has always been a topic of immense interest for economists across the globe. However, the effect of this economic globalisation in particular on the Female Labour Force Participation (FLFP) of a country has been a controversial topic with some economies showing a negative relation between them and others showing a positive or insignificant relation. For any country, increasing its FLFP has always been important and is a step towards achieving overall development and progress of the country. In this view, the paper aims to find the relationship between economic integration and FLFP globally and later focuses on finding whether a similar relationship exists in the case of India. If there does indeed exist a significant relationship between them then the paper aims to find how India can benefit from this relationship and increase its FLFP. Using econometrics techniques and qualitative research, the findings indicate that there is a significant positive effect of economic integration on FLFP globally whereas for India it turns out to be insignificant. In order to understand the reason for the insignificant effect in the case of India, a sectoral analysis was conducted which revealed a significant negative impact of globalisation on the FLFP of the agricultural sector of India. Thus, the study concluded that the Indian Government along with focusing on the traditional and cultural factors affecting FLFP must also focus a lot on the agricultural sector where the majority females are employed in India in order to reap the maximum benefits of economic globalisation on FLFP.

***JEL Classification**: F66, J16, J18*

1. Introduction

Globalisation is often known as the process which results in an increase in the interconnectedness and integration of various countries. Today, female labour participation as affected by globalisation has become one of the major topics of discussion for scholars across the globe. It is also a well-known fact that gender-gaps in terms of labour force participation exist worldwide. “Women’s share in the workforce is just about 50% while the male share stands around 80%. This means that across the globe, working age women’s participation in the labour force is only half” (World Bank, 2022). Being an era in which sustainable development is considered as the major indicator of economic prosperity and gender equality being an important SDG, it is only natural that most countries, including India, work towards achieving this goal. However, in spite of UNDP considering gender equality as central to its work, most countries have still not succeeded in making complete utilization of the resources at their disposal. A major reason for this is that they are unable to utilise the female population of their labour force to their advantage. For India as well, the female population is almost at par to the male population which means that by increasing FLFP, it is only natural that India would gain better economic growth and promote gender equality. Thus, many studies have emerged that look at the relationship between globalisation and FLFP in the global context but very few studies have focused

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on globalisation as a driver for FLFP particularly in India. It should be noted that when the paper discusses globalisation affecting FLFP in India, only the isolated effect of the economic aspect of globalisation is taken into consideration and not the cultural or social globalisation.

The studies done till date have proven that there are a lot of conflicting views when it comes to the kind of effect globalisation has on FLFP. Scholars have shown the direct and indirect effect economic integration has on the labour market through job creation or destruction but relating it specifically to FLFP is a much more complex process (Narayan et al., 2021). The outcome of all these studies is that some believe globalisation brings about an increase in FLFP whereas others believe it to have a negative or zero effect on FLFP. “There are some scholars who believe that worsening of prevailing economic disadvantages of women occurs when there is an increase in cross-country trade and FDI. They argue that this promotes conditions for forced labour. The others are of the opinion that with an increase in the openness of trade, there is increased competitiveness and it becomes more difficult to discriminate in case of any group, like gender discrimination, and thus will most probably decrease” (Neumayer & Soysa, 2007). On the other hand, some studies have proven that there exists no significant or linear relationship between globalisation and FLFP especially in the case of Least Developed Countries (LDC’s).

Considering all these existing studies on this matter, this paper aims to resolve the dilemma of the type of effect economic integration has on FLFP globally and also tries to give a comprehensive analysis of the FLFP scenario in the Indian economy in accordance with its relationship with globalisation. Thus, it attempts to understand how India should use either the opportunities or disadvantages that economic integration has brought about in its economy in order to increase its FLFP and thereby alleviates unemployment as well as increase its potential growth levels and overall development simultaneously.

2. Objectives

The objectives of this paper are as follows:

1. To find if there exists a significant relationship between economic integration and FLFP in the global context. If yes, then assess the positive or negative relationship observed.
2. To see if a similar or different trend is observed between globalisation and FLFP in the Indian context and the possible reasons behind it.
3. To conduct a sectoral analysis of agricultural, service and industry sectors for a better understanding of FLFP in India.
4. To access the policies that can be used by India to reach the FLFP levels of a developed economy with special focus on the prevailing policy practices of India and analysis of the Indian government's role in increasing FLFP.
5. To suggest improvements or changes in policies in accordance with the research and findings of the paper.

3. Review Of Literature

Hossain et al. (2022) conducted a cross-country panel study on how globalisation has affected FLFP using data for 99 countries for a time period of 2001 to 2008. In this study, the authors have considered only economic factors affecting FLFP. They have come up with the solid conclusion that globalisation does indeed affect FLFP of a country to some extent but this is more so observed in the case of low-income and middle-income countries rather than a high-income country. The effect seems to be positive and thus these results highlight the need of focusing on heavy expenditure by the government in specific sectors that bring in a lot of FDI. The direct result of this would thus be better employment creation and opportunities for women. This paper showcases the need to separately study the impact of economic integration on a specific country of interest since the impact seems to differ as per the prevailing conditions of the particular economy. However, while it mentions that targeting sectors with higher FDI is necessary, it does not mention which sectors those are and how significant their impact is. Thus, this paper has scope for further research.

An important study with regards to increasing FLFP is that of Roll et al. (2024) which has looked at globalisation and its effect on FLFP segregating it into three components namely effect of economic globalisation, social globalisation and political globalisation on employment of women. It considers two outcomes i.e. the effect of overall globalisation on FLFP which was significantly positive and the effect globalisation has on women having lucrative managerial and professional jobs which turned out to be negative overall. The critical result thus obtained here was that social globalisation and the positive effect it has on its own on the second outcome mentioned before, makes it a necessary condition for economic globalisation to not just have a positive effect on FLFP but also on providing women with high-status jobs as well. Thus, the study proves that while economic integration positively affects FLFP, in order for there to be not just opportunities but rather good opportunities of employment for women, economic integration is more beneficial when it occurs after social globalisation of a country. This explains the fact that certain other factors dampen the response of FLFP to economic integration and it cannot on its own increase FLFP.

Narayan et al. (2021) studied the effect of economic integration on FLFP in Vietnam using time-series data from 1999-2014. One of the major inferences that they achieved from this study was that of the importance of the role of trading partners. Vietnam's growth being mostly export-induced, the authors found that trading with high-income countries was much more beneficial to increase FLFP in Vietnam as compared to other low-income countries. This led them to conclude that the Vietnam government should give special attention to framing favourable trading policies and remove potential barriers to trade especially in case of trade with higher income countries to increase FLFP in Vietnam. A major limitation here is that due to limited geographic scope, the findings of this study have to be tested out in case of different types of economies before it is generalized. This raises the need for a deeper dive into researching these factors on a much broader scale to avoid potential biases.

Fernandez & Puri (2023) talk about the FLFP in the Indian context. One of their major findings is that, especially in rural India, women are mostly employed in the agricultural sector which is a major cause for driving down their wages. Also, according to this study, the FLFP is higher in rural India than urban areas and economic prosperity of the State doesn't affect its FLFP. This suggests that even though globalisation might increase job opportunities for women in India, being more employed in agricultural sectors results in them being exploited. Additionally, this study as well as most other

studies conducted on FLFP in India seem to focus more on economic growth and very few of them have looked at globalisation or economic integration as a driver for increasing FLFP. More and more studies on India including Fernandez & Puri (2023) stress on socio-cultural factors affecting FLFP. However, it is necessary to remember that it is harder to use socio-cultural factors to influence FLFP positively than economic factors. Thus, a major gap in research exists when one looks at how only economic integration affects FLFP particularly in India.

Razavi et al. (2012) in their paper talk about the gendered impacts of globalisation. Conducting a detailed qualitative empirical analysis, their results have led them to conclude that although globalisation has led to an increase in job production it has not led to creation of “decent” jobs especially for women. The existing macroeconomic policies have, according to them, failed to generate sufficient employment and the increase in FLFP due to globalisation coincides with an increase in informal and unprotected jobs for women. One of the observations made was about the increase in manufacturing and production in the export sectors due to globalisation and how this generates necessity of low labour costs in cases of these labour-intensive work. This leads them to conclude that although economic globalisation can have a positive impact on FLFP, it still does not guarantee them equal pay or protect women’s rights against being paid unfair wages. The paper makes suggestions like social protection programs, better pension and insurance schemes for women, etc. However, implementation of these schemes and their accessibility by women of all strata remain to be a continuous challenge towards increasing FLFP and thus further research on practical implementation of these policies is necessary.

To conclude, all the aforementioned case studies have contributed a multitude of ideas on FLFP of various countries. Thus, this paper makes use of a lot of ideas from these case studies by applying it particularly to the economy of India and checks whether India can target economic integration in order to increase its FLFP. While many studies have focused on factors like education, social constraints etc influencing FLFP in India, very few studies have been conducted focusing on only economic globalisation to increase FLFP. By employing a fixed effects OLS model for panel data (controlled for the effect of time), this paper aims to resolve the issue of the type of impact globalisation has on FLFP across various countries and checks whether a similar trend is seen in India.

4. Hypothesis

1. There is a strong relationship between economic integration and FLFP in the global context and thus, economic integration can be used to increase FLFP.
2. The impact of globalisation and relation between globalisation and FLFP is different in India and thus different measures must be taken for increasing FLFP in India.
3. The impact of globalisation is also different in case of different sectors for India and therefore the policy measures in each sector must be different.

5. Methodology

This paper utilizes a combination of both quantitative and qualitative analysis techniques in order to achieve the objectives mentioned before. It makes use of a variety of secondary data obtained through research papers, articles, etc and also makes use of a panel dataset to achieve the first

objective mentioned before. For the other objectives it makes use of time-series datasets. All the data obtained is sourced from World Bank Open Data.

5.1. Quantitative Analysis

The quantitative analysis is divided into three parts as follows for better understanding:

a. To study the relation between Globalisation and FLFP in the global context

Using panel data for 15 countries over a time period of 2013-2023, a fixed effect OLS model has been used in order to understand the relationship between the dependent variable and independent variables. The rationale for using panel data here is that it gives a more comprehensive overview of the relationship since it includes cross-country data as well as data across different time-periods. Also using the OLS fixed effects model where the effect of time is controlled (i.e. the factor year is taken as a dummy variable) helps to remove the effect of other omitted variables and other year-centric biases involved like natural calamities, sudden surge in inflation etc.

Thus, the functional form of the regression equation is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 (X_1 X_2) + \alpha_1 B_1 + \cdots + \alpha_{11} B_{11} + u$$

Here, X_1 and X_2 are the independent variables representing FDI and exports respectively. This study adopts FDI and exports as proxy variables for measuring globalisation. The model also includes an interaction term for interaction between FDI and exports which will give an idea on how their relationship with each other affects the overall FLFP. Y is the dependent variable measuring FLFP and "u" shows the error terms of the model. B_1, B_2, ..., B_{11} show the dummy variables taken for years 2013-23 to control for time specific effects. B_1 is omitted from the model since we have included the intercept term here. The α_2, α_3, ..., α_{11} show the coefficient values for each dummy variable taken.

Note - FDI and exports are measured in terms of % of GDP whereas FLFP is measured in terms of % of total labour force.

b. To study whether a similar effect of globalisation on FLFP occurs in India

Using multiple regression for time-series data of India from 2000-2022, to understand the overall effect of globalisation on FLFP in India. This is done to see whether the effect of globalisation on FLFP in India is similar to its effect across the world which would be found from point a.

Unlike point a, this multiple regression is constructed for time-series data instead of panel data. Thus, the functional form of the regression equation is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + u$$

Thus, the variables X_1 and X_2 also remain the same as mentioned in point a.

c. To study the FLFP of sectors which are highly impacted by Globalisation in India

Again, using multiple regression to understand the effect globalisation has on different sectors of India. Time-series data for the years 2000-2022 has been obtained for each sector of India.

- The functional form of the regression model would be the same as mentioned in point b.

- The independent variables X_1 and X_2 would also be the same i.e. Exports and FDI respectively.
- The dependent variable however would be FLFP of the respective sector i.e either agriculture, industry or service sectors.

Hence, it would allow us to compare and conclude which sector has the highest impact of globalisation on FLFP for India. This gives a useful insight to the sectors in which the country should focus on more.

In all the multiple regression models mentioned above, the level of significance (LoS) is taken as 5% and accordingly, the interpretations are made. The R-squared value for each model is assessed to determine the fitting and significance of the model. Similarly, the p-value of individual coefficients is also assessed to see whether they are significant for the model. Depending on results, the particular past policies and the future measures that the government must take are determined.

5.2. Qualitative Analysis

The qualitative analysis includes the following:

a. Insights on The Overall FLFP Scenario of India and the Issues or Limitations in Increasing FLFP of India using economic integration

This section aims to analyse the FLFP scenario currently prevailing in India and what challenges have been encountered in trying to increase the FLFP of India. In order to achieve this, a lot of past data through research papers and government websites, reports etc have been collected systematically to ensure that a complete picture of the FLFP in India is represented. Thus, this section aims to identify potential areas where the Indian government has had a positive effect on FLFP and areas they should improve or avoid in order to make maximum utilization of the positive effect that globalisation can have on FLFP. This in turn would result in helping make accurate suggestions for further improvements.

6. Analysis

6.1. Quantitative Analysis

6.1.1. Relation between Globalisation and FLFP in the global context

A fixed effect OLS regression was conducted to examine the effect of FDI and exports on FLFP of various countries with the effect of time being controlled. Both FDI and exports seem to have little explanatory power in terms of FLFP. The multiple R value is 0.6505 which suggests a strong positive linear relationship between FLFP and its predictors. The R-Squared value is 0.4231 which means that only 42.31% variation in FLFP can be explained by using FDI and exports as the explanatory variables. This can be because there are a number of other socio-cultural factors like marital status, religion etc as well as traditional factors like education, health etc that also seem to have a significant impact on FLFP. Since we are studying only the impact of economic globalisation here, the R-squared value is low. Thus, this finding is in line with the findings of Roll et al. (2024), where they examine how social globalisation is a necessary precedent to economic globalisation. The regression output can be seen in Table 1.

Thus, the following regression equation is obtained:

$$Y = 27.090918 + 0.974582X_1 + 0.433107X_2 - 0.025746(X_1X_2) + Time\ Fixed\ Effects$$

It can be seen that at 5% LoS, both FDI and exports seem to have significant p-values i.e. 0.0483 and 2e-16 respectively. The interaction term also seems to be significant with a p-value of 0.00561. Even though the p-value of the overall model is significant as well, the low R-squared value is a major indicator that economic globalisation alone has very little power to lift a country's FLFP on its own. On the other hand, the variables FDI and exports both seem to have a significant positive effect on FLFP i.e. in case of FDI, 1 unit increase in FDI (as a percentage of GDP) results in 0.974582 units increase in FLFP (as a percentage of total labour force) controlling for the effect of time. Similarly, a unit increase in exports (as a percentage of GDP) results in 0.433107 units increase in FLFP (as a percentage of total labour force) controlling for the effect of time. If we take $(\beta_2+\beta_3)*X_2$ i.e. taking X_2 common in the equation, then β_3 can be interpreted as 0.025746 units decrease in the effectiveness of FDI for 1 unit increase in exports controlling for the effect of time. This shows the interaction effect between FDI and exports which should be considered while framing policies regarding them. The overall model however does give evidence of the positive relationship between globalisation and FLFP even though the R squared value is low and suggests that there does exist a strong statistical relationship between them. The coefficient of the intercept is 27.090918 which indicates the value of FLFP when all the independent variables i.e. FDI, exports and their interaction term is zero. The *Time Fixed Effects* represent all the dummy variables and their coefficients used to control for the effect of time.

Table 1

Fixed OLS Regression model examining the relation between Globalisation and FLFP globally

	Coefficients	Standard Error	P-value
Intercept	27.090918	2.305973	< 2e-16
X1	0.974582	0.489535	0.0483
X2	0.433107	0.046362	< 2e-16
X1*X2	-0.025746	0.009162	0.00561
Multiple R		0.6505	
R -Squared		0.4231	
P-value of model		8.39-13	

6.1.2. Relationship between globalisation and FLFP for India:

A multiple regression for effect of globalisation on FLFP in India for 2000-2022 has resulted in a statistically insignificant model since the p-value i.e. 0.07736 is greater than the significance level. The multiple correlation coefficient i.e. multiple R value is only 0.544 which suggests a moderate positive linear relationship between FLFP and the predictors. This along with a R-square value of just 0.296 indicates that the regression model is not a good fit. Only 29.6% variability in FLFP of India can be explained by the predictors of the model. Thus, it indicates that in India the cause for a better FLFP is beyond economic development and globalisation. Unlike the results of section A, where globally there is definite positive relation between them, in India, the effect of economic integration on FLFP

seems to be dampened by other socio-economic, cultural and political factors which are not involved in this particular model.

The model can be summarised in the following regression coefficient:

$$Y = 30.05005 - 2.56883X_1 - 0.21652X_2 + 0.12016(X_1X_2) + u$$

Table 2 shows that the model is insignificant, with only the coefficient of exports being significant.

Table 2

Multiple Regression model examining the relation between Globalisation and FLFP in India

	Coefficients	Standard Error	P-value
Intercept	30.05005	1.70432	3.11E-13
X1	-2.56883	1.32617	0.0678
X2	-0.21652	0.08591	0.0208
X1*X2	0.12016	0.06188	0.0671
Multiple R		0.544	
R -Squared		0.296	
P-value of model		7.74E-02	

These results coincide with the results of Fernandez & Puri, 2023 where they discuss how in the case of India the economic growth of the State doesn't affect the FLFP. According to the report published by the Ministry of Labour and Employment on Female Labour Utilization in India (2023), the FLFP is higher in rural India than urban India and it is also increasing at a higher rate every year in rural India as compared to urban India. This is due to the fact that most women are employed more in the agriculture and informal sectors rather than formal sectors. As a result of this, when economic integration happens in India, although new jobs and opportunities are created for women in certain sectors there might be a shift from agriculture to these sectors but that does not necessarily mean an increase in the FLFP. This can be understood much better through the next section of the analysis.

6.1.3. Relationship between FLFP and globalisation in particular sectors of India

In order to see whether the relationship between FLFP of each sector and globalisation insignificant like that in section B, this sectoral analysis is conducted. To better understand why the effect of globalisation on FLFP was statistically insignificant for India, it is necessary to understand its effect in each of three sectors i.e. in agriculture, service and industry sector for India. Thus, multiple regression analysis was conducted for each sector which we will first interpret individually and then compare.

I. Agricultural Sector

For this sector, it can be seen that the p-value for the model is 5.37E-04, making the model statistically significant (i.e. 5.37E-04 < 0.05). The multiple R value is 0.7714, which suggests that there exists a strong linear relationship between FLFP of the agricultural sector and the independent variables. R^2 is 0.595 which means only 59.5% of the variability in the FLFP of the agricultural sector can be explained by the independent variable. The R-squared value is low but both FDI and exports, as well as, their interaction term are statistically significant for the model with p-values less than 0.05.

This means that even though not all the variation in FLFP in agriculture can be explained by economic integration, at least some variability is explained by it and is statistically significant.

Table 3

Multiple Regression Model examining the relation between Globalisation and FLFP in Agriculture

AGRICULTURE			
	Coefficients	Standard Error	P-value
Intercept	119.6301	11.3201	2.15E-09
X1	-34.4116	8.8085	0.00095
X2	-2.7419	0.5706	0.00012
X1*X2	1.6045	0.411	0.00096
Multiple R		0.7714	
R -Squared		0.595	
P-value of model		5.37E-04	

Thus, the model derived is as follows:

$$Y = 119.6301 - 34.4116X_1 - 2.7419X_2 + 1.6045(X_1X_2)$$

Here, we can see that 1 unit increase in FDI results in 34.4116 units decrease in FLFP in the agriculture sector. Similarly, an increase of 1 unit in exports results in 2.7419 units decrease in FLFP of the agricultural sector. Thus, both FDI and exports have an overall negative relationship with FLFP in the agricultural sector. The positive interaction term indicates both FDI and exports positively affect each other in this sector. The intercept coefficient of 119.6301 indicates the value of FLFP when the independent variables are zero.

II. Service Sector

For service as well, the model is significant (9.29E-03 < 0.05). The multiple R value 0.6679 indicates a strong positive linear relationship between FLFP in the service sector and the independent variables. The R^2 value is again very low i.e. only 0.4462 which means only 44.62% variation in FLFP of the service sector can be explained by independent variables. However, here FDI, exports and their interaction term are all statistically significant with p-values that are significant at 5% LoS.

Table 4

Multiple Regression Model examining the relation between Globalisation and FLFP in Services

SERVICE			
	Coefficients	Standard Error	P-value
Intercept	-14.1817	8.9842	1.31E-01
X1	24.588	6.9908	0.0023
X2	1.6681	0.4529	0.00158
X1*X2	-1.1445	0.3262	0.00235
Multiple R		0.6679	
R -Squared		0.4462	
P-value of model		9.29E-03	

Thus, the model derived can be given as:

$$Y = -14.1817 + 24.588X_1 + 1.6881X_2 - 1.1445(X_1X_2)$$

Thus, here we can see that 1 unit increase in FDI results in 24.588 units increase in FLFP for the service sector. Similarly, an increase of 1 unit in exports results in 1.6881 units increase in FLFP of the service sector. Thus, unlike the agricultural sector, both FDI and exports have an overall positive impact on FLFP of the service sector. The interaction term however is negative which indicates that both FDI and exports negatively affect each other in this sector. When all the independent variables are zero the value of FLFP in the service sector is -14.1817.

III. Industry Sector

In this sector as well, it can be seen that the overall model is significant (i.e 2.61E-05 < 0.05). The multiple R value of 0.8412 indicates a strong positive linear relationship between FLFP of the industry and globalisation measured through FDI and exports in this model. The R^2 value is 0.7077 which means that 70.77% variation in FLFP of the industry sector can be explained by the independent variables of our model. This can be considered as a somewhat better value of R^2 than the other two sectors mentioned before.

Table 5

Multiple Regression Model examining the relation between Globalisation and FLFP in Industry

INDUSTRY			
	Coefficients	Standard Error	P-value
Intercept	-5.4483	4.116	2.01E-01
X1	9.8235	3.2027	0.00634
X2	1.0738	0.2075	5.38E-05
X1*X2	-0.46	0.1494	0.00619
Multiple R		0.8412	
R -Squared		0.7077	
P-value of model		2.61E-05	

Thus, the multiple regression model obtained is as follows:

$$Y = -5.4483 + 9.8235X_1 + 1.0738X_2 - 0.46(X_1X_2)$$

The value of both the explanatory variables as well as their interaction terms is statistically significant in this case with p-values < 0.05. It can be seen that the intercept coefficient is -5.4483 which indicates the value of Y variable i.e. the FLFP of the industry sector when the X variables are 0. With a 1 unit increase in FDI, 9.8235 units increase in FLFP of the industry sector. Similarly, with 1 unit increase in exports of India, 1.0738 units increase in FLFP of the industry sector is observed. Thus, economic integration of India positively affects the FLFP of its industry sector. The interaction term however indicates a negative relation in the effectiveness of FDI on exports and vice-versa.

IV. Sectoral Comparison

The points to be noted while comparing all three sectors are:

1) The R^2 value is highest in case of the industry sector indicating that the independent variables are a good fit for the model whereas they are least in case of the service sector.
2) In all three sectors the models are statistically significant. However, when the effect of globalisation on overall FLFP for only India is considered (for the same years), the overall model turned out to be insignificant.
3) The explanatory variables of the model are significant for all three sectors however in the case of agriculture FDI and exports have a negative effect on FLFP of this sector whereas in case of the service and industry sectors they seem to have a positive impact.

Thus, one of the reasons why the impact of globalisation seems to be insignificant in case of FLFP for India can be because of the decline in women's participation in agricultural workforce and their shifting to more formal sectors i.e. industry and service sectors due to globalisation. It is a well-known fact that a majority of the female workforce in India takes part in agricultural activities with many of them living in rural India. This results in greater wage exploitation of these women with there being no regulatory force to look into their rights that get violated. When globalisation measured through FDI and exports occurs in India, it has been proven that it brings about economic growth and creates new job opportunities. It is only natural that with creation of new jobs, women would prefer working in more formal and organized sectors rather than the agricultural sector, especially the younger generation of educated female population of India. Hence, because of globalisation, there is a shift which results in the decline in the FLFP in agriculture and leads to an increase in FLFP of service and industry sectors as is shown by the results of our model. This shift to some extent can explain why the overall effect of globalisation is insignificant in case of FLFP in India. While FLFP in service and industry increases, at the same time, it decreases in the agricultural sector and thus, there is not much net overall change or increase in the FLFP of India. This, however, does not mean that globalisation is not of importance in case of FLFP of India. Globalisation as seen by our results plays an important role in bringing women in a more formalized sector where their rights are better guarded rather than the informal jobs that result in their exploitation. So, although globalisation may fail to increase FLFP of India, our model suggests that it can be used as a driver to reduce gender discrimination in terms of wages and provide women in India better jobs. This facilitates a need for targeted policy in case of service and industry sectors so that more women can participate in these sectors and enjoy the benefits to FLFP occurring from globalisation in India.

6.2. Qualitative Analysis

The FLFP in India has been showing a steady upward trend since the past few years. Female employment is not just necessary for women to become independent but is also a major indicator of gender equality and thus, in turn, of the human development level of a country. According to the Periodic Labour Force Survey (PLFS) annual report 2023-24, the FLFP for ages 15 and above has risen from 37% in 2022-23 to 41.7% in the following year. This is a massive jump from where it was in the early 20th century when not even one-third of the female population of India was employed. One of the main reasons for less female participation in the workforce in India was found to be taking care of their children/ their duties as homemakers i.e. around 44.5% females agreed to this being their

reason for not working (Ministry of Labour and Employment India, 2023). Not only this but various other social, cultural as well as safety issues were the top factors stopping women from working in India.

While this paper focuses on how economic globalisation affects FLFP, it is well established by now that economic globalisation on its own cannot help increase the FLFP of a country. But it also cannot be denied that it does provide women in India better job opportunities and creates more jobs as well for them. The insignificance of the positive effect of globalisation in India occurs due to the fact that it gets overshadowed by the norms and social customs of the society. Recently, a lot of focus has already been given to these social issues as can be seen through the various government policies which has subsequently resulted in the increase in FLFP of India. Some of these policy measures directly or indirectly address the social as well as cultural barriers and the traditional factors affecting women's participation in the labour force in India and help remove them or in some cases worsen them. Some of the notable policies are as follows:

- Education is one of the major traditional factors affecting women's employment especially in case of well-paid jobs. Beti Bachao Beti Padhao Scheme as well as the National Education Policy (NEP 2020) are both policies implemented by the Indian Government that promote gender equity and female education. Such schemes are useful for increasing FLFP since they allow women to possess knowledge which is highly necessary for jobs especially in formal sectors.
- Another major policy implementation was that of Maternity Benefit (Amendment) Act, 2017 which also focuses on child care, paid leaves, etc and thus tackles the biggest socio-cultural barrier that prevents women from participating in the workforce in India.
- National Policy for Skills Development and Entrepreneurship or the Skill India Mission are some other policies that are effective in increasing FLFP of India by developing the employability of female workers.
- A recent scheme adopted by the Maharashtra Government, Ladki Bahin Yojana, although tries to make women more independent by providing them financial benefits, it seems to be counterproductive in terms of increasing gender equality. This is because in the long term to increase gender equality and FLFP, women need to participate as part of the skilled workforce achieved through schemes like the Skilled India Mission. Small financial benefits would not necessarily guarantee them financial freedom or the right to work because of the social norms prevailing in India.

All these existing policies are successful steps towards increasing FLFP in India. They show that a focus on promoting social globalisation, which is a necessary pre-condition for the positive effect of economic globalisation on FLFP (Roll et al., 2024), is already taking place in India through these policy measures that seem to be effective in mitigating the barriers to entry in female employment to a certain extent. This means that in order to further increase the FLFP in India and make it at par with male labour force participation rates, now would be a good time to focus on the next step i.e reap the benefits of economic globalisation on FLFP alongside that of social globalisation. The two steps being complementary to each other means that focusing not just on social and cultural aspects but also on the effects of economic integration would help maximize the FLFP in India and provide better results in terms of women empowerment. Research has shown that countries with high FLFP can also further increase their FLFP through economic integration. Thus, certain policy recommendations targeting

economic globalisation are instrumental for FLFP in India at this point of time. These policies are discussed in the next section.

7. Policy Recommendations

Developing successful policies so as to increase FLFP using economic globalisation would require careful planning and implementation of these policies. Keeping in mind the interdependence between social and economic globalisation that is required to increase FLFP, some of the key things to focus on is discussed in the following sections:

7.1. Availability of Proper Regulatory Bodies

The first step towards any successful policy implementation requires surveillance over administration of those policies. We can see from our quantitative analysis that there is a rise in the number of jobs available to women in the formal sectors due to globalisation. These jobs however require one to have certain minimum qualifications in terms of education. In India, although the jobs in these formal sectors increase, the full potential of increasing FLFP is not realized because of the imbalance between the demand and supply of women labour and thus, we fail to make maximum utilization of the positive effect of globalisation on FLFP. This imbalance simply means that with the increase in jobs, the supply of women labourers who possess the skills necessary to qualify for these jobs is not adequate. While this issue is well known and recognized by the Indian Government and a lot of policies are being adopted to promote female education and skill development, it has still not received the required success. In India, as of 2022, the literacy rate for adult females (age 15 and above) was 69.1% as compared to adult males which was around 83.5% according to the World Bank Data. The difference is still huge and the progress in reducing this difference has been slow despite government efforts. A major reason for this is lack of proper regulation for policies. For example- The Beti Bachao, Beti Padhao Scheme has been successful to a certain extent but one of its major criticisms is that of insufficient monitoring and proper fund allocations. Thus, as is necessary for any policy to succeed, an impartial regulatory body must be set up that maintains proper records of the implementation and success of these educational policies for women, ensures a safe educational environment as well as prevents the problem of dropouts of women from the educational system. This would help women become competent enough to secure the benefits of increase in the jobs in formal sectors due to economic integration.

7.2. Service and Industry Sector

As was observed from our analysis, in the case of service and industry sectors both FDI and exports seem to show a significant positive effect on FLFP of these sectors. Thus, the government can try to promote FDI and exports more in these sectors by removing the barriers to trade and making the overall process more investor friendly in these particular sectors. At the same time, ensuring women get a certain share (i.e. reserve jobs for women) of the increase in jobs in this sector due to globalisation would help increase FLFP more.

7.3. Special Focus on Agricultural Sector to Mitigate the Negative Effect of Globalisation

In the case of the agricultural sector, we observe a negative effect of economic integration on FLFP. This is because globalisation is accompanied by intense international competition, technological

innovation and progress which has reduced the need for more human resources in the agricultural sector. This reduces the number of jobs in this sector and as we know, maximum female employment in India occurs in the agricultural sector, this significantly reduces the FLFP in India. Also, most of the women employed in agriculture are rural women rather than urban as a result of which the rural FLFP in India is higher than urban FLFP. Thus, the Indian Government must take massive steps to change the effect of globalisation into either positive or at least neutral so that it doesn't harm the overall FLFP in India and promotes rural women development. This can be done by promoting a shift in case of these rural women from agricultural jobs to formal sectors. Investing in infrastructure, especially rural infrastructure (like schools) and promoting these other sectors by providing special benefits to women in formal sectors as incentives for others while simultaneously incentivizing the private sector as well, to set up and provide jobs to women in these rural areas. This would ensure that women are not forced into unemployment due to lack of jobs and also do not have to migrate to cities looking for jobs. For the women already employed in the agricultural sector, in order to ensure their rights are protected, subsidies and easy access to loans must be provided in a way that it is only accessible by women to make them financially independent. This would ensure there's no further decline in FLFP in the agricultural sector due to globalisation and the reduced jobs in the agricultural sector are at the same time covered up by availability in formal sector jobs in rural areas.

8. Conclusion

This study has focused particularly on whether economic integration can be used to increase FLFP of a country with a special focus on India. While the study's findings suggest that economic integration does indeed have a positive effect on FLFP globally, a similar trend is not observed in the case of India. These findings seem to be in line with the existing research conducted on this topic where country-specific differences seem to change the effectiveness of using economic globalisation to increase FLFP. This is more so observed in case of developing or underdeveloped countries as per the existing research. India being a developing country, the effect has turned up to be insignificant overall as per our analysis. A further dive into the sector-specific effect of globalisation on FLFP has resulted in the conclusion that the major sector dragging down the positive effect of globalisation on FLFP and turning it insignificant seems to be majorly the agricultural sector. Between 1997-2007, i.e. after the globalisation of India in 1990's, around 1,82,936 farmers have committed suicide and currently, in India around 40% of the farmers are ready to take up other good jobs while quitting their jobs in the agriculture sector (Gajbhiye et al., 2020). This can be mainly attributed to the change in government provisions for the agricultural sector which has seen a declining trend ever since globalisation has taken place in India. These statistics of the overall agricultural community clearly show how badly globalisation affects FLFP in the agricultural sector in India. This study, therefore, raises the issue that to increase FLFP in India and to achieve the full potential of gender equality, only promoting social globalisation is not enough. Although reforms in terms of female education, safety, job reservations for women, etc are taking place and increasing FLFP in India to a certain extent, at the same time they are not enough to reduce the gap between the male and female employment levels. The study, therefore, highlights that with maximum women employed in agriculture; in order to bring about a major positive impact of economic globalisation on FLFP, it is of utmost importance that the Indian Government focuses on making the situation of women in this sector better or bring in an alternative form of employment for women in this sector. While since a long time, the focus has been on tackling social and cultural barriers affecting women employment, it is high time that alongside social reforms

the government looks into making grassroot level changes in agriculture by trying to cope up with the negative effects of globalisation on FLFP. One must look into whether by manipulating the FDI and export levels there can be an increase instead of a decrease in the FLFP of the agricultural sector. It is necessary to remember that there are certain limitations of this study. One major limitation being that the study only looks at the isolated effect of economic integration measured using FDI and exports on FLFP while ignoring the combined effect of cultural, social and economic factors affecting FLFP. In reality there are a lot of interrelated as well as traditional factors like education, social barriers, etc that affect the FLFP of a country. The effect of economic integration on FLFP differs country by country and therefore, a much more detailed analysis can be conducted for countries with different economies using cross-country analysis methods in future. Thus, this paper just gives a brief overview of the effect economic globalisation has on countries focusing especially on India and contributes to the factors that must be taken into consideration by India from only the economic globalisation perspective while framing policies to increase FLFP.

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Cultural Propagator to Economic Booster: A Case Study of the Korean Wave (Hallyu)

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The Korean economy has leveraged the concept of creative economy for the promotion of Hallyu Wave with an aim to globalise the Korean Culture. In this era of digital revolution, the entertainment industry plays a key role in the nation's economic growth and sustainability. With the rise in OTT platforms, the South Korean entertainment industry receives a high demand for its content. As a result, the entertainment industry has emerged as a significant contributor to the country's GDP. This paper aims to discuss the significant change that the entertainment industry has brought to the economy of South Korea with the help of both qualitative and quantitative research methodologies. The global consumer demand for the Korean entertainment industry proves to be a game changer for the country's economy. The influence of the entertainment industry can be observed to have extended to the fashion, beauty and cosmetics, food and tourism industries as well. This integration has played a pivotal role in helping the country emerge as a resilient economy.

***JEL Classification**: L82, O10, O47*

1. Introduction

The United Nations Conference on Trade and Development (UNCTAD) explains the 'creative economy' or orange economy as an evolving concept based on the contribution and potential of creative assets to contribute to economic growth and development (United Nations Economist Network, 2021). It encapsulates economic, cultural, and social aspects linking them with technology, intellectual property, and tourism objectives as a set of knowledge-based, and thus more localized, economic activities with a development dimension and cross-cutting linkages at macro and micro levels to the overall economy (United Nations Economist Network, 2021). In 2004, the Sao Paulo Consensus, the outcome document of UNCTAD XI gave an initial mandate on creative economies. It encouraged developing nations to enhance engagement in dynamic sectors like creative industries and support and preserve them to benefit from them (United Nations, 2004).

In recent times, it has been observed that several countries have focused on developing creative economies, believing them to be resilient and better at absorbing external shocks (United Nations Economist Network, 2021). South Korea is one of the countries with a flourishing creative economy. Having faced major political instabilities in the past, South Korea struggled economically until a few decades ago. After the drawbacks of the Asian financial crisis, the Hallyu, or Korean Wave, was an initiative made by the Korean government to capitalise their entertainment industry and achieve their vision of globalization of the Korean culture. Over the last two decades, Korea's entertainment industry has witnessed a mammoth growth facilitated by this policy of cultural exchange. It promoted the exchange of Korean dramas, movies, food, fashion, beauty cosmetics, etc. Furthermore, global acceptance of these mediums aided the growth of the entertainment industry, which marked an

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important milestone in contributing to the GDP of the nation from USD 1.87 billion in 2004 to USD 12.3 billion boost to GDP approximately in 2019 (Martinroll, 2021).

Various efforts have been made by researchers around the world to understand the Hallyu phenomenon and its socioeconomic implications. However, the industry-specific and inter-industrial nature of the wave has not been investigated in detail. This paper aims to shed light on the importance of the entertainment industry and its integration into the economy. It aims to achieve correlation between the various industries and how the entertainment industry has impacted these industries. Similarly, it also presents a detailed analysis of whether the entertainment industry helped Korea to sustain the COVID-19 pandemic shocks to the economy.

2. Objectives

1. To investigate the relevance of music troops like BTS and K-dramas to the economy of South Korea.
2. To investigate correlation between various industries in South Korea.
3. To investigate the impact of the entertainment industry on other industries in South Korea

3. Review of Literature

The Hallyu Wave has existed for over three decades now. Much literature is already present that studies the Korean Wave along with its social and economic outcomes. In their paper, Santos and Marques (2022) conducted a case study on the Hallyu Wave, talking extensively about the creative economy of South Korea and how it is a major medium through which Korea exercises soft power. They specifically mention the history of K-Pop and K-Dramas, and their gradual emergence into mainstream global content. They attribute the Hallyu phenomenon to the Korean government's investment into the entertainment industry during the Asian financial crisis of 1997, which in turn led to the Hallyu phenomenon. Back then, in order to resolve the crisis, President Kim Dae-Jung advocated for information technology and popular culture to be the future drivers of the Korean economy. Information technology would create new industries and popular culture would become an important export product worth billions of dollars (Martinroll, 2021). The pop culture aspect was realized through the capitalization of the entertainment industry, which escalated the international visibility of South Korea. This phenomenon influenced the growth of various unexpected sectors like tourism, cosmetics, fashion and food; which has been highlighted by Santos and Marques as the ripple effects of the entertainment industry. In addition to the economic advantages that this offered, the paper also discusses the socio-cultural impacts of Hallyu, such as the global endorsement of the Korean culture. It accredits South Korea as a "cultural and technological hub" which has strengthened its economy and has boosted its global presence through the Hallyu Wave.

Kang (2022) studied the impact of the Hallyu Wave in a global business context. He discusses how the increasing recognition of Korean culture has helped Korean businesses flourish globally. Although he agrees that the companies embody global competitiveness, he asserts that the globalisation of South Korea's entertainment industry has largely impacted the success of businesses. According to the Bank of Korea's economic data system, the music and entertainment balance of payments for South Korea hit USD 114.7 million, just in the first quarter of 2019. Additionally, the Hallyu Wave has been estimated to have brought about USD 12.3 billion to the Korean economy in 2022 alone. This contribution seems to have risen manifold from a mere USD 1.87 billion in 2004. Marketing and

advertisement of Korean products through K-Pop and K-Drama celebrities is an important phenomenon which directly impacts sales. Various examples of such commercialization have been pointed out in the paper. The paper also elaborates on the effects of the Hallyu under four headers, namely, the rise of Korean superstars; increased interest in Korean tourism; influence on consumer behaviour and improved country image, all of which are also interlinked, forming a positive economic feedback loop. Kang successfully incorporates the important business decisions shaped by the Hallyu Wave and holds it responsible for Korea's rise to international prominence. He also encourages further research on the innovative plans that the Korean government would have to devise to channel the Hallyu's immense potential.

Park (2023) conducts a thorough analysis of the role of K-Pop in shaping the Korean economy. He briefly discusses the direct economic effects like the increase in sales of music, videos, media, fashion and beauty, etc. and indirect effects such as tourism and technological advancements. In addition, he also sheds light on the impact of K-Pop on the stock market and the government policies supporting K-Pop. This involves the creation of the Ministry of Culture, Sports, and Tourism, followed by the establishment of the Korean Creative Content Agency (KOCCA) and organisation of sponsored award shows outside the country to expand the Kpop audience base. It has positively impacted the stock prices of entertainment firms, thereby increasing the investment. The paper also mentions how the Hallyu Wave has led to job creation in entertainment and related industries, helping to lower the country's unemployment rate. Although there has been rampant globalisation of the Korean entertainment industry, Park identifies various challenges to the success of Hallyu in the future. Changes in consumer behaviour and the global music environment are seen as potential threats to K-Pop. Therefore, having a diverse consumer base and newer marketing strategies are vital for Korean entertainment to continue.

Besides papers that examine the Hallyu from a macro perspective, there also exists literature that studies the effect of Hallyu on specific industries. Bae et al (2017) analyzed the impact of the Korean Wave and economic indicators such as GDP, CPI and exchange rate on the inbound tourism demand for Korea from the USA, China, Japan and Hong Kong. They concluded that Hallyu influence, GDP and Exchange Rate did have a positive effect on tourism demand, however, no relationship could be established between CPI and tourism demand. Focusing on the cosmetics industry, Tjoe and Kim (2016) examined the impact of the Hallyu on the purchase of Korean cosmetics in Indonesia, through a survey of 227 Indonesian consumers. They found that Hallyu contributed to the construction of a country of origin image for Korea which played a major role in purchase intention. Thanabordeekij et al (2022) probed into the culinary aspect of Hallyu and studied how the wave affected Korean food consumption in Thailand. They observed that the K-Food broadcasted in K-Dramas piqued the curiosity of Thai viewers and made them want to try it out themselves.

The available literature regarding the Hallyu Wave and its impacts is narrow and is region-specific. It lacks an in-depth analysis of all the industries involved individually and also the interlinkages seen in them. This paper tries to address these gaps by analysing the affected industries and using it as a scale to highlight the strength and resilience offered by the Hallyu Wave to the Korean economy.

4. Hypothesis

The Hallyu Wave, established through the entertainment industry, has led to simultaneous growth of other industries like food and beverages, tourism, fashion, beauty and cosmetics leading to their integration into the mainstream Korean economy.

5. Methodology

In order to pursue the objectives thoroughly, both quantitative as well qualitative research methods are utilized.

5.1. Quantitative Analysis:

Korean Culture and Information Service (KOCIS) draws attention to how the Hallyu Wave explains the scope of the Korean craze prevailing in the world. This has been accelerated due to the wide expansion of the entertainment industry, consisting of the film and television sector, music sector, marketing and advertising sector, to name a few. The entertainment industry has thus paved the way for the development of several other industries like the food and beverage industry, the beauty and cosmetics industry, and also the tourism sector. Therefore, it is pertinent to investigate the quantitative relationship between entertainment and other industries. Additionally, hypothesis testing has been conducted to verify the significance of the correlations.

Null Hypothesis: $H0: \rho = 0$ vs. Alternate Hypothesis: $H1: \rho \neq 0$

1. *Correlation Analysis*

As the Hallyu Wave binds together several Korean industries, it becomes a necessity to understand the strength and direction of the relationship shared by these industries with each other. To statistically comprehend this, Karl Pearson's correlation coefficient has been utilized for analysis purposes. This test guides in drawing inferences about the relationship shared by two industries of the Korean country. Similarly, it also facilitates a deeper understanding of how they support the promotion of the Hallyu Wave to different parts of the world. The results can be further utilized by the government in policy formation that facilitates the growth of the Hallyu Wave. The variables under study are as follows:

Entertainment Industry (Number of Viewers) (X): This industry acts as a brand ambassador for the promotion of the Hallyu Wave through the creation of K-dramas, shows, and movies. Every individual who consumes this content becomes a part of the Korean community which acts as a family for people who adore the Korean content. Every community member reflects the number of viewers globally watching these k-dramas and shows (KF통계센터.n.d.). This parameter of the number of viewers showcases the reach of the entertainment industry as it takes into account the global audience base. The analysis has been conducted for the period of 2014-2023. The data for the number of viewers/community members has been sourced from KF Statistics Center (KF통계센터.n.d.).

A correlation analysis has been conducted between the entertainment industry and each of the following industries to evaluate the association between each pair.

Beauty and Cosmetics Industry (Exports $ millions) (Y1): This industry has been at the forefront of the impact of the Hallyu Wave. With the increase in the consumption of Korean content, the consumer base for the beauty products has also seen a favorable acceptance by the viewers. Export data for the beauty and cosmetics industry is employed as a representative of this industry. The data for exports has been sourced from the International Trade Administration (International Trade Organization, 2023). The analysis has been conducted for a period of three years from 2019 to 2021. Here, the data related to the total exports of the products is taken into account. (See Appendix A).

Food and Beverages Industry (Exports $) (Y2) - Another major impact of the Hallyu Wave is prevalent in the Food and Beverage industry. Korean food has created a fan base amongst its community viewers who vouch for the authenticity of food items. This has facilitated a bloom in this industry. The export data as a parameter aids in quantifying the reach of the industry and hence is utilized here. The analysis has been conducted for a period of 2014 to 2021. The data has been sourced from (World Integrated Trade Solution, n.d.). (See Appendix B).

Tourism Industry (Number of tourist arrivals) (Y3) - The tourism industry is also a major player contributing to the GDP of the nation. With the onset of the Hallyu Wave, the tourism industry has undergone several changes. The parameter of the number of international tourist arrivals is used to understand the impact of the Hallyu Wave on this industry. This data has been sourced from the World Bank for the time period from 2014 to 2019 (World Bank, n.d.). (See Appendix C)

2. Contextual insights

As the main aim of this paper is to study the influence of the entertainment industry on the other industries, the correlation analysis focuses on the entertainment industry to be the main variable for achieving this result. Though the roots of Hallyu Wave go back to the late 1990s, the period from 2014 marks the evolution of this initiative in recent years. With the popularity of PSY's Gangnam Style followed by the debut of BTS and other famous groups, K-Pop content found its route to the heart of global audiences, especially the Gen Z, through social media platforms. The Government decided to make the most of this fame and invested in the promotion of Korean culture. It designed policies that led to the establishment of Korean cultural centers by promoting tourist activities in the country. All these factors contributed to the creation of the K-Pop community, which reflected the massive viewership of Korean content. Having witnessed the growth of Korean culture in several domains, the period of 2014-2023 holds significance while conducting an analysis on the Hallyu wave.

This analysis has then been conducted on the basis of data availability for the variables considered and the alignment of its duration with the timeframe of the entertainment industry. Due to unavailability of data for the beauty and cosmetics industry, the time period used to conduct the analysis is short, from 2019 to 2021. Similarly, the timeframes for the food and tourism industries were taken as 2014-2021 and 2014-2019 respectively based on availability and accessibility of data.

5.2. Qualitative Analysis

The influence of the Hallyu Wave fabricated by the entertainment industry can be studied in depth. This integration has brought about a modification in the notable GDP contributing sectors of the Korean economy like the food industry, beauty and cosmetics industry, tourism sector, etc. by fostering an affirmative effect. In order to facilitate a brief study of its impact, the industries have been

considered as a single variable each, and the effect of the Hallyu Wave has been studied. The time period considered for this analysis is from 2004 to 2019.

6. Analysis

6.1. Quantitative Analysis (Correlation Analysis)

6.1.1. Entertainment and Beauty and Cosmetics Industry (2019-2021)

Table 1

Correlation Results

Correlation Coefficient (r)	Degrees of Freedom	P-Value
0.99925	1	0.0245

It is found out that there exists an extremely strong positive relationship between both the variables, as the correlation coefficient is 0.99925. This implies that an increase in the trend of number of viewers is accompanied by an affirmative response from the beauty and cosmetics industry. The p-value is 0.0245. Since this value is less than 0.05, the null hypothesis is rejected drawing the conclusion that the correlation existing between both the industries holds statistical significance. Thus, there is sufficient evidence to conclude that there is a strong linear relationship between number of viewers and exports of beauty and cosmetic products because the correlation coefficient is significantly different from zero.

The globalization of Korean beauty standards through the entertainment industry has endorsed the rise in the exports of cosmetic products, thus creating revenue. Korea has exported cosmetics to 119 countries worldwide in the following years, signifying the growth of this industry. This can be attributed to the mass popularity of their entertainment industry and the stars of the entertainment industry, who are also the brand ambassadors for cosmetic companies, which positively impacts the demand for the products. These products usually experience a massive demand in countries like the USA, Asian countries, Europe, etc., which also form a major part of the export market. The year of 2021 noticed a giant increase in the overseas sales of cosmetic products which reached its peak of $9.22 billion. Another crucial importer of Korean cosmetics is the US which encourages products manufactured by small and medium-sized enterprises. It accounted for sales of $300 million in 2023 when Gen Z fav Glow Recipe went viral on TikTok and Sephora in North America (Nan, 2024). The market size currently making around USD 12.54 billion is expected to grow at a CAGR of 8.43% by 2032 (Straits Research, n.d.).

6.1.2. Entertainment and Food industry (2014-2021)

Table 2

Correlation Results

Correlation Coefficient (r)	Degrees of Freedom	P-Value
0.7987	6	0.01744

The food and beverage industry also shows a strong positive relationship of 0.7987 with the entertainment industry. This indicates that an increase in viewers accompanies an increase in the food industry exports. The null hypothesis here has been rejected as the p-value 0.01744 is less than 0.05

suggesting that the correlation between the industries is statistically significant. Thus, there is sufficient evidence to conclude that there is a moderate linear relationship between number of viewers and exports because the correlation coefficient is significantly different from zero.

The entertainment industry showcases a significant role in the globalization of Korean cuisine in several countries of the Asian continent, the Middle East, and the US. This has led to a positive impact on the demand for the authentic Korean taste of kimchi, ramen, gochujang, etc. foodstuffs, expanding their export quantities. Due to this, there is an increase in the foundation of restaurants that provide a wide range of Korean cuisine in several countries. There has been a jump in the export quantity of processed food like Gimbab by around 17.9% due to a hike in the demand for convenient food in the US and Europe (Wu, 2023). The fondness of Korean cuisine is also a result of the Korean celebrities' usage of the products. Social media platforms act as a major source for such information, and there has been an increase in the craze of these products due to the interactive sessions conducted by the Korean celebrities. This implies that the consumption of Korean food has a worldwide acceptance due to the increasing fondness of the Korean content. Thus, the Hallyu Wave has created a soft power about the cultural significance of the Korean country which is reflected by the positive relationship between entertainment and food industries.

6.1.3. Entertainment and Tourism industry (2014-2019)

Table 3

Correlation Results

Correlation Coefficient (r)	Degrees of Freedom	P-Value
0.6089	4	0.1995

Both the industries show a moderate positive relationship of 0.6089 amongst themselves. This moderate positive correlation suggests that as the number of viewers increases, the number of tourist arrivals will also show an increase. However, the p-value is 0.1995 which is more than 0.05. The null hypothesis has not been rejected in this case. Thus, there is insufficient evidence to conclude that there is a significant relationship between number of viewers and number of tourist arrivals because the correlation coefficient is not significantly different from zero.

Having foreseen the economic benefits of the Hallyu, the Korean government has implemented various measures to advance the cultural wave. The entertainment industry being at the forefront of this initiative plays a key role in the strong development of the tourism industry. The Korea National Tourism Organization, which is affiliated to the Ministry of Culture and Tourism, attempts to amalgamate the tourism industry and Hallyu Wave. In order to achieve this, it has appointed movie and pop stars as tourism ambassadors of Korea and opened the Korean Entertainment Hall of Fame in September 2004, while at the same time hosts events for overseas fan clubs of Korean stars with the aim to sustain the Korean Wave (Joo, 2011).

Korea witnesses a lot of international tourist arrivals from the countries of China, USA, etc. There are several factors other than the entertainment industry that have an impact on the tourism of the country. Several agents like the UN policies, treaties signed between the countries, political situation within the country, etc. play an important role in the tourist arrivals. The number of tourist arrivals from the Chinese country had witnessed a significant drop due to the tensions faced by both the countries in the period from 2016-2019. The deployment of the Terminal High Altitude Area Defense

system (THAAD) in Seoul with Lotte agreeing to give up some land portion of its company for this project soiled the seeds of tension between both the countries. China opposed this strongly with the perception that its radar could be utilized to spy on its military and also ordered a temporary shut down of markets run by Lotte. The Chinese government issued a ban against selling of online and offline trips to South Korea in wake of the THAAD issue. It also issued new guidelines mentioning a decrease in the number of round-trip flights to Korea (Kh디지털, 2017). This blow by the Chinese authorities had a massive impact on the tourism industry of Korea. This is one of the major reasons for a substantial reduction in the number of tourist arrivals in the next few years that the country experienced. Thus, the insignificant correlation can be attributed to several other confounding factors such as geopolitical relationships with other countries. Although the entertainment industry experiences an increase in the number of viewers, the association of it with the number of tourists in the country remains complex and indirect, as tourism may be influenced more significantly by other factors. This suggests that while the entertainment industry may attract more tourists, its impact on tourist inflow is moderated by external variables.

6.2. Qualitative Analysis

6.2.1. Entertainment industry

The Hallyu Wave found its roots in the late 1990s and early 2000s. The Korean wave which aims to showcase Korean culture to the entire world has been accelerated by the fandom of the entertainment industry characterized by its k dramas, tv shows and music industry. The export of Korean television dramas to Asian nations acted as a catalyst for the growth of the Hallyu Wave. However in the late 1990s it lacked this international popularity since the content was only restricted to the domestic boundaries. But with the emergence of the music troop H.O.T. and its increasing popularity, the Korean content received a warm welcome from the Asian countries like China, Japan, Taiwan, etc which propagated the globalization of the Korean content. Similarly in the early 2000s, these young talents were nurtured by the big names of the entertainment industry like SM Entertainment, YG Entertainment and JYP Entertainment. The pivotal role played by these companies helped in the expansion of the international reach of groups like BIGBANG, Super Junior, etc. The surging usage of social platforms like Spotify, YouTube had a positive impact on the Korean entertainment industry as it enlarged the scope of the accessibility of the Korean content to the global audience. The epitomization of the influence of the Korean wave was achieved by PSY's Gangnam Style in 2012 at a world stage. From here there has been no going back to the Korean Wave. In 2013, with the debut of BTS under Bighit Entertainment which is now renamed as Hybe Labels and its hold on the global chartbusters paved the way for the growth of the Korean entertainment industry. The BTS collaboration with global stars like Halsey acted like a cherry on the top moment for the introduction of k-pop to the global audience. The efforts put in by the South Korean government by investing in cultural exchange programmes and organizing events like concerts have had an affirmative effect on the stars personality which has proved it to be a factor in promotion of several other industries like beauty cosmetics, fashion, tourism, etc. BTS 5th Muster [Magic Shop] performances held in the city of Busan and Seoul in 2019 gathered crowds from overseas along with the fans at home. This event has a massive impact on the GDP and is responsible for a whopping 481.3 billion won in direct and indirect effect (Joo-hyun, n.d., as cited in Yonhap, 2019). With k-pop stars bearing the labels of these fashion companies during crowd interaction sessions, it has benefited the sales of

the respective company and also brought the Korean fashion style into the limelight. Similarly the music videos fashion styling leads to big fashion brands wanting to collaborate with Korean stars for a wider audience reach benefitting both the sectors (Anand & Baek, 2024). The Hallyu Wave has also succeeded in creating job opportunities and positively impacting the GDP of the country through growth of these sectors. For instance, the song Dynamite, released by BTS in August 2020, which broke all records and topped the billboard global chart week for 18 weeks straight proved to be a financial aid by generating USD 1.43 billion. This revenue was put to use to initiate 8000 jobs during the COVID-19 pandemic. The effective utilization of this helped the country survive during such tough times (Nensee, 2022).

With the option of watching this content in the regional language through subtitles, the language barrier has been excluded thus broadening the scope for the Korean content's reach. With big players of ott platforms like netflix investing in the streaming as well as production of k-dramas and movies, the large global fandom consuming the contents of the Korean entertainment industry can be clearly recognized. The popular Korean Series "Squid Game" is the most watched non-English TV Show on Netflix with over 142m households viewing the content. (Rushe, 2021). Music streaming platforms like spotify and youtube readily stream songs by famous Korean troops as they immediately top charts due to the huge fan following. The song "Dynamite" released by BTS in August 2020, which became an instant hit, and stayed at number one on the US Billboard Hot 100 Chart for a month (Trust, 2020). It also topped the globally most popular chart on Youtube upon release and stayed in the top 5 until January 2021 (YouTube Music Charts, n.d.).

6.2.2. Cosmetics and Beauty products

Korea has a long history of cosmetic usage. Since ancient times, natural ingredients like oils, plants and animal extracts such as green tea, rice, snail slime and bee venom have been used by Koreans as cosmetics as these were believed to nourish skin and ensure its health in the long run. Korean skincare was generally centered on achieving what is known as 'glass skin' or 'honey skin' which is hydrated, dewy, smooth and luminous. These, today, have become popular Korean beauty standards. And with the globalization of Korean content and culture, these standards are not just popular among Korean youth, but amongst consumers of K-content worldwide. Having perceived such global demand, Korean skincare and cosmetic brands have seized this opportunity to manufacture and promote products like serums and sheet-masks that guarantee 'glass' and 'honey' skin (Furgiuele, 2020; Liu, 2018). As a result, almost two thirds of the products launched in the Korean beauty market from 2015-2016 were facial skincare products, and in 2017, these products accounted for about 51% of the total market share (Mintel, 2017).

Apart from skincare, which is largely based on traditional knowledge, modern Korean cosmetics, including makeup products are also very well-known and sought after. One of the very initial products that came out from Korea was BB Cream, in 2011-12. BB Cream, also known as Beauty Balm or Blemish Balm, was originally developed by a German surgeon, it became a hit in South Korea in 1985, as it suited the Korean skin better, as compared to other western products, which were too heavy. Korean companies, thus, started manufacturing BB Creams, and its popularity soon grew so much that it reached the Western markets as a Korean export. K-pop and K-drama stars, who had gained fame due to the Hallyu phenomenon around this time, also swore by the effectiveness of the product, which impacted the product's demand (Morosini & Adkins, 2023; Rigano, 2013; Meltzer, 2014).

As Korean entertainment has reached consumers around the globe, stars featuring in K-pop, K-dramas and K-movies have been greatly endorsed. This comes with a desire to look like one's favorite stars and use the products they use. Thus, the attention and interest towards K-beauty or Korean beauty and cosmetics has increased manifold. Companies have profited from this fame by sponsoring K-content, collaborating with celebrities for advertisements and even hiring popular stars as brand-ambassadors. In 2014, the Korean cosmetic chaebol AmorePacific officially sponsored the K-drama series My Love From The Star. The series garnered wide acclaim and became Korea's No.1 series. Various AmorePacific products were incorporated into the 10-week series for advertisement. The sales of the the products used by the female lead immediately surged by 75% and their lipstick sales soared by 400% (Martinroll, 2018). Similar sales tactics have been used by companies like Abib and Sulwhasoo, who have appointed famous K-pop idols like Enhypen and Rose respectively as their global ambassadors (Agbulos, 2023).

During the COVID-19 pandemic, when people all over the world were quarantined at home, their online and OTT engagement highly increased. This, and the sudden popularity of the Oscar-winning movie Parasite and the increasing influence of K-pop on global youth, led to an exponential rise in K-drama viewership. Hence, the demand for K-beauty also soared. This trend can be observed through the following data sourced from ITA.

Table 4

Total Market Size for Cosmetics in South Korea (in million $)

Year	2019	2020	2021
Total Exports	6,554	7,572	9,182
Total Market	9,042	6,449	6,672
Exchange Rate	1,165	1,179.6	1,144.6

Note: Source - International Trade Administration

The want for Korean entertainment never ceased, therefore the demand for cosmetics linked to it never faded either. In fact, in 2021, within a year of the pandemic, the total value of cosmetics produced recuperated to $14.5 billion. The exports were valued at $9.2 billion, a 21.3% increase from those in 2020 (South Korea - Country Commercial Guide, 2023). And with the increasing popularity of Kdramas and wide scale acceptance of K-beauty products and cosmetics, the market is forecasted to grow at a CAGR of 5.48% from 2024-29, and expected to reach $9.05 billion by 2029 (GlobalNewswire, 2024).

6.2.3. Fashion

Fashion acts as a key player in the portrayal of a country's culture and its promotion to the world. The Korean fashion style which is known as K-style has achieved this eminence through the medium of entertainment industry. The Hallyu Wave and its effect on the global audience acts as a notable factor bringing the focus on k-style. The depiction of Korean trends in k-dramas and music videos has increased its reach to the global masses. Though the Hallyu Wave is characterized by fans from different demographics and age groups, the k-style binds them together as a community. In order to publicize this ahead, several k-pop stars have been observed carrying the brand's stylish products during crowd interaction sessions on social media, concerts, talk shows, etc. Witnessing their favorite stars endorsing a brand, their fans prefer to purchase these items which eventually causes a hike in the demand for those apparels. Similarly, the product placement of jewellery or clothes in k-dramas

also supports the sales of these products. This generates a significant effect on the fans who then turn these items into must-have products in their daily lives with the attempt to emulate their on-screen idols. This leads to a fast sale for these products. The portrayal of BVLGARI's Serpenti Collection in the smash hit 'Queen of Tears' went viral amongst its fans causing a hike in the sales (Classy, 2024). These factors contribute to the expansion of the fashion industry which is expected to generate US $ 22.92 billion in revenue by 2028 (Apparel Resources News-Desk, 2024).

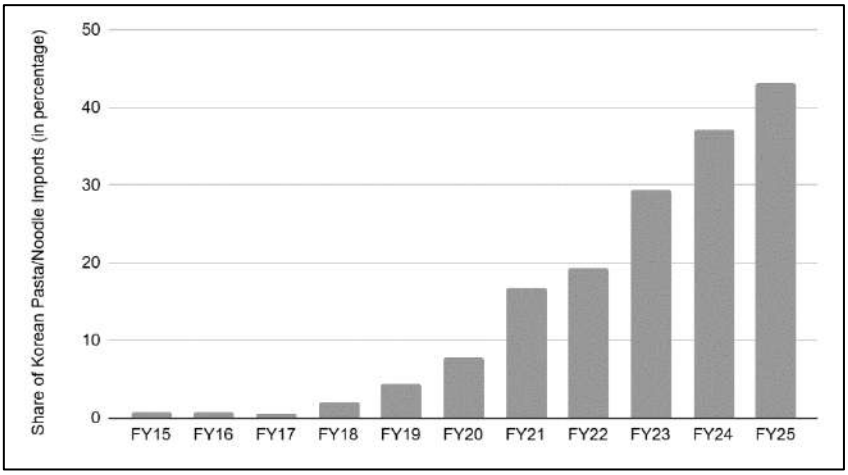
6.2.4. Food

With the globalization of the Korean entertainment industry and a global appeal for its products that frequently display traditional Korean cuisine and other food items, the consumers of K-content have taken interest in the Korean food culture. This has prompted an increase in the exports of Korean food items and packaged food to the world market. From 2006 to 2018, Korean food exports have annually increased by about 10%, with a constant rise in the export of snacks, instant noodles and ready-made meals. (Kim, 2019).

In 2020, the Korean Customs Service reported that $53.76 million worth of rice tteokbokki was exported, more than thrice the amount exported in 2017. Korean condiments, such as gochujang and doenjang, marked exports of $300 million in 2020, a whopping 25.8% increase from the previous year (Press Release, 2021). These products form an integral part of the daily Korean cuisine and are widely featured in movies and series. Additionally, these foods are healthy and nutritious, which has helped boost its awareness and repute, especially through social media.

Figure 1

Share of South Korea in India's Pasta/Noodle Imports



Source – Moneycontrol

Korean ramen (similar to noodles or pasta) brands have now found a prominent place in Indian markets. In FY24, the imports for pasta and noodles of India from South Korea rose to $12 million from $1.5 million in FY20 (Gera, 2024). The graph above shows a continuously increasing trend in the share of pasta and noodles from Korea in India's imports .

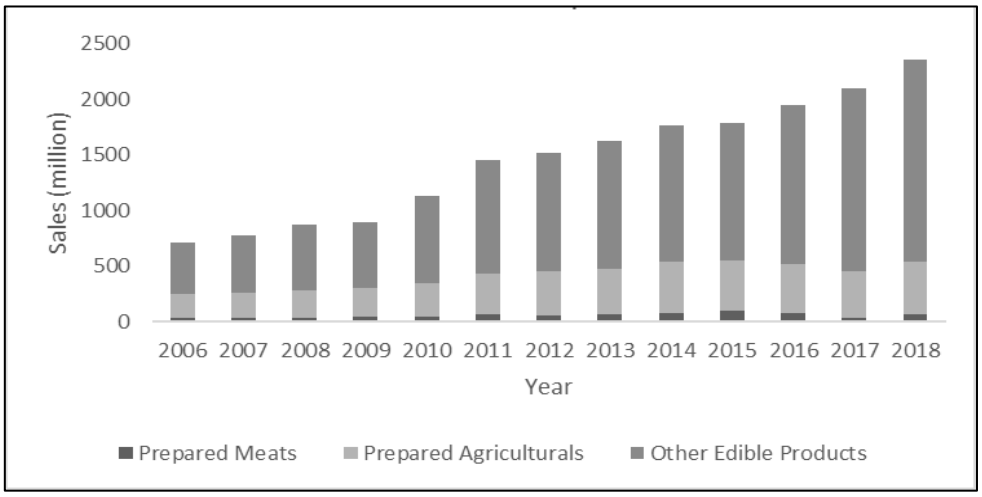
In a report by the Korean International Trade Association, senior researcher Park Ga-hyun asserted that the K-Wave which began with Kdramas and Kpop has now successfully expanded to include the Korean cuisine and lifestyle as well (Press Release, 2021). In 2021, the Ministry of Agriculture, Food and Rural Affairs (MAFRA) conducted an online survey of 8000 residents from 16 major global cities, concluding that 6 out of 10 people were familiar with Korean cuisine. When asked

what first comes to their mind on hearing k-food or 'hansik', the respondent selected several Korean delicacies such as bibimbap, Korean-style street fried chicken and bulgogi and associated them with reasons such as 'recently popular' and 'enjoyed by many people' (MAFRA, 2024). Such recognition can only be owed to the popularity achieved by Korean culture through entertainment. This large scale appeal has been utilized well by the Korean Government through the recently announced the 'Strategic Plan to Strengthen the Global Competitiveness' of the K-food Industry' which aims at amplifying the value of Korean food industry and boosting it to $224 billion by 2027 from $114 billion recorded in 2021 (MAFRA, 2024).

The instant noodle-based dish Chapaguri, which appeared in the Oscar-winning movie Parasite, had gained quick popularity and demand around the world. Similarly, the Dalgona coffee phenomenon had taken over social media after its feature in the Netflix-series Squid Game. Responding to this acclaim for everything Korean, packaged food producers in Korea have also tried to make their products distinguishable as Korean products. Korea Sisters developed a Kimchi seasoning mix, which became a top selling seasoning on Amazon in May 2019, in the two weeks of its launch, beating a popular Japanese spice mix. The dumplings market, which was dominated by Chinese dumplings, saw a major shift when CJ CheilJedang developed the Korean-style Bibigo Mandu. It gathered a revenue of $930 million, with 65% coming from abroad. US was the largest market for Bibigo Mandu, where it topped the Costco Wholesale dumpling section beating the Chinese Ling Ling dumplings which dominated the market for 25 years. This phenomenon also expanded into the fast food joints market, where the American brand Shake-Shack released a limited-edition Korean-style sandwich and Gochujang chicken bites (He-Rim, 2021).

Figure 2

Korea Food Imports



Source - National Statistics Office (NSO), Morgan Stanley Research

Over the past ten years, Korean food exports have boosted 10% annually. This growth is linked to growth in three areas; snacks, instant noodles and ready-made meals. These three categories have together accounted for almost 70% of the total overseas sales of Korean food for the past five years. In 2018, K-food exports generated around $5 billion revenue through exports and in 2019, the market share of K-food in target markets was 2.7%.

Jun & Park (2021) state that despite the worldwide COVID-19 pandemic, South Korea exported food valued at $4.3 billion to the world, marking a 14.7% increase from the $3.7 billion export in

2019. While the pandemic was still active, the exports reached $3.1 billion by August 2021, 8.6% higher than the $2.9 billion around the same period in the previous year (Press Release, 2021). This evidently shows how the food industry was able to withstand the impact of the pandemic due to the globalization of Korean culture, which brought unceasing demand for Korean produce.

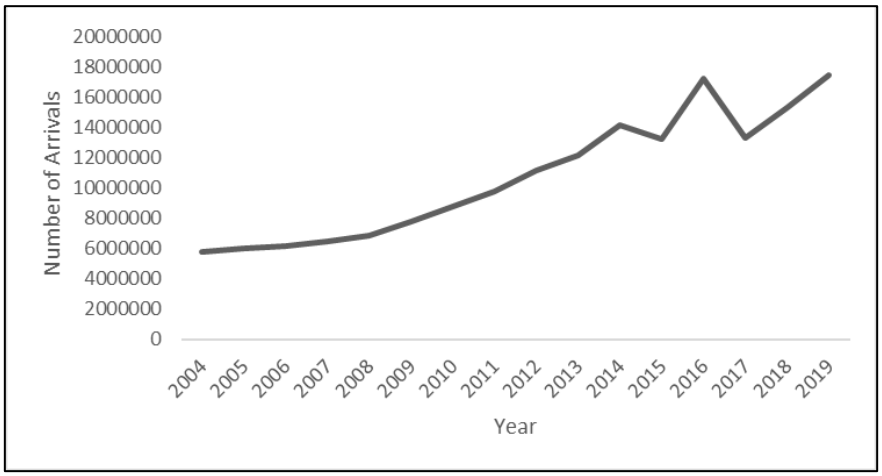
6.2.5. Tourism

Through the development of the entertainment industry, South Korea has been blessed with a wider reach of its social and cultural exchange. The filmography capturing the scenic beauty of the country has a worldwide appeal which pulls several tourists to the county in order to experience the rich culture and take a look at the touristic spots. The interaction of the Hallyu Wave with the tourism industry has led to this industry's growth and benefitted the GDP of the country. Similarly, the Government's intervention to promote tourism through Hallyu Wave acts in favor of their cultural policy exchange programme. The Government strategically partners with the global k-pop stars for promotions of Korean culture. Recently, the Kpop band NewJeans was appointed as the honorary ambassador by South Korea as a part of its initiative to promote tourism. They succeeded a long list of Korean celebrities, including the Squid Game star Lee Jung-jae and the Kpop band BTS (The Japan Times, 2024). This move grabs the audience's attention and creates a pull factor for them to visit the country. The tourists are also encouraged to purchase their products like electronic gadgets, beauty products, etc. during their stay. Korea's tourist arrivals consist mostly of people belonging to the US, Middle East, Asian countries, Europe, etc. Several music troops like BTS who enjoy a massive fan following over the globe also act as a factor contributing to the shooting up of the tourism industry. This feat has been achieved through organizing concerts and tours of these stars in the most picturesque locations of the country. The star's fanbase gets attracted to such events and are gradually dragged towards visiting the country. During the BTS World Tour 'Love Yourself:Speak Yourself' which concluded in Seoul, it was reported that around 187,000 tourists had visited the country for this out of which every 3 in 10 visitors went to Seoul (Joo-hyun, n.d., as cited in Z, 2019).

The line graph below also depicts the number of tourist arrivals that South Korea has seen over the years.

Figure 3

Trend of International tourists in Korea



Source - World Bank

With the beginning of the Hallyu Wave from 2004, the tourism industry has seen a significant impact. The number of international tourists arriving in the country shows a trend that this industry has been following over the years. Since the start, the Hallyu Wave has impacted the tourism industry in a positive way as a positive trend is visible in the graph. For instance, post the broadcasting of Korean drama "Winter Sonata" in Japan, the number of Japanese tourists visiting Korea from the year 2004 witnessed an increase by 35.5% compared to the previous year. Similarly the admiration for Korean TV dramas like Daejanggum, Autumn Fairy Tale, etc caused a craze among the fans further opening the gates for Korean Wave Tourism. A survey was conducted by the Korean Trade Organisation (KTO) in 2004 in order to understand the impact of the Korean Wave on its tourism. The results suggested that 47% of the respondents agreed to visit the Korean continent due to the influence of the Korean Wave (Bae et al. 2017).

The tourism industry impacted by the Hallyu Wave has also paved the way for employment creation. The Ministry of Culture, Sports and Tourism (MCST) along with the Korea Tourism Organisation (KTO) has been operating the ‘Creative Tourism Contest Project’. This initiative aims to create jobs in the country by integrating the tourism industry and leading to its development. It looks at partnering with the tourism venture businesses to keep the domestic tourism alive through innovation, openness and technology. This platform provides opportunities to young lads by showcasing their talent and also a chance to start a business of their own through financial aid. This project, though being in the initial stages, has shown some remarkable achievements. For instance, the “Dongju Salt Farm” programme on Daebu Island in Ansan contributed to the regional economy in the year of 2012 by leading to an increase in tourist visits by 6.2 times than the previous year. This programme enables tourists to produce and harvest salt by themselves. This has also had an affirmative effect on the revival of other businesses in the nearby area (OECD et al., 2014).

The Hallyu Wave has thus succeeded in creating a pragmatic effect on the entire Korean economy. The incorporation of the prominent sectors has led to positive remarks on the economy. It has fostered job creations in the field of entertainment. These creative employment opportunities have brought down the level of unemployment in the country. Similarly, it has also opened new scope for the exports by causing a significant increase in the revenue generated by them.

7. Limitations

1. *Sample size*

With the Hallyu wave gaining its limelight from over a decade, there has been lack of data availability which has led to the reduction of the sample size considered for quantitative analysis. Insufficiency of data has been a major drawback while conducting quantitative analysis. The availability of only 3 data points for the export data of the beauty and cosmetics industry fail to satisfy the minimum value of data points required for analysis. Through this, it has only been possible to statistically prove the result for a short time period. This has caused a difficulty in drawing inferences about the trend prevailing in that particular industry. The accessibility of export data over the years would have made it possible to draw comparative analysis between the pre and post Hallyu time period and understand the impact more deeply.

2. Extent of globalization

Although Korean exports to all of its trade partners are considered, all the countries in the world are not included in this list. Additionally, only the markets of US, UK, India and a few South East Asian countries have been considered, hence this paper falls short of exploring the global impact of the entertainment industry of Korea.

8. Conclusion

The widespread acceptance of Korean culture has been pretty evident with the extent of the Hallyu Wave and its incorporation in everyday life by people of other demographics. The assimilation of the entertainment industry through Hallyu has been strategically used as a soft power by the Korean country to change its perception and create an impression. The country's cultural policy has succeeded in achieving this fate by having an influence on several factors like food, fashion, tourism, beauty, etc. The Hallyu Wave has put a step forward in improving the country's exports to its neighboring countries. This movement has also provided aid to the country during the COVID-19 pandemic through job creations.

The Korean Wave hence proves to be a solution for the country in economic aspects. However, with the growing popularity of the entertainment industry, there has been an increase in demand for Korean content. This has created a lot of mental pressure on the stars taking a toll on their mental health ultimately leading to an increase in suicide cases. Similarly, the Hallyu Wave lacks to have a strong impact and aid in the country in formation of foreign treaties and policies with the other international players. The impact generated by this Wave however can't be generalised as the only factor for the growth seen in the industry. The insignificant relationship established in the tourism sector suggests how there are factors other than Hallyu Wave that have a strong relationship with the sector's growth. It opens the window to conduct a more detailed analysis. These points expand the scope of research on the social and international components of the Hallyu Wave.

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Appendix

A) Entertainment and Beauty and Cosmetics Industry

Table 5

Year	Number of viewers	Exports ($ millions)
2019	95987241	6554
2020	121514867	7572
2021	156607448	9182

Source: KF Statistics Center, International Trade Administration

B) Entertainment and Food Industry

Table 6

Year	Number of viewers	Exports ($)
2014	29795329	3848164.81
2015	35584259	3310579.73
2016	54705703	3638908.31
2017	60997585	4319546.03
2018	86198008	5129953.28
2019	95987241	4995724.83
2020	121514867	4592096.52
2021	156607448	5096364.09

Source: KF Statistics Center, WITS

C) Entertainment and Tourism Industry

Table 7

Year	Number of viewers	Number of tourist arrivals
2014	29795329	14202000
2015	35584259	13232000
2016	54705703	17242000
2017	60997585	13336000
2018	86198008	15347000
2019	95987241	17503000

Source: KF Statistics Center, World Bank

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Deconstructing the Impact of Immigration on Economic Outcomes: Evidence from the USA, Canada and Norway

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Immigration has been theorized to be one of the primary drivers of economic change and a pivotal factor in shaping the economy of a country. This paper attempts to examine and understand the consequences of immigration on popular macroeconomic indicators namely, unemployment, GDP growth, wages, innovation and labor force participation, with its focus on Canada, the U.S.A, and Norway, from 2012 to 2022. The analysis utilizes a fixed effects panel regression model to investigate the relationship existing between the chosen indicators and immigration levels. The results of our analysis reveal that immigration leads to a significant decrease in the rate of unemployment in a country. Its impact on GDP growth is observed to be positive, albeit statistically insignificant. No statistically significant effects were observed on the remaining macroeconomic indicators. This paper underscores the nuanced, complex and context-specific impact of immigration on a nation's economy and the importance of implementing correct policies which align with the economic goals of said nation. The recommendations are directed at the optimization of immigration and subsequent holistic economic integration. They include targeted policies that are aimed at shortages or other requirements in the labor markets. These recommendations advocate the implementation of policies that optimize the contribution from the immigrants and ensure balanced immigration to prevent any danger of putting strain on the host country's economy. The stated policy recommendations also aim to bring about a control in migrant levels, whilst laying emphasis on welfare programmes and quotas. This paper aims to contribute meaningfully to the current global discussion on the roles of immigration in development of an economy.

***JEL Classification**: J60, J61, O51, O52*

1. Introduction

The UN Migration Agency, International Organization for Migration (IOM), has defined a migrant as any person who is moving or has moved across an international border or within a State away from his/her habitual place of residence, regardless of the person's legal status, or whether the action was voluntary or not (IOM, n.d.). Immigration is a significant topic that is brought up whenever a country's economic policies and political stances are discussed. Economists are divided on the role of immigration and its effects on the economy of a country. According to the ones in favor of it, immigration could positively influence the economy by introducing needed labor to the workforce, expanding the base of consumers for products, and complementing the rate of innovation in the country. However, critics regard it as something that has the possibility of being very dangerous if not controlled properly. They are of the opinion that large scale immigration can reduce wages for native workers, thus reducing average overall wages. They believe that it can lead to a spike in unemployment rates and put severe pressure on any public welfare services implemented by the host country (The New Americans: Economic, Demographic, and Fiscal Effects of Immigration, 1997).

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The United States has witnessed the highest number of immigrants, with over 70 million immigrants in the U.S. since 1965 (Natarajan et al., 2022). Around 18 million of those immigrants have come from Mexico, making up the largest wave of immigration from a standalone country to the U.S. (J. Passel, J. Krogstad, M. Moslimani, 2024). In 2022, the number of immigrants (both legal and unauthorized) living in the U.S. reached a high of 46.1 million, accounting for 13.8% of the population (J. Passel, J. Krogstad, M. Moslimani, 2024).

Migration and immigrants impact economies and labor markets in a variety of ways. This impact is often concentrated in certain sectors, occupations, and geographic areas. The impact of immigration on the labor market and public finances also brings the issue to the forefront of the political debate. It is therefore critical to have sound data and analysis to present the evidence. (Migration. (n.d.). OECD.) The OECD publishes its own statistical data to show refugee intake and its impact on economic parameters, which serves as one of the bases for our analysis. However, it is important to understand that each country differs in its policy-making and administration, and immigration policies could be over a broad spectrum, ranging from extremely lenient to relatively strict. After much contemplation, Canada, the U.S, and Japan were found to best represent the range of policies we desire. Thus, a study of the impact of such policies on the economy becomes imperative.

With each coming year, countries have been known to “welcome” a diverse cohort of migrants and asylees. Canada, too, is no exception to this case. For example, in 2022, over 75000 refugees landed on Canadian soil, hoping to better their economic prospects (Annual Report to Parliament on Immigration, 2022). As one may expect, the influx of migrants and refugees increases the skilled workforce of the nation they migrated to. Furthermore, we expect to see increased labor force participation, and a greater supply in the labor market. This leads one to theorize how exactly this newly increased workforce impacts other economic parameters, such as growth in Gross Domestic Product (GDP), number of patents issued, etc. All in all, we are investigating the favorability of introducing new laborers and workers into an economy and suggesting new policy implementations to better the given situation.

2. Objectives

1) To explore and determine the impacts that immigration policies have on the economic health of the host country.
2) To compare how varying levels of immigration affect the common economic metrics namely Gross Domestic Product, average wages, labor force participation, and innovation of the host country.
3) To offer empirical evidence and recommendations that may inform future immigration reforms.

3. Literature Review

Immigrant assimilation into labor markets varies, with immigrants generally earning less than natives initially but partially converging over time. Immigration's effect on native wages and employment is generally small. However, low-skilled immigration may negatively affect low-skilled native workers. Immigrants may have a small net fiscal impact on public finances. Highly educated immigrants contribute positively, while low-skilled immigrants may place a burden on welfare systems, particularly in countries with generous social benefits. Immigration has both positive and negative economic impacts, with variations depending on skill levels, the host country's policies, and

the composition of immigrant populations. Most impacts on wages, employment, and public finances are modest. (Kerr, S. P., & Kerr, W. R., 2011)

OECD country-wise statistics (2022) describing recent developments in international migration. provide an overview of recent developments in international migration movements and labor market inclusion of immigrants in OECD countries. The first section analyses the evolution of international migration flows over the last decade, up to 2022. It covers both (permanent-type and temporary migration, as well as the category of migration. The chapter then examines international student mobility and recent trends in asylum requests and international protection grants in OECD countries. It then looks at the demographics of migration flows (gender and origin), the evolution of the share of the foreign-born in the population and the acquisition of nationality in OECD countries. The second section of the chapter examines trends in the labor market outcomes of immigrants over the past two decades. Detailed analysis by sociodemographic characteristics and region of origin is provided. (Home, n.d.) This analysis shows country -wise migrant intake and tabulates it demographically. Furthermore, the study highlights where exactly a certain pool of migrants comes from and how the immigrants of a particular country can be split according to their origin.

It is no unknown fact that immigration does affect public goods and services. It just doesn't necessarily do it through a rise in crime. Studies show that regions having populations with higher numbers of immigrants often experience strain on housing, healthcare, transportation and education infrastructure. Canada, for instance, has seen shortages in housing and higher rental costs particularly in urban areas. This has been attributed to a large influx of immigrants in the country, many of whom take up residence in such urban areas in search of employment. These pressures have driven up public investment needs and household expenses (Brookfield Institute, 2020). Similarly, the universal healthcare system employed by Canada, faces increased demand, leading to longer wait times, especially in areas with higher immigration populations (Friesen, 2022). In the United States of America, immigrant families are often seen to be relying on public education and healthcare. The National Academies of Sciences, through a study conducted in 2017, noted that while second-generation immigrants are typically found to be contributing more to public finances than they consume. However, first-generation immigrants may initially be a financial burden due to their reliance on public goods. Norway, with its highly conservative policies, has avoided such pressures to a great extent but still finds it a challenge to achieve holistic integration of immigrants into its welfare-dependent society (OECD,2022).

Lundborg and Segerstrom (2000, 2002) include migration in a quality ladder growth model developed by Grossman and Helpman (1991). They find that free migration would stimulate growth, especially if it responds to differences in labor force endowments. (Boubtane, E., Dumont, J.-C., Rault, C., 2014) Similarly, in an expansion-in-variety framework, Bretschger (2001) shows that skilled migration can promote growth by decreasing the costs of research and development and also by raising the market share of certain types of goods. Most of the previous studies are theoretical and there exist very few empirical assessments of the impact of migration on economic growth (Boubtane et al., 2014).

Economic and social outcomes are shaped by a country's choice to adopt a temporary or a permanent immigration model. The United States and Canada have implemented predominantly permanent immigration policies. These policies have been aimed to integrate immigrants into the

respective societies, while contributing to long-term sustainable economic growth. Canada's Express Entry system and provincial nominee programs are quite effective at attracting skilled workers who prove to contribute positively to the labour market and also to the growth of the nation's GDP (Brookfield Institute, 2020). On the other end of the spectrum, we have countries like the United Arab Emirates and others in the Gulf Cooperation Council rely primarily on temporary immigration models. Their immigration policies are designed in a manner which ensures labour shortages are met without offering any form of long-term residency or permanent citizenship. This approach, while considerably effective in addressing immediate labour needs, often leads to socio-economic segregation, as such temporary workers do not have access to welfare programs and opportunities for social integration (ILO, 2018).

Longhi et al. (2008) show that the impact of immigration on the labor market is quantitatively very small and often statistically insignificant. The study also finds that the impact may be greater on labor force participation and employment than on wages. The impact may be greater on the overall labor force participation and on employment than on wages of laborers. The greater the impact the less locally born have the opportunity to 'escape' a potentially harmful impact through other adjustments. The study suggests that policymakers should consider this finding while formulating policies that aim to increase the wellbeing of both immigrants and the host country population.

Immigrant employment outcomes vary across different dimensions, including immigrant class, length of time in the country, and educational attainment (Picot & Sweetman, 2011). Refugees and family class immigrants have lower employment rates compared to skilled economic class immigrants. Canada has a higher percentage of immigrants with higher educational levels and language skills, which may contribute to their better labor market outcomes. Canada's immigration policy is far from static, and changes are being made to improve the economic outcomes of entering immigrants. The study concludes that Canada's managed immigration system has been successful in integrating immigrants economically and socially, and that other countries may benefit from undertaking a large-scale detailed international comparative study of relevant comparator countries' processes and policies.

The relationship between immigration levels and crime rate remains highly debated and without a conclusive result. While some studies argue that crime rates are not affected, or minimally affected by immigration, others suggest the improper management of incoming immigrants can highly exacerbate criminal activities. The National Bureau of Economic Research in 2021, found that there existed no significant correlation between influx of immigrants and crime in the United States. This suggests that immigrants are less likely to engage in illegal activities than the native-born population. However, the rise of undocumented immigration creates its own set of challenges. It can create highly profitable opportunities for exploitation, corruption and may also fuel the growth of the underground economy. For example, temporary worker programs, like those existing in the Gulf Cooperation Council countries, can often lead to unregulated labour practices. This contributes to a parallel black economy (ILO, 2018). In the United States, undocumented immigrants are particularly vulnerable to underpayment and poor working conditions. This vulnerability has been linked to gaps in administrative oversight (Economic Policy Institute, 2022).

4. Hypothesis

1) Immigration levels and economic growth are positively correlated.
2) Countries with relatively open immigration policies demonstrate faster economic growth in contrast to countries with restrictive immigration policies, which demonstrate relatively slower economic growth.
3) Higher levels of immigration correspond to higher levels of innovation in the host country, and thus demonstrate a directly proportional relationship between the two.

5. Methodology

This research paper has employed a quantitative approach to examine and thoroughly analyze the impact of immigration policies on economies of the host countries.

5.1. Sample Selection

In order to accurately represent the wide spectrum of immigration policies that are in place around the globe, three countries with varying strictness of immigration policies have been selected. The countries that have been chosen are: Canada - representing the more liberal and inclusive end of the spectrum; the United States of America - a country that implements a relatively open yet stringent immigration policy; and, Norway - representing an extremely strict immigration regime. The selection of these countries provides a basis for a comparative analysis of all the diverse frameworks that exist regarding immigration policies and also the effects of the same on the economies.

5.2. Metrics and Time Period Chosen:

Data has been collected annually, for the period of a decade, keeping base year as 2012, with the primary goal of ensuring consistency over time and for ease of comparability. The metrics chosen to represent immigration statistics are the number of people obtaining permanent residency in the country, number of refugees entering the country, and the number of temporary documents such as visas issued. The metrics that have been selected to represent economic performance are absolute values of Gross Domestic Product, % change in Gross Domestic Product, labor force participation, and average wages for the residents of the country. The number of patents filed have been taken as a numerical measure of the level of innovation in the country.

5.3. Model Specification

A fixed effects panel regression has been used to study the relationship between the independent variables and the dependent variables. Here, a single regression equation for each economic indicator is acquired, which accounts for the differences across countries by including a fixed-effect or unique factor for each country. This approach enables the model to absorb or take into account the country specific factors by allowing each country to have its own unique baseline level for the dependent variables, while the impact of immigration is assumed to be constant across the countries, thus allowing for a more precise measure of the immigration levels on the country's economic indicators.

The regression equation is of the form:

$$Y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it}$$

where:

Y_{it} represents the dependent variable for the country i in the year t.
α_i is the fixed effect for each country i, thus helping to capture the time invariant characteristics that are unique to each country.
β represents the coefficient of the impact of immigration on the dependent variable across all countries. It is assumed to be constant.
X_{it} is the immigration level for the country i at time t.
ε_{it} is the error term.

5.4. Regression

To explore the effects of immigration on various economic indicators, each metric of economic growth or innovation will be treated as a dependent variable in separate regression analyses. This will be executed in a systematic manner, to ensure comprehensive coverage of the potential relationships.

6. Analysis

6.1. Qualitative Analysis

6.1.1. United States of America

The USA saw fluctuation in the number of immigrants between the years 2012 to 2022. There was significant growth from 2015-2019, which was followed by a recession in 2020, caused by the global pandemic. Economic safety measures like the CARES (Coronavirus Aid, Relief, and Economic Security) Act in 2020, were aimed to stabilize the economy and were not deemed to have affected the rate of immigration. Such acts were not directly related to immigration. As the GDP rebounded in 2021, with the recovery of the economy, the immigration numbers started climbing too. The most likely cause for this would have been the pent-up demand for labor in the country and the easing of the travel restrictions imposed during COVID-19. (Dcallahan & Dcallahan (2023), Cohen (2024)).

Different administrations have also had influences on the number of immigrants the country took in. Two administrations existed during the time period selected. The Obama Administration (2012-2017) introduced the Deferred Action for Childhood Arrivals (DACA) program. This program allowed for the temporary protection for any undocumented immigrants who had been brought to the country as children. It thus affected undocumented immigrants rather than the documented ones. Although our paper focuses only on documented immigrants, this program is worthy of being mentioned as it influenced public opinion, by leading to heightened awareness and division on the policies of immigration as a whole. This polarization may have been enough to affect the making of decisions regarding policies concerning the documented immigrants. This is reflected by the subsequent measures of the Trump Administration (2017-2021) which are regarded as restrictive and were aimed at reducing both documented and undocumented immigration. Such measures also included the suspension of visas of certain categories of foreign workers. Public opinion on the issue of immigration

too became more polarized during this period. Heightened scrutiny on the applications for visa and asylum, coupled with the restrictive policies likely contributed to the significant decrease in the number of incoming immigrants.

6.1.2. Canada:

The trends of immigration to Canada show a strong increase from 2016 to 2022. This is the result of the progressive immigration policies that have been implemented under the administration of Prime Minister Justin Trudeau. The Trudeau administration, which began in 2015, focused on increasing the immigration levels in order to supplement and support the growth of the economy and also to offset the aging population of the country. Some of the programs and initiatives that were introduced under this policy were the Express Entry System (2015) and the Provincial Nominee Program. This helped Canada attract skilled immigrants with more efficiency. The opinion of the public towards immigration has generally been positive and favorable. The consensus is that immigration is beneficial for both the country's economy and its diversity. With respect to the economic indicators, it can be seen that they are aligned with the immigration trends. The GDP growth rate increased along with the immigration numbers, in 2017 and 2018. This suggests the presence of a correlation between economic stability and the ability of Canada to attract immigrants. Canada suffered a minor economic setback in 2020. However, the economy quickly recovered and even immigration rose in 2021. This evidences the commitment of Canada to maintain high levels of immigration, even amidst global challenges like pandemics.

6.1.3. Norway:

The immigrant intake of Norway, when compared with those of the USA and Canada, are much lower. This can be attributed to the more conservative approach towards immigration taken by Norway. Norwegian policy has always focused on having stringent controls and restrictive measures, especially regarding immigrants from non-European Union countries. Public opinion has also affected decision making, with rising concerns about the socio-economic impacts of increased immigration on the welfare system. In the early 2010s, Norway saw a significant increase in immigration, following which, the government implemented measures to reduce the dependency of immigrants on social benefits - including much stricter requirements for achieving residency and citizenship. This explains the gradual decline in the number of documented immigrants from 2015 to 2019, with policies becoming more selective.

Another important reason for the decline in immigrants can be explained by the fluctuations in the Norwegian oil and gas industry. Norway is a country that is heavily reliant on oil. In 2022, the oil and gas industry accounted for nearly 73% of Norway's export value (Ministry of Energy and the Norwegian Offshore Directorate). According to the IMF, Norway's oil revenue accounts for 4.3% of its Gross Domestic Product, much higher than the OECD average of 0.2%. Norway experienced fluctuations during the time period that has been chosen. Norway's GDP saw a dip in 2015 and 2016, caused by a dip in oil prices. This may have indirectly impacted immigration, as economic conditions could have influenced job availability. By 2021, the GDP recovered and the number of immigrants rose, potentially driven by the demands of the labor market and economic recovery efforts implemented by Norway.

Thus, it can be seen that each country's immigration numbers show a strong correlation with the policy shifts, especially during periods of restrictive measures or expansionary and open policies. Higher immigration numbers can also be seen coinciding with periods of economic growth and stability, thus indicating the possibility of the existence of a cause-consequence of correlative relation between the two. Public opinion has also influenced major immigration policies, especially in the USA and Norway, where the concerns regarding job security and social integration of immigrants have contributed to more restrictive measures. Contrastingly, Canadian sentiment towards immigration, regarded as favorable, aligns with higher immigration levels.

6.2. Quantitative Analysis

The aim of our regression analysis is to determine the relationship between immigration and the various economic and innovation level indicators such as unemployment rate, GDP growth rate, average wages, patents filed, and labor force participation rates (both male and female). For this regression, a multivariate panel regression model was chosen. Further, a fixed-effects model has been employed. This was done to account for unobserved heterogeneity across the three countries - USA, Canada, Norway, over the years (2012-2022). With the use of a fixed-effects model, we are able to direct our focus on the within-country variation over time, thereby isolating the effects of immigration on the economic outcomes without the worry of there being interference from time-invariant factors like geographical location, educational and skill levels of the native population, etc.

Table 1:

Results

Term	Estimate	Std Error	t-stat	P value	Dependent Variable
Immigrants	-0.00000484	0.00000201	-2.41	0.0223	Unemployment Rate
Immigrants	0.00000676	0.00000355	1.91	0.0667	GDP Growth Rate
Immigrants	-0.0031	0.0101	-0.308	0.761	Average Wages
Immigrants	-0.027	0.0399	-0.676	0.504	Patents filled
Immigrants	0.00000246	0.00000311	0.791	0.435	Labor force Participation (male)
Immigrants	-1.09E-07	3.07E-07	-0.355	0.725	Labor force Participation (female)

The above table effectively summarizes the results of the regression model. The regression analysis has investigated six economic indicators as dependent variables, namely - Unemployment Rate, GDP Growth Rate, Average Wages, Patents Filed, Labor Force Participation Rate (Male) and Labor Force Participation Rate (Female). Immigration has been kept as the sole independent variable. This setup enables us to freely investigate the direct effect of immigration on each of these unique economic indicators, while also controlling for any unobserved country specific factors (geographic and strategic location, social welfare systems, etc.).

6.2.1. Unemployment Rate

Immigration is found to have a negative impact on the rate of unemployment. The statistical significance of this relation is evidenced by the p-value of 0.0223. The negative coefficient implies that as immigration increases by one unit, it is associated with a slight decrease in the unemployment

rate of the population. This finding supports the hypothesis made by other researchers that immigrant increase may lead to reduction in unemployment. This may potentially be explained by the theory that immigrants fill up the labor market gaps, thereby stimulating job creation. This outcome is aligned with several economic theories which suggest that immigrants generally take on job roles that prove to complement rather than entirely substitute the local labor force, thus reducing overall unemployment levels. The Canadian Labor Market Information Council in 2020, found that employment is positively affected by immigration. This is evident in high-skill sectors such as IT and healthcare. Immigrants address shortages in labor. The Canadian programs like the Express Entry, which specifically target skilled immigrants, has led to lower unemployment figures in those sectors (Brookfield Institute, 2020). Aydemir and Sweetman (2018) supports the theory that immigration policies aligned with the needs of the labor markets are essential for a favorable employment impact. In the US, the National Bureau of Economic Research in 2018 concluded that in the US, high skilled immigration had no adverse impacts on the unemployment rates in the country. These immigrants were often found to be filling up the roles that were unfilled by the natives. This includes positions in fields like tech and research. The comparatively restrictive policies that were implemented between 2017-2020 created challenges by leading to a reduction in the number of skilled immigrants entering the country. This may have limited the flexibility in the job market and opportunities in some sectors (Clemens et al., 2019). According to the Norwegian Ministry of Labor and Social Affairs (2018), the industries of oil and healthcare, reported shortages in labor that were not alleviated by the stricter immigration policies. This indirectly limited the creation of jobs in these sectors due to unmet demand for skilled labor.

6.2.2. GDP Growth Rate

The coefficient for the impact of immigration on the growth rate of the country's GDP is positive, albeit slight. However, since the p-value is greater than 5%, we are unable to effectively conclude that this relationship is statistically significant. Immigration may have an insignificant impact on the growth rate. While the outcome indicates a positive relation between the two, it would be unwise to definitively conclude that immigration has a positive impact on the GDP growth rate. Nonetheless, the positive relation does align with research which suggests that immigration proves to stimulate economic growth by contributing to the expansion of the labor market and increase in productivity of labor. Studies from the Brookfield Institute (2020), are found to be supporting the notion that immigrants significantly contribute to the growth of Canada's GDP, particularly in fields like tech and healthcare. During the pandemic in 2019, these sectors immensely benefited from skilled immigrants. This helped to maintain the stability of the economy. In 2019, the OECD report further confirmed that the immigration played a hand in boosting the GDP, particularly in sectors like service and other knowledge-based industries. This illustrates the economic value of Canada's open immigration policies. Clemens et al. (2019) concluded that in the US, immigration has been positively influencing the GDP. The National Academy of Sciences (2017) laid emphasis on the direct contribution of the immigrants to the economic output, particularly in the industries that face labor shortages. Norway's conservative policies have been limiting its ability to leverage potential economic growth through immigration. Norway's GDP is highly dependent on the Norwegian oil and gas industry. This sector faced labor shortages during the crucial period in which the price of oil recovered (2016-2021). In the opinion of the International Monetary Fund (2021), these shortages may have hampered faster recovery of the country's GDP.

6.2.3. Average Wages

The coefficient is negative with a high p-value of 0.761. This indicates that immigration does not have an impact on average wages, that can be considered as being statistically significant. These values suggest that immigration may not be affecting average wages in a meaningful way. This may be explained by the theory that immigrants may occupy jobs at various wage levels or in sectors where they are not direct competitors of the native workforce. This leads to the neutral or minimally positive effect of immigration on the average wages. Demand for labor has helped stabilize or very slightly increase wages by the adrenal of critical skill shortages in high skill sectors. The Canadian Immigration Policy Research Group, in 2019, found that Canada's policies and programs like the Express Entry system, helped stabilize the average wages in sectors like engineering, healthcare and IT. The absence of any kind of depression in the wages in these sectors reflects the effectiveness of Canada's policy in matching immigrants with the needs of the industry. Low skilled workers exerted some pressure in specific sectors on the wages while high skilled ones had a positive impact on the wage growth (Peri, 2016). However, after 2016, immigration restrictions proved to slow down this trend. In Norway, restricted immigration led to labor shortages, which in turn led to higher wages in industries like elder care (Norwegian Directorate of Immigration, 2018). This meant that certain sectors faced increased costs as wages were raised by the employers in an attempt to attract local talent.

6.2.4. Patents Filed

Immigration's impact on the number of patents filed turns out to be statistically insignificant. This suggests that immigration does not have a measurable effect on the innovation metric of the country. The lack of an impact could in fact be attributed to the varying roles of the immigrants in the economy, with a considerable part not being directly involved in research and development, in most of the cases. Alternatively, the impact of immigration on innovation may not be suitably captured by the number of filed patents alone. Studies like Ottaviano and Peri (2020) and Clemens et al. (2019), suggest that innovation has been partly driven by immigration in the US. Immigrants played an important role in Silicon Valley, by contributing to patents and startups (Wadhwa et al., 2011). For Canada, research by Sá and Treitler (2019) revealed that highly skilled immigrants directly boosted the country's innovation output. Skilled immigrants are found to contribute a lot to Canada's R&D. The Norwegian Ministry of Trade, Industry and Fisheries notably found that challenges were faced in R&D due to the shortage of high-skilled workers of foreign origin. This limited patent output. All this indicates that immigration drives innovation, something that is contrary to the regression result. This may prove that the number of patents filed may not be a suitable variable to gauge a country's innovation output.

6.2.5. Labor Force Participation Rate (Male)

The high p-value of 0.435 does not evidence a statistically significant relationship between immigration statistics and the rate at which males participate in the labor force. There is no significant influence that can be measured. A possible reason may be that the male labor force is already near full employment (Immigrants Are Not Hurting U.S.-born Workers: Six Facts to Set the Record Straight, n.d.), thus hindering the marginally positive effect that immigration may have had on the male labor force.

6.2.6. Labor Force Participation Rate (Female)

Similar to the effect of immigration on male labor force participation, in this case too, there is no significant impact on the female labor force participation. This result suggests that the entry of immigrants into the country does not notably affect the participation rate of women in the labor force of the country.

The lack of significant impact on the labor force participation by the immigration levels, might suggest that the native labor force is largely unaffected by the immigrants. Thus, the concern over immigrants taking away jobs at an unsustainable rate from the natives, may be insignificant, which aligns with research that shows that immigrants may take jobs but they also create new jobs through their spending in the local economy and by starting businesses. The Conference Board of Canada (2019) found in their research that immigration levels did not affect the overall labor force participation rates in Canada. This was due to immigrants usually filling up gaps in the labor market without displacing the domestic workers. Similarly, the American Immigration Council (2018) found that the participation of the labor force is not significantly impacted by immigration. Immigrants were found to stabilize the overall participation rates. According to the Norwegian Labor and Welfare Administration (2020), the restrictive policies of Norway regarding immigration, meant that immigrants could not have much of an effect on the labor force participation rates. The employment levels of natives in sectors like oil, remained unaffected due to fewer foreign entrants into the required workforce.

The fixed-effects analysis reveals that immigration significantly improves the employment levels of the country. Thus, immigration may lead to reduction in the number of people unemployed in the country. While the coefficient of impact on GDP is positive, the lack of statistical significance leads to the inability to say with confidence that the effect can be considered. Furthermore, there is no undeniable evidence for its impact on average wages, patent filings, or labor force participation rates.

Our findings indicate that even though immigration does have influence over certain economic outcomes, namely unemployment and GDP growth rate, the broader effects and impacts are likely more limited or even more complex in nature, than anticipated. This analysis highlights the importance of factors that are considered to be context-specific, such as structure of the local labor market and the potential roles filled by the immigrants. These factors may have a hand in mediating the overall impact of immigration on the economy.

Thus, through the fixed effects model, it is seen that the only variables that can be considered as being somewhat significantly affected by immigration are unemployment rate and GDP Growth rate. Thus, the regression equations obtained for them are:

$$\text{Unemployment Rate}_{it} = \alpha_i + \beta_{UR.}X_{it} + \varepsilon_{it}$$
$$\text{GDP Growth Rate}_{it} = \alpha_i + \beta_{GDP.}X_{it} + \varepsilon_{it}$$

7. Policy Recommendations

As expected, some of these factors were greatly influenced by the influx of immigrants. Notably, the strongest relationship was seen between immigration and the prevailing unemployment rates in a particular country. Besides this, immigration was practically seen to have a positive effect on the GDP of a nation. Historically, policy-making has included the introduction of several immigrant welfare and welfare programs, to protect them from deportation. For example, one of the federal policies of the United States includes the DACA (Deferred Action for Childhood Arrivals) program, an administrative relief that protects eligible immigrants who came into the USA when they were children, from deportation (What Is DACA? - Undocumented Student Program, 2023). The DACA program sets down strict guidelines with regard to who may be eligible, whilst giving undocumented immigrants protection from deportation, as well as a work permit. Such programs might be the way forward, if implemented in an appropriate manner. However, policy-makers must understand the various profiles of industries before allowing younger laborers to be integrated into them. The unorganized sector, in several countries, is characterized by low wages, a lack of job security and absence of any legal protection. Thus, policy-makers should carefully elucidate the clauses of such a program, by which the rights of laborers, who may even be only sixteen years of age (as allowed by the DACA program) are not exploited, which further hampers the socio-economic profile of the country.

To bolster the number of skilled laborers who enter into their country over time, the USA should make consistent efforts towards improving the Temporary Protected Status (TPS) program, under which certain undocumented workers are granted a special status, by which they may work and are protected, by law, due to the presence of life-threatening conditions in their own country. This program has, in the past, been strengthened during the Biden administration, and conversely has been weakened during the Trump administration. Today, there are roughly 4,72,000 Venezuelans (U.S. Allowing Hundreds of Thousands of Venezuelans in The Country to Work Legally, 2023), who enjoy this privilege, due to decisions made during the Biden administration. Such programs also foster the integration of several other communities into the local community, which enhances diversity and paves the way for economic development. Moreover, a nation like the USA must evaluate its rate of human capital formation, as well as the job opportunities available to such protected workers, so that they may not remain marginalized and are able to contribute to the national output. The U.S. leads globally in the field of innovation partly due to its ability to attract and retain global talent through programs like H-1B visas. There must be an expansion in visa caps for skilled workers and a simplification of the green card obtainment process for STEM professionals and entrepreneurs. An expansion in the Temporary Protected Status (TPS) can also help in controlling immigration in the US. Furthermore, restrictive policies have led to labour shortages in key sectors like elder care and healthcare.

Canada, as a country, is slightly different in this aspect. Canada boasts having a large proportion of its population in the form of immigrants - roughly one-fifth (Topic: Immigration in Canada, 2024), as of a 2023 census. However, Canada also allows a plethora of ways to gain citizenship as well as work permits and licenses. In 2022, it was seen that 58% of immigrants were admitted through economic pathways, and only about 22% of them were admitted via family connections (Roy, 2024). Some might say that Canada’s immigrant intake may be deemed to be “too much” (Roy, 2024). There

is some merit in this side of the argument, though. Excessive immigrant intake can tamper with the demographic profile of a nation, and may also adversely affect its rate of formation of human capital. Though, historically, the Canadian administration has been inclined towards multiculturalism, there exists a certain upper limit to this. The brunt of the “overcrowding” problem may have been borne by Canada in recent years, with an unprecedented rise in the demand for housing facilities and social services, thereby putting pressure on administrative authorities. One of the aspects Canada must prioritize is a reduction in the immigrant intake target, which, according to a poll conducted by polling firm Leger, is presently “too high.” Presently, there are almost no legal enforcements by which Canadian firms can ban undocumented workers or restrict their presence. Such judicial changes will have to be made, to limit the ill-effects of having too much labour at a firm's disposal. Controversially, some might be of the opinion that the federal immigration agency might be inefficiently allocating its funds. Presently, almost three-quarters of its funds are being spent on settlement programs, by means of which immigrants gain access to orientation programs, skill training, social services and ways to integrate with the already existing population. This has made Canada one of the most sought-after destinations to migrate to, with unprecedented rates of immigration into the country. (Roy, 2024) This might not be so favorable, with the present communal violence, as well as wasteful spending on immigration detention. Perhaps, the federal immigration agency will have to rethink its present strategy, with regard to the allocation of funds and allow audits, inquiries and drafting of government reports to better the situation. Any policy targeted towards increasing or decreasing immigration must be ideated after taking into consideration the composition of the new population entering into the country. Increasing immigration quotas puts immense strain on housing facilities, as well as natural resources. Thus, immigration quotas must be implemented in a manner, such that the rate of expansion of essential services like healthcare and housing are not exceeded by the rate of growth of population. Canada’s economy is heavily reliant on its traditional industries namely real estate, forestry, and mining. This limits its innovation potential. However, certain policy changes can prove to be helpful here. The government must incentivize skilled immigration in technology and R&D sectors through specialized visa pathways and increased funding for innovation and technology hubs.

As for Norway, in today’s day and age, roughly 16% of its population (PISA 2022 Results (Volume I and II) - Country Notes: Norway, 2023) comprises first generation immigrants who arrived on Norwegian soil in the past, and were the first in their family to do so. Despite this relatively high proportion of immigrants, as compared to other Nordic countries, internationals still tend to find it difficult to land a job of their choice in Norway. Furthermore, a permit is required for several administrative and corporate jobs, for which the applicant must undergo a lengthy application process. If required, certain investigations are also carried out, due to which the process takes a bare minimum of 8 weeks (Norway Work Visa - Process, Requirements and Fees., 2022) to attain completion. In many workspaces, there tends to be a language barrier, which further adds to the problems of internationals seeking employment in Norway. Thus, investment in immigrant administration might be the need of the hour, such that potential barriers to workforce security are removed, and a smoother work permit is propounded. Furthermore, funds should be heavily diverted towards the country’s Integration Policy, as well as its Cultural Orientation Program (NORCO). Both these programs will foster better integration of internationals into local committees. NORCO, solely, will also increase labor market participation by placing heavy emphasis on formal education, skills and qualifications. However, Norway must exercise a proper filtration process, to prevent undocumented refugees from settling into the country, under the pretext of being an asylum seeker by crossing other

foreign borders. In 2015 and 2016, European countries, including Norway, experienced what became known as the “refugee crisis”. In 2015, mostly in the second half of the year, Norway received an unprecedented 31,145 asylum claims, including 5500 from individuals crossing the Russian-Norwegian border. In Norway, as elsewhere in the Global North, before, during and after 2015, government and civil society actors employed the humanitarian crisis label, and frames of disorder and calamity to make sense of the increasing number of migrants. These people, often fleeing conflict and humanitarian crises in other countries, were seen as the cause or “site” of an unprecedented “crisis” in Norway. (Jumbert et al., 2023) Thus, adequate border control, as well as a thorough analysis of those entering into the nation must be carried out. These initiatives will also help better the socio-economic conditions of migrant workers, as well as those on temporary permits. To take a greater leap towards economic growth, labor force integration is a must, and efforts must be taken to achieve it in a viable and sustainable way, such that, ultimately, unemployment rates decline and national output consistently rises. The government must simplify the application process for skilled worker permits and reduce waiting times for approvals regarding the same. The removal of unnecessary procedures and bureaucracy will help smoothen the process for gaining permits. Successful immigrant integration into the native population also ensures social harmony and better labour market participation, owing to human capital formation in the long run. Thus, in Norway’s case, the government must expand programs like the Norwegian Cultural Orientation Programme (NORCO), to include cultural orientation, job readiness, and language training. This will, in turn, increase the number of skilled labourers in Norway.

8. Conclusion

This study has been valuable in providing insights into the relationships between immigration and economic indicators across the three countries that were chosen: USA, Canada, and Norway. A fixed-effects panel regression model was used for the same. The results obtained indicate that immigration has a statistically significant negative impact on the rate of unemployment, giving weight to the theory that immigrants help in filling up the gaps in labor markets, thereby reducing overall unemployment. Immigration appeared to positively impact GDP growth rates; however, the statistical significance fell slightly short of acceptable standards. This highlights the complex relationship between the two. Other indicators of the economy such as average wages, patents filed, and labor force participation rates (male and female), show no significant association with the levels of immigration, in this study.

This analysis and its results endeavor to highlight the importance of factors which can be construed as context-specific, such as the complex structures of the labor markets, policies regarding immigration, and demands of the various industries in a country, in shaping the consequences that immigration has on the economy. The findings of this study indicate that while it does possess the ability to support and drive certain economic outcomes, the overall effects of the same are quite sophisticated and complex to quantify.

This study is not entirely flawless and certain limitations do exist. The regression model is based on the assumption that there exists a linear relationship between immigration and the economic indicators chosen. The fixed effects model that the analysis is reliant on, controls for the time-invariant and country-specific factors, but may not capture the significant external influences, namely global economic shocks or advancements in technology. The dataset spans only 11 years, a relatively short time frame. This can lead to inaccurate inferences being drawn upon the long-term trends of

the relationships between the variables. The study also utilizes certain measures, such as the number of patents filed. These may not be the best suitable measure to capture the more complex and nuanced factors affecting innovation. Thus, such measures may not be the best for representing the indicators.

The future research on this topic should address the limitations stated above. It may be best to adopt a mixed-methods approach to the analysis that may incorporate the quantitative analysis and also qualitative insights from concerned individuals like policymakers, immigrants and experts. A larger dataset, one that has data for more than three countries over a longer time period, may be beneficial and helpful in providing a better understanding of the impacts of immigration, and accounting for changes in policy. Integrating additional variables like the education levels of the incoming immigrants, the specific labor demands of industries and the sectors, the resources utilized by the host country to integrate the immigrants into the population, and more diverse and accurate indicators of innovation, such as R&D expenditure, average IQ of the population, progress in the academic field, and advancements in technology may be instrumental in deepening the understanding of immigration's impacts.

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From Loss to Lesson: Integrating an Individual's Subjective Experience of Loss into Subsequent Trading Decisions

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This paper investigates the impact of subjective loss experiences on an individual's risk aversion tendencies in future trading decisions. Understanding the influence of loss on risk aversion is essential to refine trading and investment strategies, minimize risk exposure, and mitigate losses. This is especially constructive in applications to the Futures and Options Segment of the Indian Financial Market, which witnesses increasing losses sustained by retail investors daily, at alarming rates, despite sufficient warnings. The study involved an experimental method using pre and post-test measures of risk-aversion (based on the Holt and Laury (2002) lottery choice task) and a rigged financial market simulation wherein the participant traded between stocks repeatedly and eventually lost a huge sum (of token currency). Analysing the obtained data, the study sought to establish a relationship between the loss experience and participants' change in risk aversion. It was hypothesized that the subjective loss experience would result in at least a temporary deviation from an individual's baseline risk aversion tendency. The data was analysed by employing ANOVA and multiple Fisher's exact tests to answer the various research questions. The results proved to be statistically insignificant; however, there remains significant scope for further research that may be better able to address the limitations faced by this study. The findings may be extrapolated to understand trader behaviour and develop more effective risk management strategies.

***JEL Classification**: C91, D81, D84, G02, G11*

1. Introduction

The psychological concepts of risk and the perception and judgement of loss find their most widely researched application in the empirical study of financial decision-making. Kahneman and Tversky have been heralded as pioneers in the field of behavioural economics, primarily owing to their contributions to the experimental study of risk and loss aversion. Technically, "risk" refers to situations in which a decision is made whose consequences depend on the outcomes of future events having known probabilities - such as lotteries, gambles, or even insurance (Lopes, 1987). Interestingly, empirical research into individuals' tendencies to seek or avert risk, has often yielded results that violate traditional economic definitions of rational choices and behaviour.

Borrowing a simple example from Kahneman and Tversky (1982), suppose a person is on their way to a play, having bought two tickets worth Rs. 1200. As they reach the theatre, they realise that they have lost the tickets. Are they likely to pay Rs. 1200 for another pair of tickets? Now imagine this person is going to the same play without having bought the tickets. As they reach the theatre, they realise that they have lost Rs. 1200 in cash. Are they likely to buy the tickets now? Objectively, in both cases, this person is now poorer by Rs. 1200 and is faced with the decision of paying Rs. 1200 to see the play. However, Kahneman and Tversky (1982) found that most individuals were more likely to buy the tickets in the second situation and explain this finding by citing the difference in the "mental

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accounts" into which each loss experience goes - with one being directly related to the play while the other is not.

Similarly, the idea is extrapolated to financial markets, more specifically, to the derivatives market. Despite the inevitable experience of loss of varying magnitudes and frequency suffered by daily traders, the volume of trades conducted in these markets continues to increase. An extreme case would be the Futures and Options (F&O) segment, which is synonymous with heavy losses and high risk. According to The Business Standard (2023), speculation on F&O contracts causes everyday Indians to lose up to Rs 60,000 crore annually, offering minuscule potential for profits, affected by increased taxes if and when there is profit, as well as high brokerage costs irrespective of loss or gain. Presumably, these losses are registered into the same "mental accounts" that are retrieved when deciding whether to trade more money into these stocks in subsequent trading decisions. Yet, many individuals continue to engage in such trading, even after incurring substantial losses.

This is indeed a curious pattern and raises many intriguing questions about human behaviour. How does the subjective experience of a loss get integrated into our future decisions? Are traders in the derivatives market irrational, and if yes then to what extent? Do individual risk aversion tendencies determine the way losses are integrated into subsequent decisions - do the risk-seeking become more or less risk-averse after experiencing a loss? These are the questions this paper aims to explore.

2. Objectives

1. To establish a relationship between an individual's experience of loss and their risk aversion in subsequent trading decisions.
2. To examine whether the observation of this change differs for individuals with varied risk aversion tendencies.
3. To assess whether there is a statistical difference between daily traders' and non-traders' responses to experiencing loss.

3. Hypotheses

H_{01}: The subjective experience of a loss does not produce any deviation from the individual's baseline risk-aversive tendency. *v/s*
H_{A1}: The subjective experience of a loss results in at least a temporary deviation from the individual's baseline risk-aversive tendency.

H_{02}: The aforementioned deviation due to loss is not statistically different for individuals with varying risk aversion tendencies. *v/s*
H_{A2}: The aforementioned deviation due to loss is statistically different for individuals with varying risk aversion tendencies.

H_{03}: The aforementioned deviation due to loss is not statistically different for traders and non-traders. *v/s*
H_{A3}: The aforementioned deviation due to loss is statistically different for traders and non-traders.

4. Review of Literature

The mathematician Daniel Bernoulli (1738) was the first to systematically study and discuss a widespread characteristic of human preferences: risk aversion. Since then, most research on risk has concentrated on gambles - which are considered to be synonymous with 'risky choices' - in which there are only two possible outcomes (Lopes, 1987). Often, research has also included one-outcome gambles, in which one outcome represents a change (e.g., winning a cash prize) and the other represents the status quo. As Lopes (1987) finds, the focus on two-outcome gambles seems reasonable to most researchers in part because such gambles lend themselves well to parametric manipulation in the laboratory, and because they become conceptually simple. Traditionally, the expected utility model has been the most widely used in economic literature concerning risk aversion.

To understand the way risk is perceived and studied in finance, it is important to note that risk is a well-integrated component of the concept of financial rationality. Investment strategies and decisions are anchored in the minimization of risk exposure. The conventional financial theory assumes that more importance is given to risk minimization than wealth maximisation. Strategies may be prescriptive in nature but in practice, the risk investors are willing to undertake is not similar and depends on their individual attitudes to risk (Shiundu, 2009). Research in behavioural finance has developed rapidly in recent years and provides evidence that investors' financial decisions are also affected by internal and external behavioural factors (Wameryd, 2001).

Shiundu (2009) concluded from their survey of Indian individual investors that regardless of the extent to which an investor might be well informed, have done the research, and studied deeply about the stock prior to investing, their behaviour is still guided in part by the fear of loss in the future, often leading to irrationality. Investors commonly perform investment analysis by using fundamental analysis, technical analysis, and judgment, and consider factors such as expected corporate earnings, profit and condition of the statement, past performance of the firm stock, price per share, and expected dividend by investors, more subjective factors including the reputation of the firm, its status in the industry, and feelings about the economy also play a key role. Many such factors often compromise investor rationality, leading to deviant behaviour in individual investors. To quote Schädler (2018), "Irrationality, in this sense, is neither good nor bad per se, it is simply the part not explained by rational behaviour as proposed by The Efficient Market Hypothesis."

Most academic literature speaks of investors, characterized by long-term, risk-averse, rational behaviour. However, this paper aims to explore the behavioural tendencies of speculative investors or traders, who display more frequent irrational, sentiment-lead behaviour. According to the Corporate Finance Institute (n.d.), speculation is the buying of an asset or financial instrument with the hope that the price of the asset or financial instrument will increase in the future. Speculative investors (traders) tend to make decisions more often based on technical analysis of market price action rather than on fundamental analysis of an asset or security. They also tend to be more active market traders – often seeking to profit from short-term price fluctuations – as opposed to being "buy and hold" investors. Thus, for the purpose of this research, derivative trading will be viewed as speculative, not hedge, and thus irrational.

To understand the sentiment of individual investors in the Indian financial markets currently, SEBI conducted an in-depth study to analyse investor behaviour in the Main Board IPOs, in light of the

increasing participation of retail investors and the heightened oversubscription in recent IPOs. A key finding related to "Flipping" behaviour among individual investors - they sold 50.2% of the shares allotted to them by value within a week of listing, and 70% of shares by value within a year, implying that investor behaviour is driven by short-term profits as opposed to long-term capital growth (*SEBI | Study - Analysis of Investor Behaviour in Initial Public Offerings (IPOs)*, 2024). Short-term market movements are volatile and do not enable long-term capital gains.

Further, well-performing IPOs (>20% gains in a week) were withdrawn by 61.9% of retail investors. Implying that returns have a high correlation with exiting patterns, proving the impact of the disposition effect and the profit-seeking tendency in Indian individual investors in the period studied. These findings further imply that Indian individual investors are now favouring shorter-term investments over longer terms. This is indicative of the trend of Indian individual investors becoming more like traders, prioritising short-term gains, and seeking immediate returns: two characteristics heavily associated with trading and counterintuitive to investing or long-term duration wealth building. This investor behaviour evidences the fact that the volume of derivatives trades is steadily increasing in India.

These increased volumes of trades generate proportionate losses, thus making it crucial to understand how potential profits or losses integrate into risk aversion, a key player in such volatile markets. This underscores the rationale behind our research. Kahneman and Tversky (1982) offered a modified version of the aforementioned expected utility model, replacing the utility which equals monetary value, with an expected value function, which captures the subjective value of potential gains and losses, relative to some neutral point (which may be endogenous). Pivotal in research on the topic of risk aversion, was their finding that human beings perceive the positive utility of gains differently than the negative disutility from losses, attaching relatively greater intensity to the latter. For example, the perceived value gained from a profit of Rs. 500 is less compared to the perceived value lost from a loss of the same amount. This finding was captured by their proposed expected value function, as the convex curve representing the perceived value of losses is steeper than the concave curve representing gains. A typical experiment in their research involved the option of a certain profit or loss (depending on the case being tested) or a gamble with different probabilities of a significant profit or loss, or nothing.

Their work led to the general conclusion that individuals tend to be more risk-averse when comparing certain and risk-involving gains, and more risk-seeking when choosing between a certain loss and the substantial probability of one. Our work, on the other hand, seeks to uncover whether these baseline tendencies change as a direct result of experiencing a subjective loss, given that in financial markets, human beings are much more likely to have to choose between a potential gain and a potential loss as compared to a gain or loss versus no change. In their experiments, participants were presented with independent choices to determine the direction of risk preference. However, in our experimental design, we manipulate the loss variable to compare the difference in participants' baseline measurement of risk preference with the post-test, thus incorporating the possibility of learning from experience, rather than focusing on the predictable patterns of departure from objectivity or rationality that are characteristic of human thinking.

5. Methodology

An experiment was conducted to obtain primary data for this paper, consisting of three distinct components: a pre-test, a financial trading simulation, and a post-test. Each of these components had specific functions. The pre and post-tests were designed per the Holt and Laury (2002) lottery choice task, the most widely used method for eliciting risk preferences in economics research (Charness et al., 2018). The measure presents the participants with a series of ten decisions to be made wherein they must choose the lottery of their preference out of two lottery options with variable outcomes. The measure is designed such that each decision includes one "safe" lottery with less variable outcomes and one "risky" lottery with high variability of outcomes. For the first four decisions, the expected value of the safer choice exceeds that of the riskier choice; for the remaining decisions, the riskier option has a higher expected value (kindly refer to Table 1 and Table 2 in Appendix I). Thus, based on the choices made by the participants, they can be categorized as risk-averse, risk-neutral, or risk-seeking.

It is assumed that rational participants would aim to receive the highest possible amount with minimum risk exposure. Thus, in theory and practice, participants may be expected to begin by picking safe choices, and then switch over to the riskier option depending on their risk preference as the probabilities of variable outcomes change. Participants who switch immediately after the fourth decision are classified as risk-neutral, those who switch before are classified as risk-seeking, and those who switch after the fifth decision are considered risk-averse.

Our sample consisted of two groups: (1) Traders - those with technical knowledge and/or experience in derivatives trading, and (2) Non-Traders, those without experience in the derivatives markets, who may or may not be investors (long-term, minimal risk seeking). Participants were first asked to fill out the pre-test questionnaire via a Google Form shared with them a day before the experiment. The time gap between the pre-test and the simulation was to prevent participants from unintentionally conforming to a recall bias, given that the pre-test and post-test were structured similarly, with only minor changes in the values of the lottery choices. Additionally, to avoid obtaining biased or skewed data, our objectives and research questions were not revealed to them until the debrief (following the post-test).

The financial market simulation consisted of participants trading between two stock options with a fixed amount of token money and minimal or basic information about the stocks' performance and the market condition. This simulation, designed using an algorithm in Python, was programmed to ensure that the participant experienced a loss - the output messages were predetermined, such that regardless of the choices made, the final magnitude of loss experienced by all participants was identical. The simulation involved repeated games to ensure ego involvement. After completing the simulation, the post-test was administered to the participants to capture the immediate impact of their experience of a sense of loss - expected to become apparent through a difference in participants' choices in the pre and post-tests.

When organizing the obtained data, it was noticed that a few participants had made inconsistent choices (in one of two ways: by switching back and forth between safe and risky choices, or by picking the safe option in Decision 10), a phenomenon discussed in detail by Grüner (2017) and Charness et al. (2018). According to Andersen et al. (2006), inconsistent choice behaviour may be due to an

indifference toward the available options. The common practice for researchers with inconsistent subjects is to drop these responses from the analysis. Holt and Laury (2002) argue that their results remain almost unchanged if they drop inconsistent subjects who violate expected utility axioms. Hirschauer et al. (2014) address the problem of dropping inconsistent subjects from the sample, concluding that the consequent reduction in the sample size may pose a problem only if the proportion of inconsistent subjects is high.

In our sample of 60 participants (30 Traders and 30 Non-Traders), we found that 8 participants (13.3% of the total, 5 Non-Traders and 3 Traders) made inconsistent choices. In alignment with the findings from Grüner (2017), our sample indicated that participants with an academic background or technical experience in economics and finance were less likely to violate the expected utility theory. For this study, the inconsistent responses were dropped and the number of participants in each group was equalized, resulting in a final sample size of 44 with 22 participants in each group.

Finally, an ANOVA test was conducted to determine whether the number of safe choices made in the pre and post-tests were statistically different from each other. After which, Fisher's exact tests in R (given the relatively small sample size) were conducted, investigating the independence of different variables as shown in contingency tables in Appendix III, to answer our research questions.

6. Results

Of the final sample, 21 participants were categorized as risk-averse based on the pre-test, 12 were risk-neutral, and 11 were risk-seeking. Further, 13 out of 22 traders (roughly 59%) and 10 out of 22 non-traders (around 45.5%) answered differently in the post-test compared to the pre-test.

Appendix II shows that the F stat obtained of 0.165 for the ANOVA conducted for the entire sample is less than the F critical value of 3.95. This indicates that there is no statistically significant difference between the number of safe choices made by the participants in the pre and post-tests and that the loss experience had virtually no effect on their risk-aversion tendencies. This finding is mirrored by the ANOVA results obtained for the two groups separately, wherein the F critical value of 4.072 exceeds both the F stats of 0.04 for traders and 0.5 for non-traders, indicating statistical insignificance of the difference in the average number of safe choices made before and after the treatment (in this case, the loss experience from the market simulation). Thus, the conclusion disproves our hypothesis that the subjective experience of a loss results in at least a temporary deviation from the individual's baseline risk-aversive tendency.

Furthermore, as seen in Section I, Appendix III, the p-values of all three Fisher's exact test statistics obtained - 01234 for traders, 0.418 for non-traders, and 0.4285 for both combined - exceed the significance threshold of 0.05, indicating a statistically insignificant interrelationship between an individual's baseline risk aversion and their changing their decisions in the post-test. This implies that a person's likelihood of changing their choices after experiencing a loss is not affected by their varying baseline risk aversion tendencies, and we fail to reject the null hypothesis of statistical identity among the groups. Lastly, as made evident by Section II, Appendix III, the p-value of .5467 also exceeds the significance threshold value of 0.05, confirming that a person's membership in the traders or non-traders group is not significantly related to their changing decisions in the post-test. Thus, neither

group is more likely than the other to have their risk aversion tendency temporarily affected by loss experience. The difference in the odds ratio is most likely due to random chance.

7. Insights

The main insights that can be drawn from this study regarding its outcomes and applicability, as discussed ahead, are divided into subsections. The first subsection deals with certain nuances of the experimental setup and design. This includes potential biases participants may have experienced and the aspect of hypothetical choices and token money. The second subsection covers limitations regarding the data set, including but not limited to the small and undiversified nature of the sample.

Nuances of the experimental design

In the conduct of the experiment for most participants, a significant time gap, (around 8-15 hours in most cases), was left between the pre-test and the remainder of the experiment to ensure that they avoided unintentionally conforming to a consistency bias. A consistency bias occurs when participants unintentionally or subconsciously try to emulate consistency in their choices in the lottery choice tasks. The longer the time between the pre-test and the trading simulation and the post-test, the less likely it is that this bias creates an impact. In other studies that evaluate subjective aspects, this is taken into consideration and remedied by repeated testing with larger time intervals. Due to the time-bound nature of this study, the temporal gap could not exceed 15 hours, and repeated testing was not possible.

Further, a limitation of the study is the exclusive use of token money. This may have painted an inaccurate or inadequate picture of the impact of losses that were experienced. Had the participants experienced real monetary losses, their risk aversion might have deviated more and this would have been reflected in their post-test scores. This leaves significant scope for future studies with better access to resources and time, to investigate further, with the involvement of real monetary gains and losses, as is standard procedure with the Holt and Laury (2002) task.

Limitations of the data set

The sample size of this experiment was perhaps a major limitation that translated into insufficient variability in the data collected. As aforementioned, due to inconsistent responses to the risk-aversion measure, this original sample size of 60 participants was reduced to 44 participants inclusive of both groups. This small sample size may be inadequate to draw concrete conclusions. Further, due to practical constraints, the sample was entirely limited to college students and recent graduates (only 13.6% of these participants were employed). This lack of diversity in this sample size limits the broader applicability of this study. Additionally, risk aversion tendencies in students (unemployed, with no income or pre-existing debt or major responsibilities, etc) may be expected to be different as compared to those in earning adults with responsibilities.

8. Future Scope

A sound understanding of the impact of loss on risk aversion has a multitude of applications in financial fields, especially in aspects of portfolio management, behavioural finance, investment and trading strategies, etc. Volatility in markets is inevitable and with volatility come losses. Understanding the impact of losses on risk aversion in uncertain and high-risk environments enables effective decision making especially in times of economic downturns, recessions, and economic depressions. First and foremost, having a complete understanding of losses will allow traders and investors to adjust their strategies to accommodate their perceived losses and in the process of doing so, adjust their risk aversion tendencies. This could enable them to incur higher levels of risk, without internalising their losses and potentially reap higher levels of returns. Secondly, this research bears implications on corporate finance, the insurance sector aiding in the refinement of risk models to adjust for psychological tendencies, and other fields of finance in which risk assessment plays a major role. Furthermore, understanding the impact of losses on risk aversion on a wide scale may be used by Indian regulatory bodies such as the Reserve Bank of India (RBI) Securities, Exchange Board of India (SEBI), and Insurance Regulatory and Development Authority of India (IRDAI) so that these institutions can accommodate for mass losses and adjust their policy, response and recommendations accordingly. Beyond financial fields, this research has scope in game theory development, guiding tactics in competitive settings where decision-making dynamics are influenced by loss possibility, the findings of this research question can be extrapolated to the applications of game theory and loss hedging strategies.

9. Conclusion

The hypothesis of this paper suggested that the subjective experience of a loss results in at least a temporary deviation from the individual's baseline risk-aversive tendency. This hypothesis was proven incorrect as the deviation seen in subjects' risk aversion was statistically insignificant. If the limitations of this paper were to be overcome with long-term research and effective funding, significant findings and results could be obtained which could then be applied to a plethora of fields, models, systems, and environments. Even though behavioural variables are subjective and tougher to navigate due to the uncertainty and inconsistency that comes with them, their applications can be utilized in almost any field due to their ubiquitous nature. Continuing research in this subject may lead to more resilient and robust systems that take human behaviour complexity into consideration, which would ultimately yield more effective and fair results in a variety of fields.

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Appendix

Appendix I

Table 1: Experimental design of Holt and Laury (2002) procedure applied in the Pre-Test

Choice of Lotteries			
Decision	Option A	Option B	Difference in Expected Payoff (A-B) **
1	1/10 of 600, 9/10 of 480	1/10 of 1100, 9/10 of 36	349.6
2	2/10 of 600, 8/10 of 480	2/10 of 1100, 8/10 of 36	255.2
3	3/10 of 600, 7/10 of 480	3/10 of 1100, 7/10 of 36	160.8
4	4/10 of 600, 6/10 of 480	4/10 of 1100, 6/10 of 36	66.4
5	5/10 of 600, 5/10 of 480	5/10 of 1100, 5/10 of 36	-28
6	6/10 of 600, 4/10 of 480	6/10 of 1100, 4/10 of 36	-122.4
7	7/10 of 600, 3/10 of 480	7/10 of 1100, 3/10 of 36	-216.8
8	8/10 of 600, 2/10 of 480	8/10 of 1100, 2/10 of 36	-311.2
9	9/10 of 600, 1/10 of 480	9/10 of 1100, 1/10 of 36	-405.6
10	10/10 of 600	10/10 of 1100	-500

** Experimental subjects were not made aware of this column.

Table 2: Experimental design of Holt and Laury (2002) procedure applied in the Post-Test

Choice of Lotteries			
Decision	Option A	Option B	Difference in Expected Payoff (A-B) **
1	1/10 of 320, 9/10 of 210	1/10 of 615, 9/10 of 12	148.7.
2	2/10 of 320, 8/10 of 210	2/10 of 615, 8/10 of 12	159.7
3	3/10 of 320, 7/10 of 210	3/10 of 615, 7/10 of 12	50.09
4	4/10 of 320, 6/10 of 210	4/10 of 615, 6/10 of 12	0.8
5	5/10 of 320, 5/10 of 210	5/10 of 615, 5/10 of 12	-48.5
6	6/10 of 320, 4/10 of 210	6/10 of 615, 4/10 of 12	-173.4
7	7/10 of 320, 3/10 of 210	7/10 of 615, 3/10 of 12	-147.1
8	8/10 of 320, 2/10 of 210	8/10 of 615, 2/10 of 12	-234.2
9	9/10 of 320, 1/10 of 210	9/10 of 615, 1/10 of 12	-245.8
10	10/10 of 320	10/10 of 615	-295

**Experimental subjects were not made aware of this column.

Appendix II

Tables 1 and 2: ANOVA Results for the entire sample (44 participants)

Source of Variation	*SS*	*df*	*MS*
Between Groups	0.418605	1	0.418605
Within Groups	212.9767	84	2.535437
Total	213.3953	85	

F	*P-value*	*F crit*
0.165101551	0.685535754	3.954568408

Tables 3 and 4: ANOVA Results for Traders

Source of Variation	*SS*	*df*	*MS*
Between Groups	0.090909	1	0.090909
Within Groups	95.45455	42	2.272727
Total	95.54545	43	

F	*P-value*	*F crit*
0.04	0.842446	4.072654

Tables 5 and 6: ANOVA Results for Non-Traders

Source of Variation	*SS*	*df*	*MS*
Between Groups	1.454545	1	1.454545
Within Groups	126.0909	42	3.002165
Total	127.5455	43	

F	*P-value*	*F crit*
0.484499	0.490226	4.072654

Appendix III

SECTION I

Table 1: Contingency Table for Traders - Fisher's exact test of independence between baseline risk-aversion and a qualitative variable indicating whether a participant changed their decisions in the post-test.

	Risk-Averse	Risk-Neutral	Risk-Seeking	Total
Changed	5	4	4	13
Did Not	7	2	0	9
Total	14	6	7	22

Results from R: p-value = 0.1234, alternative hypothesis: two-sided (difference in odds ratio was tested for both directions).

Table 2: Contingency Table for Non-Traders - Fisher's exact test of independence between baseline risk-aversion and a qualitative variable indicating whether a participant changed their decisions in the post-test.

	Risk-Averse	Risk-Neutral	Risk-Seeking	Total
Changed	4	4	2	10
Did Not	5	2	5	12
Total	9	6	7	22

Results from R: p-value = 0.418, alternative hypothesis: two-sided (difference in odds ratio was tested for both directions).

Table 3: Contingency Table for the Entire Sample - Fisher's exact test of independence between baseline risk-aversion and a qualitative variable indicating whether a participant changed their decisions in the post-test.

	Risk-Averse	Risk-Neutral	Risk-Seeking	Total
Changed	9	8	6	23
Did Not	12	4	5	21
Total	21	12	11	44

Results from R: p-value = 0.4285, alternative hypothesis: two-sided (difference in odds ratio was tested for both directions).

SECTION II

Table 1: Contingency Table for the Entire Sample - Fisher's exact test of independence between group membership (Traders or Non-Traders) and a qualitative variable indicating whether a participant changed their decisions in the post-test.

	Traders	Non-Traders	Total
Changed	13	10	23
Did Not	9	12	21
Total	22	22	44

Results from R: p-value = 0.5467, alternative hypothesis: true odds ratio is not equal to 1
At 95 percent confidence interval: (0.4500252, 6.7555989)
sample estimates- odds ratio: 1.711562 (thus indicating statistical insignificance).

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Goals Beyond the Game: Sports as a Catalyst for achieving Sustainable Development Goals in India

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This paper examines the role of the sports economy in advancing India's Sustainable Development Goals (SDGs) within the Kazan Action Plan framework. Using a combination of qualitative analysis and Multivariate Linear Regression, it quantifies sports' impact on economic growth, gender equality, urban development, and health while exploring broader societal benefits like social inclusion and youth empowerment. The findings highlight how sports investments drive GDP growth, reduce unemployment, and enhance women's representation, positioning sports as a catalyst for sustainable development. Policy recommendations include boosting rural sports infrastructure, gender-focused initiatives, and green sports practices. By integrating sports into SDG strategies, the paper underscores their potential to foster inclusive, resilient, and equitable progress in India.

***JEL Classification**: I15, J70, J160, J11, Z220, Z20*

1. Introduction

The Sustainable Development Goals (SDGs), a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity, have become an integral part of global development discourse. These 17 interconnected goals, adopted by world leaders in 2015, provide a blueprint for a better future for people and the planet. They address a wide range of issues, including poverty, hunger, health, education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice, and strong institutions. ("The Sustainable Development Goals"). The cruciality of achieving the SDGs has never been greater. The world is facing unprecedented challenges, including climate change, inequality, and political instability. These challenges threaten to undermine progress on sustainable development and leave millions of people behind. The SDGs offer a framework for addressing these challenges and building a more just, equitable, and sustainable world.

In recent years, there has been a growing recognition that sports can play a significant role in achieving the SDGs. Sports have the power to inspire, unite, and empower people. They can promote health, education, and social inclusion. Sports can also contribute to economic growth and development. The United Nations has identified sports as a powerful tool for achieving the SDGs. In its "Sport for Development and Peace" report, the UN highlighted the potential of sports to contribute to a wide range of development goals, including poverty reduction, gender equality, and social inclusion.

Quoting the UN document, "Transforming our world: the 2030 Agenda for Sustainable Development": "*We recognize the growing contribution of sport to the realization of development and*

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peace in its promotion of tolerance and respect and the contributions it makes to the empowerment of women and of young people, individuals and communities as well as to health, education and social inclusion objectives."

The UN has also emphasised the importance of the Kazan Action Plan, which was adopted at the World Conference on Sport for Development and Peace in 2015. The Kazan Action Plan sets out a series of recommendations for promoting sport for development and peace at the global, regional, and national levels. It calls on governments, sports organisations, and other stakeholders to work together to ensure that sports are used as a tool for positive social change. India is committed to achieving the SDGs and has made significant progress in recent years. The government has launched several initiatives to promote sustainable development, including the National Action Plan on Climate Change, the National Health Mission, and the National Education Policy. However, there is still much to be done to achieve the SDGs, particularly in areas such as poverty reduction, gender equality, and environmental protection.

The sports economy in India is a rapidly growing sector with significant potential to contribute to the country's economic development. In 2023, India's sports industry was estimated to be worth approximately 158 billion rupees. This was a significant increase from 2021, driven by media spending, sponsorships, and endorsements. (Statista, 2024) The sector includes a wide range of activities, including professional sports leagues, sports infrastructure development, sports media, and sports tourism. The sports economy has the potential to create jobs, generate revenue, and promote social inclusion. The perception of sports as a career in India and its economic significance is ever evolving. Traditional mindsets that viewed sports as mere leisure activities are shifting as young Indians increasingly pursue sports professionally. This shift is partly attributed to government initiatives like Khelo India and Target Olympic Podium Scheme (TOPS), along with the emergence of leagues such as the IPL, ISL, and PKL, which boost investment, media rights, and infrastructure development. Key data indicate that India's sports segment revenue grew by 11% in 2023, with cricket alone contributing 87% of total revenue. The sports sector's contribution to India's GDP, currently at 0.1%, lags behind the global average of 0.5%, pointing to untapped growth potential. The report underscores the need for infrastructure, grassroots development, and gender inclusivity to foster a thriving sports industry that significantly contributes to the economy and employment. (IBEF, n.d.)

Not only this, India's sports tourism sector has shown significant growth, with its market valued at approximately USD 10.87 billion in 2023 and expected to expand to nearly USD 53 billion by 2033, driven by a robust annual growth rate of 17.1%. (*Harnessing India's Sports Tourism Potential*, n.d.) Cricket remains the primary draw, but other sports like hockey, football, and motorsports are gaining traction, particularly due to the hosting of major international events such as the ICC Cricket World Cup and Formula E races. (*Harnessing India's Sports Tourism Potential*, n.d.) Investments in sports infrastructure, including large-scale venues and training facilities, have bolstered the country's reputation as a premier sports destination. Government initiatives, like the Khelo India Scheme and sustainable tourism policies, have supported this growth by fostering grassroots participation and promoting eco-friendly practices. Meanwhile, private sector efforts have focused on developing green accommodations and promoting women's sports, exemplified by the success of the Women's Premier League (WPL). Despite the progress, challenges persist, including inadequate infrastructure, environmental impacts, and seasonality issues. However, opportunities for growth remain,

particularly through technological advancements, diversification into niche sports offerings, and strategic collaborations. By addressing these areas, sports tourism in India can continue to drive economic development, enhance cultural exchange, and increase the global appeal of the nation as a sports hub. (*Harnessing India's Sports Tourism Potential*, n.d.)

It is essential to study the impact of sports on the SDGs in the Indian context now more than ever. While there is a growing body of research on the role of sports in development, there is a lack of data and analysis specific to India. Understanding the relationship between sports and the SDGs in India can help inform policy decisions and identify opportunities for collaboration between the sports sector and other stakeholders. By studying the impact of sports on the SDGs in India, we can better understand how sports can be used as a catalyst for positive social change.

2. Objectives

1. To establish, quantify and analyse the impact of Sports on SDGs in the Indian context.
2. To qualitatively understand the broader, indirect implications of sports on SDGs in India.

3. Review of Literature

The paper titled *'Opportunities in India For Sport To Contribute To Un's Sustainable Development Goals in India' (ChetanpreetKaurNilon, 2019)* explores how sports in India can contribute to the United Nations SDGs, particularly in health, education, and gender equality. Through desk-based analysis and qualitative content review, it highlights the potential of sports to empower marginalised communities and foster social integration. However, it identifies a disconnect between existing sports policies and broader SDG strategies in India, suggesting a need for more cohesive approaches. The study's reliance on secondary data and interviews limits its empirical depth, pointing to a need for further research on sport's role in sustainable development in the Indian context.

'Exploring the Potential and Challenges of Sports Tourism in Uttar Pradesh: Emerging Trends, Strategic Initiatives and Sustainable Development' (Chauhan, 2024) examines the expanding field of sports tourism in Uttar Pradesh, emphasising its potential for sustainable growth. Using a qualitative analysis of existing literature, policies, and interviews with sportspersons, officials, and experts, the study explores opportunities in adventure sports, e-sports, wellness tourism, and sustainable practices. Uttar Pradesh's rich cultural heritage and diverse landscape provide a strong foundation, though challenges like inadequate infrastructure, language barriers, and weak marketing strategies persist. The paper highlights government efforts in infrastructure development and tourism promotion, recommending strategic planning, technology, and international cooperation to position Uttar Pradesh as a global player in sports tourism.

The *United Nations Secretary-General Report on Sport for Development and Peace (2024)* report reviews the progress and challenges in leveraging sport as a tool to achieve the Sustainable Development Goals (SDGs), covering 2022–2024. It emphasises sport's role in social inclusion, health, gender equality, peacebuilding, and climate action. The central idea revolves around positioning sport as a vehicle for social transformation, especially for marginalised communities. Notably, it highlights the role of community-based sports, education, and physical activities in improving health (SDG 3), empowering women (SDG 5), and promoting inclusive cities (SDG 11). Key recommendations call for

strengthened multi-stakeholder collaboration and innovative partnerships, urging stakeholders to align with the United Nations Action Plan and overcome implementation gaps. This report provides a detailed ecosystem of stakeholders in sports, identifies barriers, and suggests policies that advance sustainable development and peace globally. (*UN Report on Sport for Development Calls for Increased Impact and Collaboration*, 2024)

The *Kazan Action Plan (2017)* is a global framework to harness sport, physical education, and physical activity for achieving sustainable development. Formulated at MINEPS VI, it aligns sport policy with the 2030 Agenda for Sustainable Development. The plan's central themes include promoting inclusive access to sport, maximising sport's contributions to health, education, and gender equality, and safeguarding the integrity of sports. It categorises policy areas into three main objectives: expanding inclusive access, enhancing sport's role in social and economic development, and protecting sport from corruption and abuse. It advocates for multi-stakeholder partnerships, quality physical education, and data-driven policy decisions. The plan's key highlight is its emphasis on integrating sport into national SDG strategies, setting out specific actions and indicators for measuring sport's contributions to global goals. This comprehensive approach aims to translate policy intent into measurable social and economic benefits. (*Kazan Action Plan*, 2023)

The report, *'Sports and the Sustainable Development Goals'* (SDG Fund, 2018) by the SDG Fund, explores how sport contributes to achieving the 2030 Agenda for Sustainable Development. It emphasises sport as a powerful tool for addressing social challenges, enhancing health, and fostering inclusive communities. Central themes include sport's role in promoting gender equality, education, youth engagement, and environmental sustainability. The report highlights that sports encourage teamwork, discipline, and resilience, which contribute to the economic and social development of individuals and communities. Key highlights include real-world examples of sport-based initiatives that align with SDGs, such as improving educational outcomes through sports programs in schools and promoting health by encouraging physical activity. It also discusses how sports initiatives can be integrated with policies to build inclusive, resilient societies. The report ultimately advocates for governments, private sectors, and civil organisations to leverage sports for sustainable development by creating supportive policies and infrastructure.

4. Research Questions

1. How can sports in India be linked to SDGs and how can quantitative metrics be utilised to measure the impact of the same?
2. What are the broader implications of sports on the SDGs in India, and how do these impacts manifest across different sectors?

5. Methodology

The paper employs a combination of qualitative and quantitative metrics to analyse and understand the implications of sports on SDGs in India. Each SDG has been analysed using a robust qualitative framework analysis and a Multivariate Linear Regression Model is employed for the relevant Quantitative Econometric Analysis.

I. Qualitative Analysis

The research methodology for qualitative understanding of the direct and the indirect impact of sports on each SDG involves a comprehensive content analysis of both international and national policy documents, frameworks, and programs, alongside an in-depth review of relevant theoretical literature and a robust perusal of any available data.

II. Quantitative Analysis

The paper employs the Multivariate Linear Regression Model to allow for the simultaneous prediction of multiple dependent (response) variables based on a set of independent (predictor) variables. To facilitate the econometric analysis i.e to overcome any complexities due to outliers and heteroscedasticity and interpret the results as elasticities, all variables are first transformed using natural logarithms (ln).

Furthermore, the variables incorporated in the MLR Model are essentially *SDG-related outcome measures influenced by sports (the response variables) and key drivers related to sports (predictor variables).* The selection of SDG-related outcome measures influenced by sports (the response variables) was driven by the availability and quality of data. These measures were chosen to best reflect the impact of sports on the relevant SDGs, ensuring accuracy and completeness in representation.

The data for these variables is collected for a period of *10 years*, *FY 2014-15 to FY 2023-24*. Sources include Official Reports of the Department of Sports, World Bank Open database and GOI Import- Export Data.

SDG-related outcome measures:

- GDP per capita for India (current US$)
- Unemployment in India (% of total labour force) (modelled ILO estimate)
- Percentage of seats held by Women in National Parliaments
- Women Business and the Law Index Score (scale 1-100)
- Manufacturing, value added (% of GDP)
- Percentage of Annual Urban population growth

Key drivers related to sports:

- Actual Exp. of Department of Sports, GOI (in Rs. Cr)
- Export data for Sports Goods for India (in Million USD)
- Import data for Sports Goods for India (in Million USD)

Multivariate Linear Regression:

Variable	Equation
GDP per capita for India (current US$)	$y_1 = \beta_{0,1} + (\beta_{1,1} * x_1) + (\beta_{2,1} * x_2) + (\beta_{3,1} * x_3) + \epsilon_1$
Unemployment rate (%)	$y_2 = \beta_{0,2} + (\beta_{1,2} * x_1) + (\beta_{2,2} * x_2) + (\beta_{3,2} * x_3) + \epsilon_2$
Percentage of seats held by women in	$y_3 = \beta_{0,3} + (\beta_{1,3} * x_1) + (\beta_{2,3} * x_2) + (\beta_{3,3} * x_3) + \epsilon_3$
Women Business and the Law Index (scale 1-	$y_4 = \beta_{0,4} + (\beta_{1,4} * x_1) + (\beta_{2,4} * x_2) + (\beta_{3,4} * x_3) + \epsilon_4$
Manufacturing, value added (% of GDP)	$y_5 = \beta_{0,5} + (\beta_{1,5} * x_1) + (\beta_{2,5} * x_2) + (\beta_{3,5} * x_3) + \epsilon_5$
Annual urban population growth (%)	$y_6 = \beta_{0,6} + (\beta_{1,6} * x_1) + (\beta_{2,6} * x_2) + (\beta_{3,6} * x_3) + \epsilon_6$

Where,

y_1 *= GDP per capita for India (current US$)*
y_2 *= Unemployment rate (%)*
y_3 *= Percentage of seats held by women in National Parliaments*
y_4 *= Women Business and the Law Index (scale 1-100)*
y_5 *= Manufacturing, value added (% of GDP)*
y_6 *= Annual urban population growth (%)*

x_1 *= Actual Expenditure of the Department of Sports (Rs. Cr)*
x_2 *= Export data for Sports Goods (Million USD)*
x_3 *= Import data for Sports Goods (Million USD)*

$\beta_{0,j}$ *= the intercept term for the j-th dependent variable*
$\beta_{1,j}$ *= the coefficient for expenditure*
$\beta_{2,j}$ *= the coefficient for export*
$\beta_{3,j}$ *= the coefficient for import*

ϵ_j *= the error term for the j-th dependent variable*

Hypotheses Testing:

A t-test is run for each coefficient β_j where,

H₀ : *The coefficient* $\beta_j = 0$ *, i.e., it is insignificant.*
H₁ : *The coefficient* $\beta_j \neq 0$ *, i.e., it is significant.*
DC: *Tested at 5% los, reject* H_0 *if p-value < 0.05*

6. Analysis

6.1. Quantitative analysis and results

Table 1

GDP per capita for India (current US$)

Model Fit			
R-squared	0.9636	F-statistic	52.88
Adjusted R-squared	0.9453	p-value	0.0001044

Variables	Coefficient	p-value	Significance
Intercept	3.59944	5.29e-05	significant at 1% level
Actual Exp. of the Department of Sports, GOI (in Rs.	0.21457	0.0196	significant at 5% level
Export of Sports Goods for India (in Million USD)	0.12251	0.2542	not significant
Import of Sports Goods for India (in Million USD)	0.30824	0.0481	significant at 5% level

For GDP per capita, the model demonstrates that 96.36% of the variance is explained by the predictors, indicating a strong link between sports-related investments and economic growth.

The significant positive effect of the Department of Sports' actual expenditure highlights how public investment in sports can enhance economic output through associated sectors like tourism, events, and infrastructure. Similarly, the positive and significant effect of sports imports suggests that acquiring advanced equipment fosters productivity, contributing to GDP growth. These results strongly support the hypothesis that sports drive economic development, reinforcing the importance of SDG 8 (Decent Work and Economic Growth).

Table 2

Unemployment in India (% of total labour force) (modelled ILO estimate)

Model Fit			
R-squared	0.7730	F-statistic	6.81
Adjusted R-squared	0.6595	p-value	0.02331

Variables	Coefficient	p-value	Significance
Intercept	6.9658	0.00163	significant at 1% level
Actual Exp. of the Department of Sports, GOI (in Rs.	-0.4275	0.13369	not significant
Export of Sports Goods for India (in Million USD)	-0.5060	0.20115	not significant
Import of Sports Goods for India (in Million USD)	0.1598	0.73572	not significant

In the case of unemployment, the model explains 77.3% of the variance, though none of the predictors are statistically significant. The negative coefficient for sports expenditure suggests a

potential inverse relationship between sports investments and unemployment. However, the lack of significance indicates that other mediating factors may influence this relationship. This finding highlights the need for further analysis to explore how sports initiatives can address unemployment challenges, aligning with the broader hypothesis that sports contribute to job creation in areas such as management, coaching, and manufacturing.

Table 3

Percentage of seats held by Women in National Parliaments

Model Fit			
R-squared	0.8804	F-statistic	14.72
Adjusted R-squared	0.8205	p-value	0.003573

Variables	Coefficient	p-value	Significance
Intercept	0.46440	0.36462	not significant
Actual Exp. of the Department of Sports, GOI (in Rs.	0.39547	0.00481	significant at 1% level
Export of Sports Goods for India (in Million USD)	0.23063	0.12617	not significant
Import of Sports Goods for India (in Million USD)	-0.36482	0.07094	not significant

Table 4

Women Business and the Law Index Score (scale 1-100)

Model Fit			
R-squared	0.7776	F-statistic	6.992
Adjusted R-squared	0.6664	p-value	0.02196

Variables	Coefficient	p-value	Significance
Intercept	3.05396	3.98e-05	significant at 1% level
Actual Exp. of the Department of Sports, GOI (in Rs.	0.06534	0.279	not significant
Export of Sports Goods for India (in Million USD)	0.09056	0.299	not significant
Import of Sports Goods for India (in Million USD)	0.03906	0.711	not significant

The analysis of women's representation in parliament demonstrates that 88.04% of the variance is explained by the model, with sports expenditure having a small yet statistically significant positive impact. This underscores how investments in sports empower women, challenge societal norms, and promote leadership development. These findings align with SDG 5 (Gender Equality), highlighting the potential of sports initiatives to enhance women's participation in leadership roles. Similarly, the Women, Business, and the Law Index model explains 77.76% of the variance, with positive coefficients suggesting a potential relationship between sports and a more equitable business environment. The selection of the Women in Business and Law Index Score and the Percentage of seats held by Women in National Parliaments as dependent variables is based on their recognition as key indicators for SDG 5: Gender Equality by the World Bank for India. While alternative measures,

such as women's sports enrolment ratios, might offer deeper contextual relevance, the choice is constrained by the availability of comprehensive datasets for India. These variables thus represent the most robust proxies for gender equality within the scope of this analysis. However, the lack of statistical significance warrants further exploration to better understand the systemic changes influenced by sports in promoting women's economic empowerment, thereby linking to both SDG 5 and SDG 8. (Sonam & Aggarwal, 2019, 555-560)

Table 5

Manufacturing, value added (% of GDP)

Model Fit			
R-squared	0.8398	F-statistic	10.49
Adjusted R-squared	0.7597	p-value	0.008431

Variables	Coefficient	p-value	Significance
Intercept	3.95497	1.51e-05	significant at 1% level
Actual Exp. of the Department of Sports, GOI (in Rs.	-0.19689	0.0169	significant at 5% level
Export of Sports Goods for India (in Million USD)	-0.12680	0.1902	not significant
Import of Sports Goods for India (in Million USD)	0.15096	0.2192	not significant

For manufacturing value-added, the model explains 83.98% of the variance, with sports expenditure showing a small yet statistically significant negative impact. This suggests potential trade-offs between resource allocation for sports and manufacturing or inefficiencies in sectoral prioritisation. Policymakers must balance investments to avoid compromising manufacturing growth while fostering sports development, aligning with SDG 9 (Industry, Innovation, and Infrastructure).

Table 6

Percentage of Annual Urban Population Growth

Model Fit			
R-squared	0.8017	F-statistic	8.085
Adjusted R-squared	0.7025	p-value	0.01574

Variables	Coefficient	p-value	Significance
Intercept	2.26414	0.00044	significant at 5% level
Actual Exp. of the Department of Sports, GOI (in Rs.	-0.08838	0.20710	not significant
Export of Sports Goods for India (in Million USD)	-0.23132	0.04129	significant at 5% level
Import of Sports Goods for India (in Million USD)	0.09089	0.45766	not significant

The analysis of urban population growth shows that 80.17% of the variance is explained by the model, with sports exports exhibiting a significant negative relationship. This result suggests that sports-related economic activities, particularly exports, may decentralise economic opportunities and reduce rural-to-urban migration. (Njuguna, 2016) This aligns with SDG 11 (Sustainable Cities and Communities) by emphasising the role of sports in balancing urban and rural development.

Table 6

Test for Multicollinearity: VIF Values

Variables	VIF Values
Actual Exp. of the Department of Sports, GOI (in Rs. Cr)	3.609336
Export of Sports Goods for India (in Million USD)	2.617677
Import of Sports Goods for India (in Million USD)	4.761021

Since the VIF Value for all independent variables is less than 5, there exists low multicollinearity.

6.2. Qualitative Analysis

6.2.1. No Poverty

World poverty remains a critical issue, affecting billions and perpetuating cycles of inequality. Despite economic progress, many people lack access to essentials like food, water, healthcare, and education. Poverty impacts health, education, and vulnerability to exploitation, with children particularly at risk for stunted growth and limited opportunities.

Sustainable Development Goal 1 (SDG 1) aims to end poverty in all its forms by 2030. ("The Sustainable Development Goals")Nearly half of the global population lives in poverty, lacking basic necessities. Achieving SDG 1 requires implementing social protection systems, ensuring equal access to resources, and building resilience against shocks, particularly in developing countries (Goal 1: No Poverty, n.d.). In India, the NFHS-5 data shows significant progress, with multidimensional poverty dropping from 24.85% to 14.96% between 2015-16 and 2019-21, lifting 135 million people out of poverty (National Multidimensional Poverty Index: A Progress Review 2023, 2023).

Sports can play a pivotal role in combating poverty by promoting health, education, and economic opportunities, while fostering community cohesion. They teach valuable life skills like teamwork and conflict resolution, crucial for personal and community development (Sports as a Tool Against Poverty, n.d.). Programs such as the Foundation for Global Sports Development empower youth, while Omondi Peter's sports-based initiatives in Kenya provide employability skills, creating job opportunities and breaking the cycle of poverty (How Sports Programs Can Reduce Poverty, 2022; Power of Sports in Poverty Alleviation, 2024).

In India, sports can raise awareness, mobilise resources, and inspire collective action towards poverty alleviation. By engaging communities, sports programs foster social cohesion, promote health and education, and offer economic opportunities, contributing to a more equitable and prosperous society.

6.2.2. Zero Hunger

In the 2024 Global Hunger Index, India ranks 105th out of the 127 countries with sufficient data to calculate 2024 GHI scores. (Global Hunger Index, 2024) With a score of 27.3 in the 2024 Global Hunger Index, India has a level of hunger that is serious. (Global Hunger Index, 2024)

World hunger remains a critical issue, with millions suffering from chronic hunger and malnutrition, closely linked to poverty and inequality. Malnutrition impedes physical and cognitive development, causing long-term health problems and reduced productivity. It also contributes to social and political instability, leading to resource conflicts, migration, and displacement. Addressing hunger is essential for global peace, prosperity, and sustainable development.

Sustainable Development Goal 2 (SDG 2) aims to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture by 2030. (“The Sustainable Development Goals”) It focuses on ensuring everyone has access to sufficient, safe, and nutritious food year-round. SDG 2 emphasises sustainable food production systems, resilient agricultural practices, and the conservation of genetic diversity in seeds, plants, and animals (UNDP, n.d.). It also calls for investment in rural infrastructure, agricultural research, and extension services to boost productivity and sustainability, aiming for a world where all can live healthy, productive lives (Goal 2: Zero Hunger - United Nations Sustainable Development, n.d.).

Sports can play a significant role in addressing hunger by promoting nutrition, wellness, and sustainable agriculture. Integrating nutritional education into sports activities helps individuals, particularly youth, improve food security. Sports also foster community engagement, which is vital for collective action against hunger, such as supporting local food security initiatives like community gardens (Brewer, 2016). Furthermore, sports can raise awareness of global food supply chain inefficiencies, such as food waste, and drive policy changes to improve food security.

Football-based community organisations use the sport to promote health and nutrition, providing meals and education to vulnerable communities (Common Goal, n.d.). The "Tackle Hunger" campaign leverages rugby events to raise awareness and funds for food security (Mark, 2015), while the "All In Challenge" supports charities like Meals on Wheels through sports icon donations (ESPN, 2020). Additionally, the Refugee Olympic Team has raised awareness about global hunger through Olympic participation (Tyree, 2024). In India, sports are key to tackling hunger and malnutrition, making them an indispensable tool for achieving SDG 2 (Staempfli et al., 2017). Especially in a developing country like India, which is grappling with the issues of hunger and malnutrition, the role of sports to eradicate these becomes indispensable in today's time.

6.2.3. Good Health and Well Being

Sustainable Development Goal (SDG) 3, "Good Health and Well-being," aims to ensure healthy lives and promote well-being for all, with a focus on maternal and child health, infectious and non-communicable diseases (NCDs), and mental health. (Global Hunger Index, 2024) In India, SDG 3 is crucial due to the country's large population, which faces dual challenges of infectious diseases like tuberculosis and malaria, alongside rising NCDs such as diabetes and cardiovascular diseases. This is compounded by rapid urbanisation, unhealthy lifestyles, and limited access to healthcare, especially in rural areas (Health, Water and Sanitation, n.d.).

India's maternal health remains a major concern, with a stillbirth rate of 5% (NFHS 4), and nearly 0.34 million of the 1.9 million global stillbirths occurring in India in 2019 (Health, Water and Sanitation, n.d.). Achieving SDG 3 requires improvements in maternal and infant health, universal healthcare access, safe medications, preventive care, mental health support, and health education. Strengthening healthcare systems would reduce healthcare costs and enhance quality of life, leading to economic growth and sustainable development.

India's alignment with the WHO's Global Action Plan on Physical Activity (GAPPA) demonstrates progress in addressing NCDs through physical activity (PA). However, gaps remain in funding and inter-ministerial coordination, limiting PA's broader impact. A centralised system to streamline PA initiatives could advance SDG 3 by promoting healthier lifestyles (Sports and Society Accelerator, 2024). The STEP (Sustainability, Technology, Environment, and Perception) framework from the Sports and Society Accelerator aligns PA with cultural practices, incorporating yoga and regional dance to make it more accessible across India. It also uses technology to create virtual communities, supporting sustained engagement in physical activity (Sports and Society Accelerator Report, 2024).

Sports also support mental health, as demonstrated by the *Women on the Move (WotM) project* in South Sudan, which used trauma-informed sports interventions to improve mental health and resilience in women affected by conflict. By fostering social support networks, the program reduced PTSD symptoms and improved coping skills, showing the therapeutic potential of sports for mental well-being (Staempfli et al., 2017). In conclusion, sports, physical activity, and mental health programs are integral to advancing SDG 3 in India, addressing both physical and mental health challenges and promoting social cohesion and resilience.

6.2.4. Gender Inequality

Sustainable Development Goal 5, which aims to "achieve gender equality and empower all women and girls," finds a powerful ally in sports, especially in India, where traditional norms limit women's opportunities. Sports challenge stereotypes and provide visibility, helping redefine women's roles beyond the household. The United Nations Report on Women, Gender Equality and Sport highlights how sports break gender biases, with successful women athletes serving as role models. Programs like *Khelo India* encourage girls' participation, fostering confidence and recognition. Sports also create safe spaces that combat gender-based violence, with initiatives like Women Win showing how sports build resilience and empower women to confront harassment. (Women Win, 2009) (United Nations Division for the Advancement of Women, 2007) (Singh & Pro Sport Development, 2023)

Sports programs also help reduce early marriage by promoting self-worth and education. The AKWOS Conference on Gender Equity notes that girls engaged in sports are more likely to delay marriage and pursue education. The Goal Project in India blends sports with financial literacy, empowering girls to resist early marriage. Additionally, sports foster shared domestic responsibilities, as evidenced by *View from the Grassroots*, where female athletes experience more equitable household dynamics. (Raw et al., 2024) (Association of Kigali Women in Sports, 2008.

Leadership opportunities in sports are another significant benefit. Programs highlighted by Women Win show that sports develop teamwork and resilience, enabling women to take on leadership roles. Female sports mentors inspire girls to envision themselves as leaders, contributing to gender parity in leadership. Economic empowerment is also facilitated, as sports programs provide

valuable skills that enhance employability and financial independence. (Women Win, 2009) Sports improve health and well-being, especially for rural women with limited access to healthcare. The UN Report emphasises how physical activity reduces risks of non-communicable diseases. Initiatives like the Fit India Movement offer rural women preventive health resources. Sports boost self-esteem and resilience, laying the foundation for lifelong health.

Sports foster unity, bringing together women from diverse backgrounds. Community programs, such as Slum Soccer, promote societal cohesion, shared understanding, and inclusivity. (Laureus Sport for Good Foundation, 2018) Technology further extends sports' reach, enabling access to training, mentorship, and networking through digital platforms. Social media amplifies the visibility of female athletes, inspiring others to participate. Platforms like Fit India help women connect with nationwide networks, broadening sports' cultural impact. In conclusion, sports are a transformative tool for advancing gender equality in India, supporting SDG 5 by promoting confidence, leadership, health, and community solidarity. Continued investment in inclusive policies, grassroots programs, and technology will ensure sports empower women and girls to realise their potential.

6.2.5. Clean Water and Sanitation

Sustainable Development Goal 6 aims to ensure the availability and sustainable management of water and sanitation for all. ("The Sustainable Development Goals") Access to clean water and sanitation is a fundamental human right, yet in developing countries like India, millions still lack reliable access. Waterborne diseases burden India with approximately USD 600 million annually, with drought- and flood-prone areas affecting a third of the population. (Clean Drinking Water | UNICEF India, n.d.) India's rapid urbanisation, population growth, and climate change exacerbate these challenges, further stressing water resources.

Sports can play a significant role in addressing SDG 6 by raising awareness and promoting sustainable water practices. Sporting events and organisations have the power to mobilise communities to adopt water-saving behaviours, while sports facilities can implement water-efficient technologies. These venues also serve as platforms for hygiene education. (European Football for Development Network, n.d.) For example, the "Rehydrating The Earth" campaign by Football for Peace focuses on groundwater conservation and raising awareness of water scarcity. The initiative brings together athletes, diplomats, and communities to advocate for policies to improve water conservation and sustainability. (Sports Diplomacy Unites for Water Announcing Rehydrating The Earth Campaign, Calling for Unity and Global Partnerships to Tackle the World's Water Crises Through Football for Peace – Football For Peace, 2024)

By leveraging the popularity and global reach of sports, such initiatives foster a culture of sustainability and ensure that clean water and sanitation are accessible to all. This approach helps advance SDG 6 by combining sports' mass appeal with the urgency of water conservation.

6.2.6. Affordable and Clean Energy

Sustainable Development Goal 7 aims to ensure access to affordable, reliable, sustainable, and modern energy for all. ("The Sustainable Development Goals") Access to clean energy is crucial for improving living standards, reducing poverty, and addressing climate change. However, millions still lack reliable energy, especially in developing countries like India, where rural areas often depend on

inefficient and polluting sources like kerosene. India faces both opportunities and challenges in transitioning to clean energy. The government has set ambitious targets to increase renewable energy, particularly solar and wind power. However, achieving these goals requires continued investment in infrastructure, technology, and inclusive policies that ensure marginalised and rural populations benefit from affordable, clean energy.

Sports can play a key role in promoting SDG 7 by raising awareness and showcasing sustainable energy solutions. Large-scale sports events are ideal platforms to promote clean energy initiatives, such as using solar-powered stadiums or wind-powered training facilities. Athletes and sports organisations can also act as ambassadors for renewable energy, endorsing clean energy brands, participating in energy conservation campaigns, and supporting green technologies. Furthermore, sports programs in schools and communities can incorporate energy education, teaching youth about efficiency, renewables, and the importance of reducing carbon footprints. By connecting sports with sustainability, we can inspire collective action to achieve SDG 7. (Achieving More Together With Sport for Development, n.d.)

6.2.7. Decent Work and Economic Growth

Sustainable Development Goal (SDG) 8 focuses on promoting inclusive and sustainable economic growth, employment, and decent work for all. ("The Sustainable Development Goals") This is crucial for addressing poverty, reducing inequalities, and fostering long-term development. In India, high unemployment rates, informal labour markets, and poor working conditions are ongoing challenges, particularly for youth, women, and marginalised groups. To achieve SDG 8, economic growth must be inclusive, providing fair wages, safe working environments, and opportunities for career advancement.

Sports can play a vital role in driving SDG 8 by creating job opportunities and fostering economic growth. The sports industry itself is a significant economic sector, generating employment in areas such as coaching, event management, sports media, marketing, and merchandising. Beyond direct employment, sports can promote entrepreneurship and innovation. Local sports leagues, sports tourism, and community initiatives stimulate local economies, especially in underserved areas, by supporting small businesses and grassroots sports (Moustakas & Reynard, 2023). Sports can also inspire youth to pursue careers in sports science, technology, and coaching, contributing to a more diverse workforce.

Additionally, sports can advocate for decent working conditions. Professional athletes and sports organisations can lead campaigns for fair wages, worker rights, and gender equality, influencing broader sectors of the economy. By promoting these values, sports can create a ripple effect, ensuring that economic growth translates into decent, fair work for all (Achieving More Together With Sport for Development, n.d.). Through these efforts, sports can support SDG 8, driving economic growth and promoting social equity.

6.2.8. Industry, Innovation, and Infrastructure

Sustainable Development Goal 9 focuses on building resilient infrastructure, promoting sustainable industrialization, and fostering innovation. ("The Sustainable Development Goals") For India, achieving SDG 9 is crucial for economic growth. While the country has made significant

progress in infrastructure development, including expanding its road and rail networks, improving electricity access, and enhancing digital connectivity, challenges remain in creating sustainable infrastructure that can withstand natural disasters and climate change. India's industrial sector, particularly manufacturing, plays a vital role in GDP growth, with a 5.2% average annual growth rate over the past decade (Press Release: Ministry of Finance, 2024). To promote inclusive industrialization, India must address regional disparities, improve access to finance for SMEs, and encourage the adoption of environmentally friendly technologies. Innovation, supported by greater investment in research and development (R&D), is key to addressing social and environmental challenges.

Sports can contribute to SDG 9 by fostering economic growth and job creation. Sports events can boost local businesses and promote community involvement, provided they adhere to human rights and labour standards (European Football for Development Network, n.d.). Sports infrastructure investment is particularly important for driving economic growth. The sports industry in India is valued at ₹6,600 crores, with a projected growth rate of 10-12% over the next five years. High-quality sports facilities attract national and international competitions, generating significant economic impact, as seen with the 2010 Commonwealth Games, which generated an estimated ₹1,500 crores (Gallant Sports, 2024). Sports infrastructure also promotes community development, increasing physical activity and providing safe spaces for social interaction. (Gallant Sports, 2024) Major sports events, like the Mumbai Marathon, generate substantial revenue and increase local tourism, benefiting businesses in hospitality, retail, and services (Gallant Sports, 2024). These investments create a ripple effect, contributing to inclusive and sustainable industrial growth.

6.2.9. Reduced Inequality

Sustainable Development Goal 10 aims to reduce inequality within and among countries, a critical goal for India, where significant disparities persist in income, education, and access to basic services. Despite economic growth, India still faces challenges in reducing inequality, as reflected in the SDG India Index, which shows a decline in the country's score from 67 in 2020-21 to 65 in 2023-24 (NITI Aayog, n.d.). Initiatives like the Pradhan Mantri Jan Dhan Yojana for financial inclusion and the Right to Education Act aim to address these disparities. Programs such as the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) have also been vital in providing employment and reducing poverty. However, more targeted interventions are needed to ensure that economic growth benefits all segments of society, especially marginalised communities (Press Release: Press Information Bureau, 2024).

Sports can play a key role in achieving SDG 10 by promoting social inclusion and reducing inequalities. Through sports, marginalised groups gain access to opportunities, fostering a sense of empowerment and belonging (Garai, 2023). Sports initiatives can bridge gaps in education, health, and employment, offering platforms for skill development and social integration. They can also challenge stereotypes and promote gender equality, contributing to a more inclusive society (Social Inclusion - Sport, n.d.). Kamberidou (2011) highlights the role of athlete activism and peace education in combating racism, xenophobia, and promoting gender equity. By fostering prosocial attitudes, reducing prejudices, and promoting non-violent conflict resolution, sports can address systemic inequalities and provide pathways for marginalised groups to thrive, ultimately advancing the goals of SDG 10 (Kamberidou, 2011).

6.2.10. Sustainable Cities and Communities

Sustainable Development Goal 11 aims to make cities inclusive, safe, resilient, and sustainable, a goal particularly relevant for India, which is undergoing rapid urbanisation. By 2030, India is expected to have six mega-cities with populations exceeding 10 million (India's Stance on SDG 11: Sustainable Cities and Communities, 2018). India faces significant urban challenges, including inadequate housing, poor infrastructure, and environmental degradation. In response, initiatives like the Smart Cities Mission, the Jawaharlal Nehru National Urban Renewal Mission, and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) are working to improve urban infrastructure, provide affordable housing, and enhance urban quality of life (India's Stance on SDG 11: Sustainable Cities and Communities, 2018). Achieving SDG 11 also requires addressing the needs of vulnerable populations, ensuring safe housing, sustainable transport, and green public spaces, alongside reducing urban pollution and improving waste management (Jha, 2023).

Sports can play a significant role in achieving SDG 11 by promoting inclusivity, equality, and resilience in urban communities. By engaging diverse groups, sports can challenge discriminatory practices and foster mutual understanding, empowering women, youth, and people with disabilities (European Football for Development Network, n.d.; Sustainability.sport, n.d.). Sports events and facilities can serve as platforms for social integration and human rights-based inclusiveness. Additionally, sports can contribute to urban sustainability by encouraging active transportation, reducing reliance on motor vehicles, and promoting healthier lifestyles. Sports infrastructure can also help address urban challenges such as pollution, traffic congestion, and the lack of green spaces (Thibodeau, 2020). By integrating sports into urban planning, cities can promote social cohesion, environmental sustainability, and economic growth, contributing to the achievement of SDG 11 in India.

6.2.11. Climate Action

Sustainable Development Goal 13 urges countries to take urgent action on climate change, a challenge that is particularly pressing for India. The country faces a range of climate-related issues, including rising temperatures, erratic rainfall, floods, and increasing air pollution, all of which disproportionately affect marginalised communities, agriculture, and overall socio-economic development. One innovative way to promote climate action in India is through sports. National and international sporting events offer platforms to raise awareness about environmental sustainability. Athletes and sports teams, as influential role models, can use their visibility to encourage climate-conscious behaviour, such as promoting eco-friendly tournaments, green technologies, and sustainable practices like reducing waste and energy consumption (From Sport for to Sport as Sustainability: Confronting the Climate Crisis in Sport for Development, n.d.).

Additionally, sports can inspire sustainable behaviours among youth by combining physical activity with environmental education. Youth-focused sports programs that highlight climate issues can engage young people in proactive climate action. In India, where cricket, football, and field hockey have massive followings, incorporating climate awareness into these sports could reach millions, fostering collective action and connecting health, fitness, and environmental well-being (Sport – a Key Player in Climate Action?, 2024; United Nations Department of Economic and Social Affairs, 2022).

This approach not only helps raise awareness about climate change but also encourages sustainable lifestyles, creating a ripple effect across communities.

7. Policy Recommendations

1. *Incorporate Sports into National SDG Monitoring Frameworks:* Establish dedicated indicators within the national SDG reporting system to track the impact of sports initiatives on specific goals such as health (SDG 3), gender equality (SDG 5), and economic growth (SDG 8). This will ensure that sports-based interventions are systematically evaluated for their contributions to sustainable development.

2. *Targeted Investment in Rural Sports Infrastructure Development:* Prioritise the construction and enhancement of multi-sport facilities in rural and tier-2 cities, with a focus on providing inclusive spaces for women, differently-abled individuals, and marginalised communities. Implement public-private partnerships to facilitate resource mobilisation and ensure the long-term maintenance of these facilities.

3. *Health Integration Programs Through Local Sports Events:* Partner with state health departments to conduct large-scale, sports-linked health awareness campaigns in conjunction with local sports tournaments. These programs should focus on screening for non-communicable diseases (NCDs), promoting physical fitness, and integrating nutritional education as part of the event activities.

4. *Expansion of Gender-Focused Sports Initiatives:* Launch specific programs aimed at increasing the participation of girls in sports, such as scholarships for female athletes, safe transportation options for sports training, and training camps in collaboration with women-led organisations. Develop mentorship and leadership training programs to support women in coaching, sports management, and governance roles.

5. *Implementation of Green Sports Policies for Sustainability:* Introduce mandatory guidelines for the sustainable operation of sports facilities, including requirements for renewable energy use, rainwater harvesting, and waste management. Incentivize sports federations and event organisers to adopt eco-friendly practices by offering tax rebates or subsidies for meeting green certification standards.

8. Conclusion

The findings directly address the research objectives and hypotheses by quantitatively establishing and analysing the impact of sports on SDGs in the Indian context, while qualitatively exploring the broader, indirect implications of sports for sustainable development. Statistically significant results affirm that sports act as a catalyst for sustainable development in India, with measurable contributions to economic growth, gender equality, and urbanisation. For example, the positive relationship between government expenditure on sports and GDP per capita supports the hypothesis that sports drive economic growth (SDG 8: Decent Work and Economic Growth). Additionally, the link between sports-related imports and urban population growth highlights how sports infrastructure can contribute to inclusive urbanisation, aligning with SDG 11 (Sustainable Cities and Communities).

The analysis also uncovers nuanced relationships, such as the indirect effects between sports imports and GDP or exports and urbanisation, suggesting complex dynamics that warrant further exploration. These findings validate the hypothesis that quantitative metrics can capture the direct and indirect impacts of sports on SDGs, while qualitative insights provide a deeper understanding of these relationships.

On a qualitative level, the broader implications of sports in India extend to key SDGs. Sports programs focusing on education and community engagement are contributing to poverty reduction (SDG 1) and improved nutrition (SDG 2). Health initiatives using sports also support India's efforts to address non-communicable diseases, aligning with SDG 3 (Good Health and Well-being). Furthermore, sports serve as a platform for promoting gender equality (SDG 5), empowering women and fostering leadership opportunities.

These insights emphasise the transformative role of sports in India's sustainable development. By integrating sports into national policy frameworks and expanding grassroots programs, India can accelerate progress toward achieving its SDG targets. The findings reinforce the hypothesis and highlight the need for targeted interventions, investments, and collaborative efforts to harness the full potential of sports across economic, social, and environmental dimensions.

9. Limitations

1. *Limited Access to Comprehensive and Recent Data:* The research primarily utilises secondary data, which may not reflect the latest trends in India's evolving sports sector. Furthermore, the data points for the quantitative analysis are only 10. This could have hindered the accuracy of the analysis, particularly given the rapid growth and recent policy shifts in sports infrastructure and funding.
2. *Overemphasis on Qualitative Insights:* The paper provides extensive qualitative insights into the broader impacts of sports but lacks a sufficient empirical basis for these claims. The absence of primary data collection limits the ability to substantiate findings with statistically significant results, particularly in quantifying the indirect contributions of sports to different SDGs.
3. *Insufficient Exploration of Sectoral Interdependencies:* The research does not fully account for the interdependencies between the sports sector and other key industries, such as education, healthcare, and tourism. Failing to consider these linkages might have underestimated the broader economic and social multiplier effects of sports-related policies, particularly in rural and underserved areas.

Future research can address these limitations by incorporating more recent primary data and exploring the cross-sectoral impacts of sports on industries like education, healthcare, and tourism. Additionally, a more robust empirical approach could help quantify the indirect contributions of sports to SDGs.

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Integration of the Public-Private Partnership Model in India

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This study investigates the impact of Public- Private Partnerships on the economic growth and development in India and looks into the integration of both sectors in the country. Using Multiple Linear Regression, with GDP growth rate as the dependent variable, the analysis examines the influence of Public Expenditure, Private Expenditure along with the World Bank Quality Index. A comparative analysis with the United States also highlighted the need for regulatory reforms in India with regards to this scheme. Results indicated a significant positive relation between GDP and private expenditure while public expenditure showed a negative impact, further underscoring the need of a regulatory framework. The results depict the potential of PPPs in driving sustainable development and growth through strategic integration between the public policy goals as well as private sector investments.

***JEL Classification**: H54, L32, O40, R42*

1. Introduction

Today, most governments globally use Public-Private Partnerships (PPPs) as a strategic and efficient economic tool to address urgent infrastructure needs while promoting growth and development PPPs are collaborations between government agencies and private sector entities that fuse together the assets, expertise, and efficiency of both sectors, proving to be effective engines of growth.

PPPs have a number of advantages, one of them being that they speed up the processes in infrastructure construction. Through the medium of PPPs, the private sector provides the capital as well as the necessary infrastructure, for instance in the case of roads, highways, railways, and bridges, which can be constructed in order to stimulate economic growth. They also improve the efficacy and efficiency of the services provided by the government.

However, due to budgetary restrictions, there are frequent roadblocks that hamper the government's ability to make several investments in infrastructure projects. Now, governments can cut costs frequently while simultaneously enhancing service quality by delegating the functions of management and upkeep of these public facilities to the private sector. As a result, industries, businesses, and citizens of a country can be more satisfied with the outcome and in turn boost the economy.

We can see an instance of a successful PPP in India with the Tejas Express. It runs between New Delhi and Lucknow and is being termed the first private train of India. The physical infrastructure of the trains is in the hands of the government while the services that are provided come from the Indian Railway Catering and Tourism Corporation.

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On the other hand, the Delhi-Mumbai Industrial Corridor (DMIC) has faced significant financial challenges starting from rising costs, delays in land acquisition, regulatory obstacles, an economic slowdown, and disagreements over risk allocation (Shahana Chattaraj, 2023). These challenges have caused project delays, a reduced scope, and a greater financial strain on the public sector. To tackle this, the government has implemented public-private partnerships (PPPs), along with cost-reduction measures and policy interventions to tackle these issues.

The public-private partnership is a practical approach to enhance public services provided and promote infrastructural growth and development. In order to boost efficiency, governments can develop infrastructure and create a sustainable future by combining the advantages of both the public as well as the private sector.

2. Literature Review

Public-private partnerships (P3s) are necessary for addressing urban development challenges, most importantly when resources are limited. Tavana et al. (2021) proposed a framework to enhance partner selection for sustainable P3s using three methods: the Best-Worst Method (BWM) to prioritize selection criteria, the Weighted Influence Non-linear Gauge System (WINGS) to evaluate interrelated factors, and TOPSIS to rank potential partners. This model emphasizes on economic, environmental, social, and technological aspects, portrayed in a case study using biodegradable materials. While the model shows promise, issues such as adapting to various contexts and stakeholder complexities remain areas for future research (Tavana et al., 2022).

Public-private partnerships (PPPs) in developing countries are increasingly being used to address infrastructure deficits and emphasize economic growth. Existing literature showcases infrastructure's critical role in economic development, but funding issues have given governments an incentive to involve the private sector. While studies like Aschauer (1989) highlight a positive link between public infrastructure and economic growth, empirical evidence on PPPs remains limited. The available research, mainly focused on case studies, suggests that PPPs can promote efficiency and output, though sectoral impacts differ. Data limitations and inconsistencies in findings highlight the need for further research on PPP effectiveness across different sectors and regions (Mofokeng, 2019).

Public-private partnerships (PPPs) have achieved global traction as an alternative to traditional government-funded infrastructure projects. Increasing demand for infrastructure, fiscal constraints, and the challenges of public institutions have driven this shift. PPPs allow governments to leverage private sector efficiency, resources, and expertise to provide necessary services like education, health, and transportation. Studies like Hammami et al. (2006) have shown that factors like government debt, macroeconomic stability, institutional quality, and market conditions impact the success and prevalence of PPPs. Countries with past PPP experience, stable economies, and robust legal systems are more likely to attract private investments and form effective partnerships.

With India's infrastructure development being propelled by economic liberalization policies during the 1990s, Public-Private Partnerships are crucial. PPPs are partnerships in which projects typically overseen by the public sector are developed using private capital. In this paper they talk about how they are especially helpful in industries that demand large investments, such power, transportation, utilities, and urban infrastructure (Patel et al. 2019). Two PPP models that accelerate risk-sharing

between public and private sectors are Build Operate Transfer (BOT) and Build Own Operate (BOO). This increases productivity along with lowering the project completion delays. An environment that is supportive leads to the Indian government aggressively encouraging PPPs and drawing in large private investments. However, PPPs' full potential is still hampered by issues including commercial viability, openness, and inadequate capability in public institutions. The success in the future depends on overcoming these challenges and being able to refine the economic model to attain sustainable development and growth.

Public-Private Partnerships are becoming increasingly significant around the world as a model for building infrastructure and providing services. This paper by Parlak et al. (2021) compares and contrasts the PPP procedures in nations such as India, South Africa, UK, and Russia. In Russia, PPPs are essential to their infrastructure more so in the areas of transport and telecommunications. Though there are currently legal as well as regulatory obstacles. India has seen a massive expansion in PPP projects focusing on the areas of ports and roads. This has been due to significant investments from the private sector along with the public sector. In the UK, PPPs were first established by the Private Finance Initiative which had projects at large scales in defence, transport along with healthcare sectors. South Africa on the other hand have mostly transit related projects, such as the Gautrain project. Nonetheless, even with the advancements, there are still problems with the regulatory framework, sharing the risks and the capabilities of both the sectors. In summary, PPPs are evolving into a vital mechanism that has helped in addressing infrastructural gaps, however the success depends on the policies of each country independently.

PPPs are becoming increasingly well-known as a successful strategy for developing infrastructure, particularly for transportation-related projects. A comparative study was done among the PPPs in the United States, India and Mexico (Kulkarni, 2009), where there is an emphasis on the contrast among each of the nations. In the US, PPPs have a long history ranging from toll roads that were constructed in the early 18th century. However, it is shown that private sector contributions declined till they started increasing again in the 1980's due to a need in infrastructural development. India has an imminent need for PPPs which are now essential to the country for dealing with the problem of lack of infrastructure, mainly in the road and port industry. There are several initiatives by the Indian government to incentivise more PPPs, such as the Viability Gap Funding Scheme and the PPP Appraisal Committee. In the 1990s, Mexico was facing challenges including project failures as they did not have sufficient planning and there was economic instability. However, more stable models have come up now (Loganathan et al., 2021).

This article speaks about how policy design is critical in achieving policy goals that are predetermined (Virani, 2019). However, the success depends on the clearly defined objectives as well as understanding the expectations of stakeholders. P3s, especially in sectors such as healthcare face challenges due to conflicting interests of the stakeholders which complicates the assessment of the success of policies (Peter 2018). India's healthcare sector reveals how discriminating against diverse agendas in P3s can lead to ineffective policy implementation as well as unfair outcomes. Recently, there has been a critique against technocratic policy designs for their biases. There is a need for adaptive approaches that include the political scenario as well as the stakeholders' objectives in this setting (Bali and Ramesh 2019).

Public-private partnerships (PPPs) have evolved into necessary tools for sustainable development, particularly since adopting the United Nations' Sustainable Development Goals (SDGs). Initially hierarchical, with governments leading and private actors supporting in specific roles, PPPs have shifted toward collaborative governance, involving both sectors across all policy stages. Their success in addressing sustainability depends on effective institutional design, which balances public and private contributions. However, research shows that including private actors doesn't always guarantee better outcomes or cost efficiency. Regional differences exist, with Asia's government-led PPPs contrasting Europe's more balanced approach, where private actors complement public efforts in sustainability.

3. Hypothesis

The success of Public-Private Partnerships in driving economic growth is dependent on the level of integration between public policy goals and private sector incentives.

4. Objectives

1. Evaluating the efficiency of the PPP model in India in enhancing infrastructure and economic growth.
2. Employ our research on PPPs effectiveness to guide future economic development strategies.
3. Comparing the PPP structure of the USA (developed country) to India (developing country).

5. Methodology

In this analysis, Multiple Linear Regression was utilized to investigate the relationship between the Economic Growth Indicator (GDP growth rate) and various independent factors. This approach allowed for a comprehensive examination of how multiple variables collectively impact economic growth over time.

5.1. Quantitative Data:

Equation: $Y = -60.398988 + 0.97658797X_1 - 4.5226932X_2 + 3.07993975X_3$

Quantitative data, collected annually from the Open Government Data (OGD) Platform India and other global databases such as the World Bank Data Bank, includes information on infrastructure investment, government/public expenditure, private sector expenditure, and the World Bank Regulatory Quality Index. This Index measures the capability of a nation to design and execute regulations and policies that aid in the private sector development of the country. These variables were selected as independent factors for the regression analysis, with the GDP growth rate serving as the dependent variable. The analysis aimed to assess the strength and significance of the relationships between these factors and economic growth.

By integrating multiple data points and applying time series analysis, the research was able to explore not only the statistical relationships but also the dynamic interactions between these economic drivers over time.

5.2. Qualitative Data:

A comparative analysis of the PPP model of India and the United States, which provides a valuable lens to examine the factors contributing to their success or failure. By understanding the implementation in diverse economic and regulatory environments, policymakers can identify best practices and address challenges effectively.

6. Analysis

6.1. Multiple Linear Regression

$$\text{Equation: } Y = -60.399 + 0.9766X_1 - 4.5227X_2 + 3.0799X_3$$

A multiple regression model was used to find the relationship between India's GDP and the three key independent variables: the World Bank Quality Index, public and private expenditure (see Appendix A). The model resulted in an R-squared value of 0.732, suggesting that these variables can explain approximately 73.2% of the variance in India's GDP. This indicates a reasonably strong fit of the model to the data. GDP serves as the dependent variable as it is a widely recognized parameter of economic growth. Here, the study measures the impact of PPPs on economic growth and on government policies, infrastructure investments, and private-sector initiatives. This choice of GDP allows the analysis to reflect the contribution of PPPs in stimulating growth effectively.

The significance of each independent variable was determined by their respective p-values. The World Bank Quality Index is an index that assesses how conducive government regulations are for private sector participation in the economy. A supportive regulatory framework can reduce barriers, aligning private incentives with public policy goals. Its p-value of 0.059 is not statistically significant at the 5% level.

Public expenditure with coefficient as -4.52 and p-value 0.02, indicating a statistically significant negative relationship with GDP. This finding may suggest inefficiencies in public spending or a crowding-out effect where public investments may not be optimally allocated (Girish Bahal, Mehdi Raissi and Volodymyr Tulin, 2015). This suggests that public expenditure alone may not be sufficient for promoting economic growth and highlights the importance of aligning public spending along with private sector initiatives. The government's expenditure on infrastructure, health, education and other sectors play a significant role in a country's economic activities, and so does its role in complementing or crowding out private investments, making it a relevant variable in this study.

Conversely, private expenditure with a coefficient as 3.07 and p-value of 0.09, exhibited a positive and statistically insignificant impact on GDP. Here, Gross Fixed Capital Formation has been used as a proxy for private investment. According to the regression, private expenditure is not associated with higher efficiency and innovation which is often crucial in driving growth through PPPs.

To summarize, the regression analysis provides evidence proving public and private expenditure both to be significant determinants of India's GDP. Although the p-value for private expenditure exceeds the 0.05 threshold, it remains a significant indicator, possibly influenced by factors such as the limited sample size. Furthermore, the negative relationship between public expenditure and GDP highlights the importance of efficient public spending and strategic alignment with private sector

initiatives. The marginal significance of the World Bank Quality Index suggests that while a supportive economic environment is important, direct public and private investment plays a more immediate role in driving economic growth.

6.2. Comparison Between PPP Structure in India and USA

Integrating the expertise and resources provided by the private sector along with the regulatory as well as administrative abilities of the public sector is what leads to Public-Private Partnerships being such innovative arrangements. This model plays an important role in infrastructural growth and development of a nation and enhances the services provided by the public sector. Both India as well as the United States employ the PPP structure for this economic expansion however, their effectiveness is not matched due to factors such as different sectoral priorities, regulatory systems and the economic and policy framework of a country. This comparative analysis gives insights into the unique strategies, accomplishments, risk systems which guide policymakers as well as stakeholders in each nation.

India in recent years has made several advancements in its PPP structure, specifically in transportation sectors, energy and infrastructure. An instance of this is the National Infrastructure Pipeline (NIP) which was launched in 2020. It had an ambitious goal of investment Rs 111 Lakh Crore by 2025 for development in critical sectors of the economy (Home-Public Private Partnerships in India, 2021). The NIP channels resources towards transportation and energy projects prioritizing PPP as an essential tool. However, the regulatory framework in India acts as a hindrance for the private investors due to bureaucratic delays, inconsistent policies and complex land acquisitions. All these factors lead to elevated costs and delays in projects. Several of these regulatory frameworks require refinement to improve their efficiency and also in order to reduce the risks associated with the PPP model.

On the other side, the United States enjoys a well-established and consistently applied regulatory structure that encourages the private sector to engage in the PPP process. Legislative initiatives like the Infrastructure Investment and Jobs Act (IIJA) of 2021 have also encouraged PPP arrangements by providing approximately $550 billion for new infrastructure construction, which is at least five times this amount (Infrastructure Investment and Jobs Act (IIJA), 2023) . Such stability creates predictable conditions that attract private investors, although there are areas where public opposition to privatization is strong, including water management and some utilities. Still, U.S regulatory practices are more overall clear and consistent, which enhances PPP projects' execution and encourages the involvement of the private sector because legal and administrative risks are lesser.

Policies that support the PPP initiatives are also different in each of the countries. For example, in India, PPP projects often have to rely on large amounts of government guarantees and subsidies in order for the Private Public Partnership model to be applicable, especially for long-term projects that take a long time to get back the investment. Private investors bear high costs of financing as well as the risks of regulation which may harshen profitability of the project. India has addressed these problems by using support tools such as India Infrastructure Finance Company Limited (IIFCL) and the Viability Gap Funding (VGF) scheme which provide monetary assistance for infrastructure projects (Home-Public Private Partnerships in India). Nonetheless, borrowing rates being very high along with

a banking sector that is risk-averse limits the private investments. Stronger financial mechanisms and incentives are required to address these challenges and encourage private sector involvement.

Conversely, the US has developed an advanced financial market with different sources of funding for infrastructure projects which include investments from institutions and bonds. A large number of states and municipalities are rated A and above in terms of credit risks which lowers the cost of any borrowings and makes private public partnerships more attractive to private companies (Spohr et al., 2024). In addition, pension funds which are institutional investors also contribute significantly to the infrastructure financing given that PPPs promote long term and stable returns. This ecosystem aids in effective capital mobilization and a conducive environment for private stakeholders.

Another area of divergence is the sectoral thrust. In India, PPPs are concentrated in the development of highways, development of airports, and renewable energy, thus having a clearcut focus on fast tracking the development of the economy. As a result, the government has an influential role in identifying and sequencing PPP projects and directs funding to the projects with high social and economic beneficial returns. However, urban infrastructure PPPs are less popular since regulatory and structural issues limit private participation. The extension of PPPs to urban services and utilities should assist India in its urbanization strategy assuming the regulatory frameworks are sorted out.

The United States makes use of the more extensive sectoral type of PPPs. These include waste management, health care, education, and water management. Among them are PPPs, which can pinpoint specific needs at the local level and can provide a variety of projects tailored to meet the needs of different regions towards improved public service, such as those initiated by Texas and California. Strong regional regulatory structures are leveraged by local governments in their pursuit of region-specific PPPs. The U.S. model is sectorally diversified and adaptive.

In India, effective risk allocation is an essential ingredient for successful PPP projects. Political and economic uncertainties add to the complexity of risk-sharing in India, making the government carry major risks regarding land acquisition and compliance with regulatory requirements (Chandrasekaran et al., 2021). Thus, some risks are shifted to private partners; however, this may result in a biased transfer that creates potential for disputes, delays in project completion, and financial pressure. This is possible when risk-sharing is made more transparent and balanced. It will reduce uncertainty and bring public and private parties together in accountability.

In most PPPs in the United States, defined risk sharing is taken on by the private sector in areas related to demand, operations, and construction. The regulation oversight keeps most government interference on such areas at bay while spelling out what the government can and cannot do; it encourages private investment, giving predictability that results in fewer conflicts and efficient projects, hence the appeal of PPPs to the private sector.

Success in PPPs is dependent on the availability of funds, effective regulation, and the support of governments in India. Still, some very promising sectors such as renewable energy and digital infrastructure remain constrained by issues such as the risk-sharing structures and bureaucratic inefficiencies as well as the lack of transparency associated with bidding processes. Legislative measures and financial incentives, can be used to attract more private investment and promote the sustainability of PPPs

The success of PPPs in the US is due to several factors, such as strong contract enforcement, wide funding sources, and steady regulatory conditions. There are areas, however, where people oppose private participation, for instance Private Healthcare or Prisons where the profit motives overpower the need for rehabilitation. Good stakeholder relations and accountability ensure public interest is not jeopardized and progress is made toward completing the projects.

One lesson could be learned from one country to another. A focus on transparent regulations and different funding options with an efficient risk-sharing practice of the U.S. may bring a better investor-friendly environment for India. On the other hand, India can teach lessons on high-impact infrastructure through the utilization of PPPs to the United States. By integrating the best practices and issues arising in existing PPP structures, both countries can move to improve their PPP structure that will aid in sustainability-based infrastructure development and economic growth, furthering their way to national prosperity for decades.

The comparison between the United States and India is presented to position the U.S. as a model, allowing India to examine the U.S.'s public-private partnership framework and adapt relevant ideas and policies for implementation.

7. Policy Recommendations

For Public-Private Partnerships success, a number of strategic measures have to be taken in India. Taking inspiration and insights from practices that have been established in the United States, India should focus on optimizing this model for infrastructural development and economic growth. For the same, the following policy suggestions are recommended.

A streamlined environment for the regulatory practices is imperative for effectively executing the PPPs in India. To shorten the duration of timelines and bring in larger private investments, a simpler bureaucratic process along with expediting approval systems is required. Therefore, implementing such consistent and transparent guidelines for various project contracts, designs and final executions gives them a framework which is stable and leads to a boost in confidence among the private as well as public stakeholders. In addition, transparent decision making and sharing information technology should be promoted to further foster trust and accountability.

The financial stability of PPPs also needs to be enhanced. The government can look into more innovative financing options and tools like asset-backed securities or bonds specific to infrastructure. Private funding is mobilized due to this and the dependence on the conventional methods of debt financing is reduced. Viability Gap Funding should be increased as it can provide vital support for projects that have higher risks attached to them. Another method that could be followed is establishing a dedicated PPP fund which offers financing in the long-term leading to increased private sector participation and less funding challenges.

Inequality can also be reduced by preaching to the bottom of the pyramid. Last mile connectivity, for instance building road networks to Naxal areas can also increase development of those areas and reduce Naxalism. Even though profitability and revenue earned are one of the guiding forces for PPP’s, infrastructure needs to be built to strengthen the weakest links of society. Along with this, looking at PPP’s from the perspective of assets can be essential for the strategic safety as well as security of a nation.

Experts in the domain of PPP are another pillar for the success of this model. In implementing and managing, public officials should be trained with hard skills and participate in programs that offer capacity-building to strengthen processes in PPPs such as contract negotiations and overseeing projects. Moreover, these seminars and workshops when offered to the private sector as well can raise awareness on the rewards as well as attached risks. This leads to a more corroborative and collaborative environment for the functioning of these partnerships. Therefore, focused expertise and trained officials will clear the way for quicker decision making.

Lastly, all such partnerships come with risks. Effectively identifying, evaluating, and mitigating these risks is essential, necessitating thorough and detailed risk assessments. They should be conducted for each project individually to point out any potential issue that may arise and how to mitigate it successfully. The risk needs to be balanced fairly between the public and private sector as well to correctly align the incentives. Giving priority to this will enhance the attractiveness of the project to investors and also increase the chances of success of the project.

8. Conclusion

This study concludes the transformative role that Public-Private Partnerships (PPPs) could play in promoting India's economic growth. PPPs have the potential to address infrastructure demands effectively, given that there is a strong collaboration between public policy objectives and private sector incentives. Our analysis illustrates that while public and private investments impact GDP, the positive correlation of private expenditure—contrasted with the negative effect of public spending—implies that strategic alignment is essential for optimizing economic outcomes. By introducing and exploring innovative financing methods, clear regulations, and building capacity within the public sector, India can improve the efficiency of its PPP initiatives and develop a more investment-friendly environment.

The paper has a few technical limitations that could possibly affect its analysis. One such limitation is the small sample size taken for the regression which shows the p-value for private expenditure exceeds the 0.05 threshold. It relies heavily on GDP as the sole measure of economic impact, as data on project-specific metrics like timelines, costs, and quality isn't easily available. Each sector has its unique challenges in specific domains such as urban infrastructure which is difficult to address. Additionally, critical regulatory and structural differences between the U.S. and India makes it difficult to practically apply practices in India. Furthermore, systemic inefficiencies such as corruption and bureaucratic delays weaken the technical rigor of the study.

In conclusion, PPPs represent a promising approach for India to address infrastructure needs and stimulate economic growth. By inculcating lessons from international models and implementing targeted policy reforms, India can maximize the potential of PPPs, creating a collaborative path for sustainable development that proves to be advantageous to both the public and private sectors.

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Appendix

Appendix A

Table I

Regression Summary Statistics

Multiple R	R Square	Adjusted R Square	Standard Error
0.855643	0.732124	0.598186	2.757522

Table II

ANOVA

Source of Variation	df	SS	MS	F	Significance F
Regression	3	124.692451	41.5641503	5.4661	0.03756854
Residual	6	45.6235492	7.60392486	-	-
Total	9	170.316	-	-	-

Table III

Regression Summary Statistics

Variables	Coefficient	Standard Error	T. Stat.	P-value	Lower 95%	Upper 95%
Intercept	-60.3989	23.372957	-2.5841	0.04153769	-117.59056	-3.2074
WB Index	0.9765879	0.4199723	2.3254	0.05901413	-0.0510474	2.0042
Public Expenditure	-4.52269	1.4989248	-3.01729	0.02347887	-8.1904302	-0.85496
Private Investment	3.0799	0.8835869	3.4857234	0.01305115	0.91788039	5.241999

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Is BRI a One-Way Street? Analysing the Trade Relations and the Increasing Trade Imbalance between China and Partner Countries

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The Belt and Road Initiative (BRI), launched in 2013, aims to enhance global trade and connectivity through infrastructure investments. Using a Fixed Effects regression model, this paper evaluates the impact of BRI on trade ratios and volumes between China and its top 20 trading partners from 2001 to 2021. Results indicate that BRI participation modestly increases trade ratios, reflecting China's growing exports relative to imports in partner countries. However, the impact on overall trade volumes is limited. The findings suggest that while BRI promotes economic ties, its primary influence is shaping trade imbalances favouring China rather than enhancing mutual trade growth.

***JEL Classification**: H20, H53, H63*

1. Introduction

The Belt and Road Initiative (BRI) is China's global development strategy to enhance trade and connectivity through infrastructure projects like roads, railways, and ports. As the name suggests the BRI intends to establish a transport network consisting of a "Belt", i.e., overland transport connecting China to Europe through Central Asia; and a "Road", i.e., a maritime return route to southern Europe through the Suez Canal and back to Asia, with a stopover in East Africa. Covering over 150 countries, it aims to promote economic integration, boost global trade, and foster regional cooperation through improved transport and economic corridors. It was introduced by Xi Jinping in 2013 and aims to revive ancient trade routes and enhance global economic connectivity. The BRI encompasses five cooperation priorities: policy coordination, facilities connectivity, unimpeded trade, financial integration, and people-to-people bonds (Cheng, 2020).

BRI's strategy is to promote international cooperation based on a network of infrastructure projects like railways, highways, ports, and energy pipelines across Asia, Europe, and Africa. These projects are designed to stimulate economic growth and create new markets for China while expanding its geopolitical influence. It can be seen as a counterbalance to the U.S.'s "New Silk Road Initiative" launched in 2011.

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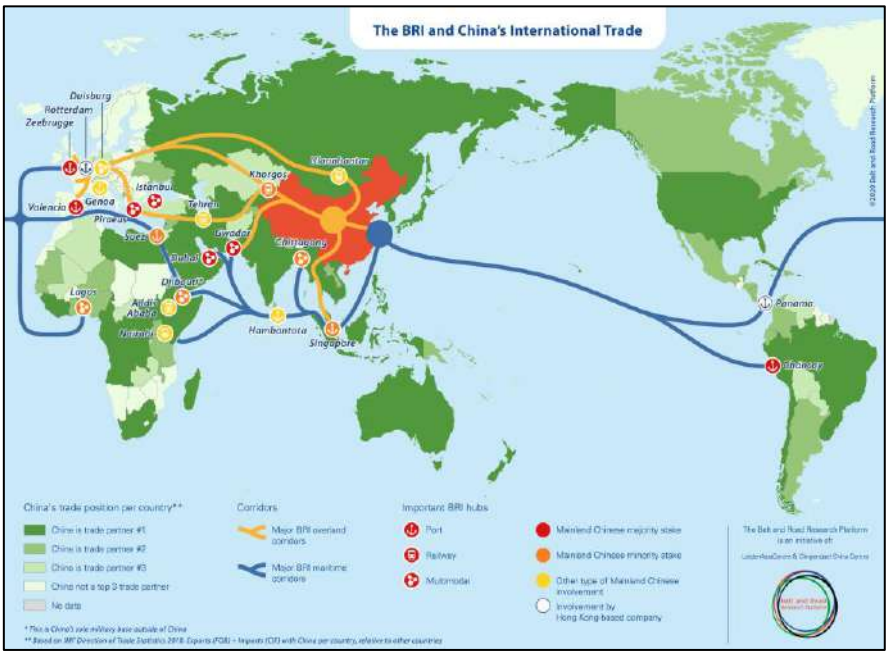
Figure 1

Map of BRI movements



Source: Leiden Asia Centre (2021)

Historically focused on self-sufficiency, China, under Deng Xiaoping in the late 20th century, began to view foreign trade as a critical source of investment and modern technology. Trade restrictions were relaxed in the mid-1960s, and foreign investment was legalized, particularly joint ventures between Chinese units and foreign firms. China's integration into the global economy has been deeply shaped by its foreign policy, transitioning from bilateral relations to a more complex form of economic diplomacy. This shift became more evident in the 1990s, following trade liberalisation initiatives in forums like the Asia-Pacific Economic Cooperation (APEC), China's WTO membership, and the Asian financial crisis (Ohashi, 2018).

China embraced an export-led growth model, positioning itself as a key player in global supply chains. Owing to its industrious and cost-effective labour, China became an attractive destination for foreign investment. Overseas Economic and Trade Cooperation Zones (OETCZs) in parallel with BRI provided platforms for Chinese enterprises to invest and establish industrial chains and clusters while reducing investment risks and operational costs. This has allowed China to strengthen its economic footprint abroad. (Cheng, 2020)

Many arguments surround whether BRI represents China's attempt to assert itself as a new global leader challenging the U.S. while promoting multilateral cooperation across Asia, Africa, and beyond, or if it is a purely economic initiative focused on trade and development.

It's noteworthy to observe how BRI adapts itself to each country, rather than being a one-size-fits-all policy, reflecting China's flexible approach to fostering diverse partnerships. This paper aims to assess the impacts of BRI on trade relations between China and its partner countries and evaluate how effectively the initiative serves as a platform for economic integration. Through a detailed analysis of trade patterns, this study will explore the extent to which the BRI has facilitated trade growth and integration, and whether it has led to trade imbalances in favour of China.

2. Objectives

This paper aims to satisfy two major objectives:

1. Primarily, to study how BRI has affected export-import ratios (also referred to as trade ratios) between the countries.
2. To analyse the trade volume and ratios between China and its top 20 partner countries in the last 2 decades, and how BRI has influenced it.

3. Review of Literature

The Belt and Road Initiative is a hugely debated topic on its economic as well as political aspects. Thus, a wide array of literature exists that address the same from different perspectives quantitative and qualitative.

Johnston (2018) expands into the Belt and Road Initiative from a public policy standpoint. Elucidating from the start of Chinese liberalisation in 1970 led by Deng Xiaoping to BRI, Johnston offers a comprehensive picture of foreign investments and international trade in the Chinese economy. The paper breaks down the Chinese economy into four phases based on reforms, pre-reform (pre-1978), Early reform (1978 to 1990s), Growth period with the trinity of aid, trade, and investment (1990s to 2010), and the timely reform and opening-up for Chinese assistance (2010 to present). Johnston (2018) can be used to set the groundwork that opens up perspectives on understanding Chinese foreign economic policies and BRI. However, this paper relies primarily on theoretical analysis and historical context to interpret the Belt and Road Initiative (BRI) rather than concrete empirical data or case studies.

Li et al. (2020) used a panel gravity model to analyse the trade pattern between China and 50 select partner countries between 2000 and 2018. It uses the pooled OLS and Fixed Effects methods to regress the data using variables like GDPs of a country, spatial distance between countries, populations of a country, exports from a country, language and religion of the countries clarifying the country-specific effects. Adopting a gravity model, the regression uses the distance between countries as a regressor along with other independent variables. The paper finds that Chinese BRI trades are increasing due to China's economic prowess and growth. The infrastructure investment aspect of BRI works to develop better trade possibilities for the country, especially with China. Based on their model, it was observed that the variables they considered such as cultural differences and language had poorly significant coefficients, which raises the need to evaluate and change variables for a better fit.

De Marcos (2022) studies the impact of BRI on bilateral trade with China using a two-way fixed effect (2WFE) difference-in-difference approach with an extensive sample of 51 BRI countries and 55 non-BRI countries as the treatment and control groups. The paper finds that bilateral trade between China and BRI countries grew approximately 6.37% and 8.53% faster than countries not participating in the BRI. The DID model observed a 9% difference in means of the Trade Intensity between the treatment and control groups. Although, the paper limits the time frame to just 10 years, limiting observation of cyclical trends.

This paper takes a similar approach, conducting a panel regression analysis with a sample of 20 countries basing the analysis on export-import ratios.

4. Hypothesis

We presume that the Belt and Road Initiative positively impacts gross trade and trade ratio, but the extent of the impact is vastly different among countries. The export-import ratio is presumed to be rising with time as Chinese exports to partner countries increase faster than imports to China.

In conclusion, it can be stated that:

1. There is a significant observable difference in trade ratios between the different trading partners irrespective of economic size.
2. BRI resulted in an uptrend in trade relations while increasing the export-import ratios

5. Research Methodology

The research aims to analyse the trends of trade ratios, which can be explained by observing total Chinese trade with respective countries. To analyse this, we have adopted a Fixed Effects Least Squares Dummy Variable (LSDV) panel regression model that takes time series data from 2001 to 2021.

The model will be limited to the top 20 countries of Chinese trade accounting for ease of computation. The top 20 will be considered based on the average Gross Trade (sum of exports and imports) with China from 2001 to 2021 calculated based on annual data from the IMF's Direction of Trade Statistics (DOTS). This filtering refines the list of countries to the United States of America, Japan, South Korea, Germany, Australia, Netherlands, Singapore, Russia, United Kingdom, Saudi Arabia, Canada, Brazil, Mexico, Vietnam, Thailand, Malaysia, France, Indonesia, and Italy in descending order of gross trade. As of 2021, these 20 countries are roughly 74% of China's total gross trade.

Among the 20 countries, South Korea, Singapore, Russia, Saudi Arabia, Vietnam, Thailand, Malaysia, Indonesia, and Italy are part of BRI and have signed a Memorandum of Understanding (MoU) with China (Nedophil and Christoph, 2023). Italy has been considered a BRI participant even though the country exited the program in 2023 since our time frame is only till 2021.

The Export-Import ratio (Trade Ratio) defined as the value of exports from China divided by Imports from respective external nations shall be taken as the dependent variable. The explanatory variables shall include The Gross Trade between the 2 countries and a dummy for BRI. The dummy addition will start in the year that the respective country signed the BRI Memorandum of Understanding (MoU) with China. The symbol delta will denote dummy variables for n-1 countries, capturing time-invariant country-specific effects. The proposed Regression function will be as follows considering time t and countries c and China represented with CH with 420 observations.

$$\widehat{TradeRatio}_{CHct} = \beta_0 + \beta_1 \cdot GrossTrade_{CHct} + \beta_2 \cdot BRI_{ct} + \beta_3 \cdot \sum_{c=1}^{19} \delta_c$$

The data for the trade ratio and gross trade are obtained exclusively from the IMF's Direction of Trade Statistics (DOTS).

6. Analysis

6.1. Pooled OLS and Fixed Effects: Results and Comparison

While we determined that a Fixed Effects model shall be used for analysis, it is relevant to see the difference between using a Pooled OLS model (without country-specific effects) and a Fixed Effects model.

Table1

Pooled OLS Regression model

Variables	Coefficient	S.E.	T. Stat	P
Intercept	2.91	0.2	14.43	<0.01
Gross Trade	-0.3	1.33	-0.23	0.82
BRI	-1.52	0.47	-3.25	<0.01

Note: Dependent Variable = Export-Import Ratio (Trade Ratio) N = 420, R-squared = 0.02, Gross Trade measured in trillions USD, S.E = Standard Error, p = P value

Table 2

Fixed Effects Regression Model

Variables	Coefficient	S. E	t. stat	p
Gross Trade	-4.29	0.8	-5.36	<0.01
BRI	0.31	0.15	2	0.0462
Australia	1.37	0.2	6.75	<0.01
Brazil	1.04	0.19	5.35	<0.01
Canada	3.82	0.19	19.66	<0.01
France	2.08	0.19	10.83	<0.01
Germany	1.72	0.22	7.88	<0.01
India	3.52	0.19	18.21	<0.01
Indonesia	1.32	0.2	6.72	<0.01
Italy	2.82	0.19	14.69	<0.01
Japan	2.39	0.28	8.6	<0.01
South Korea	1.39	0.23	5.95	<0.01
Malaysia	1.29	0.19	6.65	<0.01
Mexico	13.22	0.19	68.14	<0.01
Netherlands	8.07	0.2	40.83	<0.01
Russia	1.27	0.2	6.4	<0.01
Saudi Arabia	0.54	0.19	2.8	0.01
Singapore	1.23	0.2	6.24	<0.01
Thailand	1.49	0.2	7.52	<0.01
United Kingdom	4.22	0.2	21.61	<0.01
United States	6.54	0.41	16.05	<0.01
Vietnam	2.38	0.19	12.26	<0.01

Note: Dependent Variable = Export-Import Ratio (Trade Ratio) N = 420, R-squared = 0.9573, Gross Trade measured in trillions USD, S.E = Standard Error, p = P value

The Pooled OLS model assumes that the relationship between the independent and dependent variables is the same for all countries considering it as a single entity. Therefore, the model doesn't capture the variability in the results due to country-specific characteristics, leading to a poor R-squared. Table 1 reveals that the pooled OLS regression model has a relatively low R-squared of 0.02. This low value suggests that this variable alone explains only a minuscule fraction of the variance in the dependent variable.

The fixed-effects model provides a more accurate and meaningful analysis by capturing the impact of gross trade and BRI within each country's context and the significant variation across countries. The substantial increase in R-squared to 0.95 in the fixed-effects model indicates that including these country-specific effects explains much more of the variance in the dependent variable. This higher R-squared suggests that the fixed-effects model is far more successful in fitting the data, as it can account for omitted variables at the country level that were ignored in the pooled OLS model.

In the Fixed Effects model, the dummy coefficient along with the intercept, represents the new intercept for each country. Thus, the original intercept term is not required with these dummies as it is adjusted for every country to create a new intercept for each country.

The Coefficient of gross trade is -4.29 which suggests that, within each country, for every additional trillion USD in gross trade, the Trade Ratio decreases by 4.29, assuming that all other factors (BRI and country specific impacts) are constant. The negative sign indicates an inverse relationship, implying higher gross trade is associated with a lower Trade Ratio within each country over time.

The coefficient of BRI is 0.31 which suggests that participation in the Belt and Road Initiative (BRI) is associated with an increase of 0.31 units in the Trade Ratio within each country, controlling for other factors. This indicates a positive association between BRI involvement and the dependent variable, assuming that all other factors are constant. However, the coefficient is relatively small in magnitude and does not result in significant change.

All p-values below 0.05 show that the independent variables and country coefficients are statistically significant.

6.2. Impact of BRI

The Belt and Road Initiative (BRI) has enabled China to boost its exports by heavily investing in infrastructure projects across participating countries, especially in transportation and energy. BRI has catalysed China’s trade with these countries, especially in the machinery industry, where Chinese firms supply essential parts and products for large-scale projects. In Africa, for example, China has funded and constructed major infrastructure like high-speed rail networks. China exports raw materials, machinery, components, and final products to BRI countries to support these projects, contributing to a noble rise in trade volume with these regions (Yang & Lin, 2021).

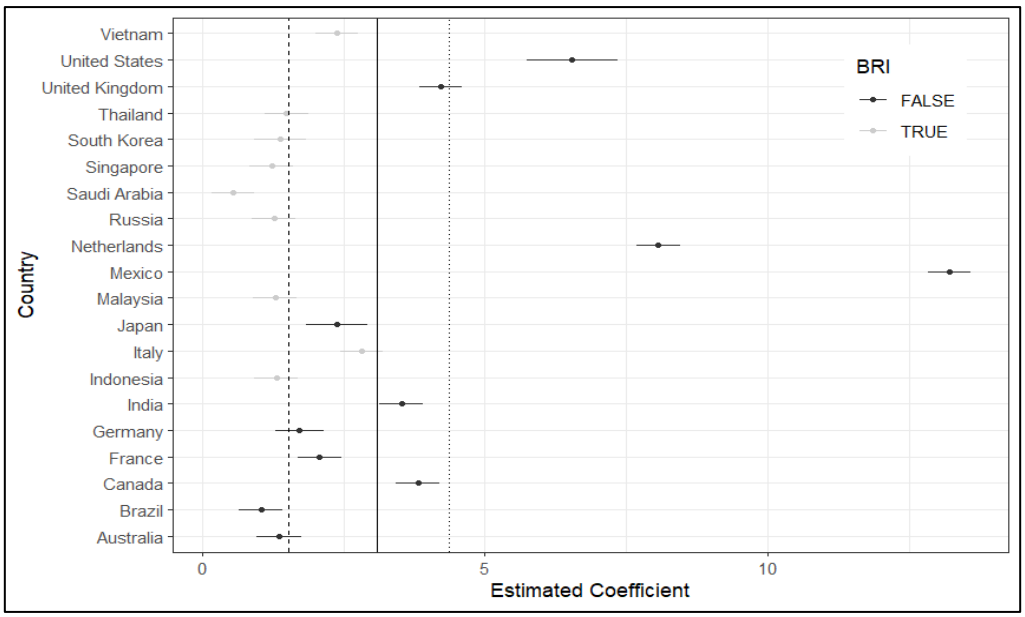
This surge in imports boots overall trade volume but also causes the export-import ratio to increase, as imports grow faster than exports in the short term. China has reinforced its economic ties with BRI countries' production networks by exporting essential components and finished goods needed for infrastructure. This dependency on Chinese imports initially boosts trade volume, and

increases the export-import ratio, reflecting the rapid increase in imports required for infrastructure development as shown in our regression analysis. While we do not have a hypothesised amount of change in Trade Ratio due to BRI, it can be said that the magnitude of the impact of BRI is rather low.

6.3. Country Effects

Figure 1

Coefficient plots Country Coefficients



Source: Author's construction

Note. This figure plots the coefficients for each country. The dot is the estimated point and the line indicates the confidence interval at 95%. Countries with BRI Agreements are marked in light grey and others in dark grey. The black solid line is the average of coefficients. The dashed and dotted lines are averages of coefficients for BRI and non-BRI countries respectively.

As observed, the country coefficients range from 0.54 for Saudi Arabia to as high as 13.22 for Mexico. On average, the countries have a coefficient of 3.08, but bifurcating based on BRI status, we obtain more clarity. BRI Countries have a lower coefficient of 1.53 compared to 4.36 for non-BRI countries. It can be seen that the spread of coefficients for non-BRI countries is also much wider. Thus, while BRI increases the trade ratio, the countries with BRI generally have lower trade ratios, suggesting a more balanced trade. Whether the countries are selected in that manner is subject to a deeper evaluation of the country's economic and political relationship with China.

Looking into the outliers, Mexico recently became the largest source of U.S. imports under the USMCA (United States-Mexico-Canada Agreement) while China's share in U.S. imports is decreasing due to additional tariffs. In 2017, China held a 21.9% share in U.S. goods imports, which declined to 14.1% in 2023. Meanwhile, Mexico's share has increased from 11.7% in 2011 to 15.4% by 2023 (Ouygan and Shi, 2024).

China's rising interest in Mexico's auto manufacturing sector aligns with Mexico's role as a critical car exporter to the United States. Chinese auto firms rely on upstream materials and equipment supplied from China, further solidifying Chinese supply chains in Mexico's industrial landscape. To sustain this growth, China has provided lenient loans, investment insurance overseas, and tax

exemptions. Consequently, Chinese foreign direct investment in Mexico grew faster than U.S. investments. (Ouygan and Shi, 2024)

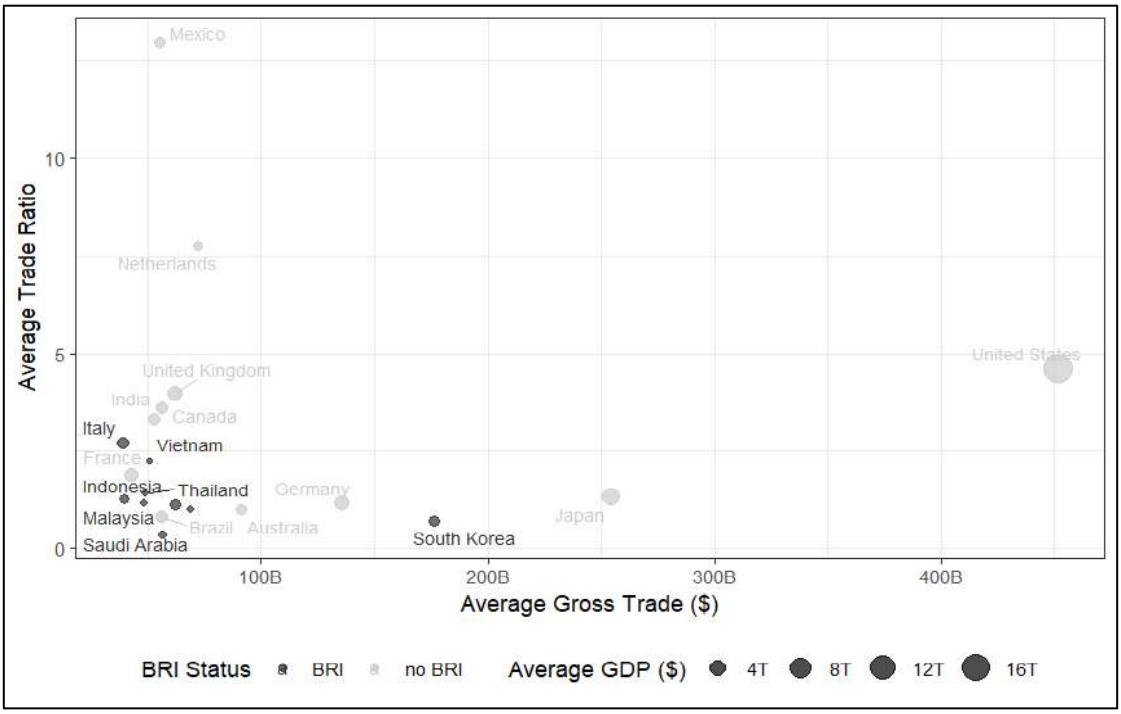
Another outlier, The Netherlands, serves as a trading nation and acts as a gateway to Europe. Advanced logistics infrastructure and great location make it perfect for receiving goods from China, which are then stored, processed, and distributed throughout Europe in an extremely efficient network (Butter and Hayat, 2013). The Dutch distribution centers manage the flow of goods, adopting advantageous trade policies and streamlined customs processes to expedite re-export (Butter and Hayat, 2013). This will enable an entry point to be established through the Netherlands for commodities intended to enter the European market thus maximising volume and efficiency in the trade distribution.

6.4. Trade Volumes and Trade Ratio

Time series and scatter plots can be used to get a better understanding of Trade Volume (Gross Trade), Trade Ratios, and their relations with regard to BRI.

Figure 2

Scatter Plot of Trade Ratio and Gross Trade



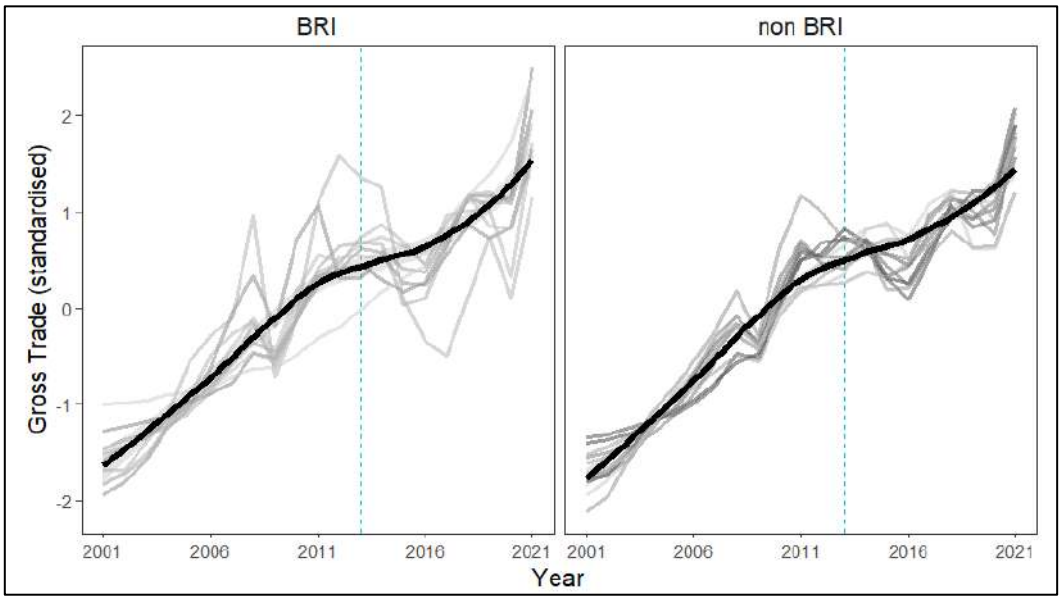
Note. The size of points is determined by GDP and colour by BRI. B = billions, T = trillions

Figure 2 plots the Trade Ratio and Gross Trade as the average values throughout the analysis. It can be observed that a majority, excluding six countries, falls in a region with a trade ratio below five and a Gross Trade below 100 billion dollars. The outliers in gross trade can be attributed to the economic size of the country, while the outliers in the Trade Ratio have been explained in the previous section. All BRI countries, except for South Korea, fall within the region implying the countries are small and have relatively balanced trade ratios with China. This further clarifies how smaller developing countries are the primary recipients of BRI.

A time series analysis of Trade Ratio and Gross Trade can give a better understanding of the trends.

Figure 3

Gross Trade time-series BRI vs. non-BRI

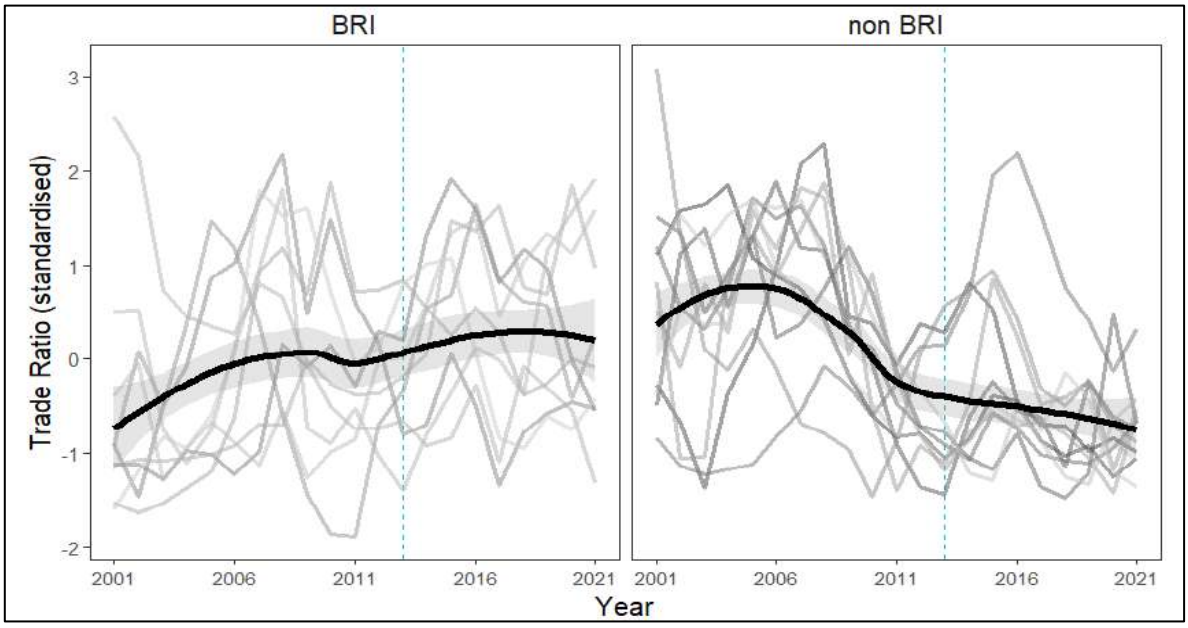


Note. Gross Trade has been standardised using z-scores for better plotting. The black curve represents the smoothed data points of all countries. The vertical line represents the year 2013, the start of BRI.

A fairly linear trend can be observed in Gross Trade throughout the analysis for both BRI and non-BRI Countries. The smoothed curve rose at a steady rate until 2011, after which it plateaued before gaining pace in a few years. This plateau can be associated with the saturation and level of development of the Chinese economy (Morrison, 2019). It can be observed that BRI countries have a higher susceptibility to fluctuations. While the smoothed curve for BRI and non-BRI countries are rather similar post-implementation of BRI in 2013, an exponential rise is more pronounced in BRI countries. However, a significant change in growth exclusive to BRI countries cannot be observed.

Figure 4

Trade Ratio time-series BRI vs. non-BRI



Note. Trade Ratio has been standardised using z-scores for better plotting. The black curve represents the smoothed data points of all countries. The vertical line represents the year 2013, the start of BRI.

With the Trade Ratio, BRI makes an evident difference. While the ratios are very fluctuant, when smoothed, BRI countries have a positive slope while non-BRI countries have a negative slope. The positive coefficient suggests an increase in imports from China due to the BRI, but the impact is minimal as the coefficient is relatively small. While the trend is fairly linear for BRI countries, a dip can be noticed around 2008 owing to the global economic crisis. The next negative slope came in the pandemic era. Meanwhile, non-BRI countries show a rising trade ratio around 2001, falling steeply after 2006, until 2011 when the curve flattened with a negative slope. The rise after 2001 can be attributed to China's accession to the World Trade Organization (WTO) after which China became more export oriented (Tan, 2021).

However, in the mid-2000s, there was a change of strategy to a more inward-looking policy. This fall in export supply was followed by a fall in demand due to the 2008 economic crisis. After 2013, with the Xi Jinping administration, China continued with a balanced approach, maintaining exports and domestic economy (Liu, 2024). The BRI shifted focus to smaller countries. Thus, the trade ratio has taken a relatively negative slope since then.

Bringing Gross Trade and Trade Ratio together, it is clear that BRI impacts the trade ratio more than it would Gross Trade. While Gross Trade may increase at a similar rate, the breakdown i.e. the exports and imports will vary with BRI countries receiving more imports from China increasing Trade Ratio. As hypothesised, BRI does make trade more imbalanced while bringing it up.

7. Conclusion

While "unimpeded trade" is one of the five objectives of BRI, evidence suggests that it may not be the priority. Arguably, China is more focused on lending activities and infrastructure development than simple trade. Chen et al. (2022) find that Chinese banks show considerably more support to BRI countries, especially those with weaker economic performance, more fragile institutional quality, and closer political interests. The trade associated with BRI is leaning more toward Chinese outflow evident from our results.

We find that while BRI has a positive impact on the trade ratio indicating an increase in Chinese outflow, the increase is of weak magnitude. Most BRI countries are small developing nations. As gross trade increases with time, the trade ratio reacts negatively to gross trade. While BRI does not have a significant impact on trade volume, it is trade ratios where the change is clearer and more differentiable from countries not part of BRI.

As a policy, the Belt and Road Initiative is a blanket policy that does not have any fixed terms or stipulated conditions but tailors itself to each nation. Nedopil and Christoph (2023) find that 150 countries have signed BRI MoUs with China, encompassing the whole world. Thus, BRI remains just a name, and transactions are based on many other factors, economic and political.

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The Divergent Paths of Integrating Intellectual Property into Foreign Policy: Open-Source vs Closed-Source AI Models and Their Implications for Global Trade

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This study investigates the contrasting impact of open-source versus closed-source AI models on economic growth and global trade dynamics. Open-source AI models, known for their high public accessibility and ability to encourage collaboration, provide significant advantages in promoting innovation and reducing development costs, thereby enabling broader economic participation. On the other hand, closed-source AI models prioritise proprietary control, allowing businesses to maintain superiority and a monopolistic position in AI by retaining strict control over technology and limiting forms of external collaboration. By developing an openness score and using the panel regression method, this study leads to the conclusion of how open-source AI models potentially support global trade integration and enhance economic growth by democratizing access to AI-driven technologies. Furthermore, it explores the implications of diverging AI strategies on international trade policies, particularly regarding intellectual property risks, competitive advantages, and geopolitical challenges. The research ultimately offers relevant insights towards understanding the economic considerations of AI accessibility at the strategic global forefront.

***JEL Classification**: C33, L24, O34, O36, O38*

1. Introduction

The rapid advancement of artificial intelligence (AI) has scintillated a global debate over the contrasting approaches of open-source and closed-source models, each offering distinct advantages and challenges. Open-source AI models, characterized by their accessibility and collaborative nature, provide a platform for widespread innovation and democratization in terms of technology. They allow smaller firms and research institutions to participate in the AI ecosystem without facing licensing costs that can be prohibitive. For instance, Meta's LlaMA and EleutherAI's GPT-NeoX have significantly contributed to academic research and AI development at reduced costs. These models have transformed sectors such as natural language processing, data analysis, and creative industries by promoting decentralized innovation. In contrast, closed-source AI models offer highly refined market-ready solutions, their access restricted to firms with the financial capacity to afford their licensing. Thus, they have a tendency to create monopolistic behaviour by limiting broader access to the general public. Models such as OpenAI's GPT-4 and Google's BERT, emphasize proprietary control and commercial advantage, therefore, maintaining a competitive performance in the AI industry (Sapkota et al., 2024).

Several studies suggest that although closed-source models lead to significant breakthroughs in industries such as healthcare and search engine optimisation, their restricted use stifles widespread innovation and raises concerns about unequal access to AI advancements. AI is increasingly becoming a driving force behind economic growth, with global spending on AI systems projected to amass

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approximately 500 billion dollars by 2024 (McKinsey & Company, 2023). Open-source models are seen as catalysts for economic development as they lower innovation costs and enable more businesses to integrate AI technologies into their operations (WIPO, 2023). European Union members have embraced open-source AI models and concurrently demonstrated faster rates of innovation diffusion and a more competitive AI sector (European Commission, 2024). On the other hand, closed-source models, while generating substantial profits for corporations such as Google and OpenAI, often raise concerns over intellectual property concentration and its impact on global trade dynamics.

The training cost factor must be taken into consideration while comparing the two models. The training costs of open-source and closed-source AI models are significantly different, mainly because of the difference in objectives and operational structures (WIPO, 2023). Open-source models generally require lower training costs because they draw from collaborative frameworks that utilize pooled resources and decentralized contributions, reducing financial barriers and making AI more accessible to academic and small commercial applications. Closed-source models often have higher training expenses due to proprietary algorithms, extensive infrastructure, and commercially oriented optimisation. Developed by large tech firms, such models call for massive investments to sustain a competitive position, contributing towards the trend of monopoly and proprietary superiority in AI (McKinsey & Company, 2023) .

This paper explores the 'divergent paths of integrating intellectual property into foreign policy' through the opposing lenses of open-source and closed-source AI models. Through both quantitative and qualitative methods, it aims to examine the impact of AI strategies on economic growth and trade, further focusing on how intellectual property rights play a significant role in a broader geopolitical landscape.

2. Objectives

1. To investigate the contribution of open-source and closed-source AI models towards integration of global trade.
2. To analyze the role of training costs in AI development as a driving force for economic growth.
3. To examine the divergence of global trade policies as a result of intellectual property laws associated with AI strategies.

3. Review of Literature

Bommasani et al. (2023) investigate the administrative challenges surrounding open foundation AI models. There is awareness that these models are openly available for public consumption and use. The direction of this paper accentuates the benefits of open models, some of which include even distribution of power in the AI ecosystem and transparency (Bommasani et al., 2023). This model has significant scope to encourage innovation, as is accurately captured by the paper. The authors compare open foundation models with closed AI systems, highlighting that open models allow a broader range of stakeholders. From small businesses to independent developers, the access and use of these technologies are at lower costs. As a result, the concentration of power in the hands of a few large companies is diminished and the promotion of healthy competition occurs. Another important aspect covered by this paper is that open foundation models provide significant benefits in terms of transparency. These models are accessible easily which allows independent auditing and assessment

to be done by third parties. This provides a comprehensive understanding and inspection of the AI systems, which is essential in ensuring that AI models are accountable and free from any prejudices and one-sidedness, which can be much harder to scrutinize and validate in closed systems.

The authors highlight the risks associated with open models, especially the possibility of misuse by hostile actors. When model weights are available to the public, developers have limited control over how these models are used or misused. Hostile actors can remove safety guardrails, and misuse the models to generate misinformation, cyberweapons and other harmful outputs. The paper states that there is insufficient evidence in support of the assertion of open models being riskier in relation to closed models and research needs to be undertaken to properly address the risks. Finally, the article presents policy implications urging states to take into account, even if unwisely, the effect of regulation on the open foundation model ecosystem. The adoption of regulatory provisions for example liability for downstream harm would unduly affect open model developers hampering growth without reducing the threat. The authors support the idea of regulation of open AI models in such a way as to encourage the creation of such models but at the same time reduce the risk of negative consequences (Bommasani et al., 2023). The paper raises questions regarding the alignment of international collaborations and ethical principles for open foundation models and the mechanisms that can prevent misuse while promoting open source models. There is inadequate information available regarding the real-world applications of governance frameworks for open foundation models as is emphasized by the author.

Trammell & Korinek (2024) explore how advanced artificial intelligence (AI) could fundamentally reshape economic growth patterns and labour markets. This paper raises questions about the influence of transformative AI on productivity, income distribution, and labor markets, and the policy interventions necessary to ensure inclusive economic growth. The paper is based on two key possibilities: AI's capacity to accelerate output production and AI's role in enhancing knowledge production. According to the authors, human-centered tasks will be performed by AI machines which in turn leads to a self-augmentation of the economy. In this paper, the authors also discuss the contribution of AI to knowledge creation. More so, advanced models of AI will support research development as new technology will be discovered at a more rapid rate. Factors that will enhance economic growth in this case, include productivity improvement in a number of industries. AI would be such that its impact will be profound when it is able to reach a point at which it can improve itself. The authors argue that as more tasks are accomplished by AI machines, the decreasing share of income going to labour will have many adverse effects on the working class. While this can lead to wage stagnation for most workers, they, however, argue that productivity increases as a result of AI will translate to lower prices and volumes, which create an increase in possible welfare in society (Trammell & Korinek, 2024). The paper recommends at the end that AI is set to change the global economy in ways that no one would have imagined, and these changes may be comparable to or even exceed the effects of the age of industrialization in terms of time growth. The time seems inappropriate as the maxim follows, authors recognize that current economic models may underestimate the level of AI's interference. They have called for new frameworks to further examine and understand the potential of AI-driven economic growth and its gains and pitfalls (Trammell & Korinek, 2024). The gaps are identified in the underdeveloped theoretical models accounting for AI's potential self-augmenting growth effects and the insufficient examination of how transformative AI might reshape global economic hierarchies, particularly among emerging economies, the authors' have called for more research in these areas.

Lerner & Tirole (2000) deal with various aspects of economics and how they support the premise of open-source software (OSS). This paper focuses on the reasons surrounding the voluntary donation of professional programming capabilities for a public collaborative effort in software development. As per the authors, this phenomenon of free contribution challenges traditional economic theories that expect remuneration/ financial compensation to be the primary motivators of labour. Instead, as is argued by the authors, it is career concerns, signalling and reputational incentives that motivate the programmers to freely contribute. The paper emphasizes the surprising behaviour of OSS developers despite the final product having the nature of a public good. OSS allows the sharing of code by developers, the refinement of software and the building of contributions of others without receiving any direct payment or remuneration. Lerner and Tirole put forth an argument that states that this type of collaborative innovation draws parallels to other user-driven innovations as seen in industries of scientific instrumentation and machine tools. The idea of 'career concerns' is put forth as a way to explain the non-monetary rewards sought by developers, such as gaining recognition in the community, skill improvement and signalling their abilities to potential employers. The authors explored several case studies of prominent OSS projects like the web servers Apache, Perl and Sendmail, to display the diverse organizational and incentives that promote success in OSS. For example, Apache grew from a small group of developers who were frustrated with existing server technology into a project with global influence, driven by a decentralized group of contributors. Similarly, the Sendmail project, which started as a student project, later grew into a widely adopted software, used to manage email systems. The importance of contributions and the ability to signal competence are important factors in the open-source model (Lerner & Tirole, 2000).

Lerner and Tirole (2000) have also considered how commercial companies have begun accepting open-source reproduction, not by grossing money out of the model itself but through the use of peripheral products and services that are associated with the model. Red Hat and Va Linux, however, do offer open-source support but in the form of service or hardware that is customized to open-source software. By doing so, they create a profitable business based on free software. The interaction between open-source and commercial software development is another important point of the paper. It suggests that companies can benefit indirectly from the success of OSS by offering complementary products and services. In the end, the paper comes to the conclusion that OSS will always pose a challenge to conventional economic constructs since several of its components are not particularly inclined towards profit-maximizing behaviours. The authors emphasize that OSS is a new form of organization that crosses the boundaries of economic rationale to the normal extent, but still helps to destroy the software in a much more productive way due to collaboration and innovation (Lerner & Tirole, 2000). This paper raises questions regarding why contributors engage in open-source projects and how open-source models influence traditional software markets. The authors' have emphasized the need for research on the sustainability of open-source projects and their economic comparison to proprietary models.

Oztruck (2024) has explored the transformative role of Artificial Intelligence in international trade, emphasizing its involvement in optimizing trade operations, enhancing trade finance, and expanding market access. This paper raises questions regarding how AI can enhance international trade accessibility for SMEs and the risks of over-reliance on AI in trade logistics. AI technologies, particularly machine learning, predictive analytics, and natural language processing, are pivotal in streamlining processes and improving efficiency in the trade of goods and services. In trade operations, AI enhances supply chain management by analyzing historical data and market trends to predict

demand, thereby minimizing overstock and stockouts. This predictive capability is crucial for businesses to align inventory levels with market needs, ultimately reducing costs and improving logistics. Furthermore, AI-driven automation in customs processes accelerates clearance times and minimizes human errors, vital for maintaining the flow of goods across borders (Oztruck, 2024). It can also be observed that open-source AI models, with accessible frameworks and tools, enable businesses, regardless of size or financial resources, to adopt advanced AI technologies. This fosters innovation and allows companies, especially in developing economies, to compete globally without the high costs of proprietary AI systems. The gaps are evident in the limited availability of case studies focused on developing economies and the lack of detailed research on the ethical and social implications of AI driven automation in trade processes.

In contrast, closed-source AI models are often expensive and restrictive, limiting access to larger corporations and developed economies, and potentially widening the gap in global trade participation. Ultimately, open-source AI models enhance trade integration by making AI more accessible and affordable, helping businesses optimize operations and improve market access. By lowering adoption costs and fostering innovation, open-source AI drives sustainable economic growth, particularly in emerging markets. This ensures a more inclusive and efficient global trade environment, contributing to greater trade integration and economic development.

Igbinenikaro & Adewusi (2024) bring to light the importance of incorporating artificial intelligence into global trade policies to advance efficient business models, transformative technologies, and ethical practices in international commerce. The paper focuses on the fact that AI systems rely on vast datasets to train and optimize algorithms which results in the urgent need to maintain robust data privacy and security, to minimize the risks of misuse of personal or proprietary information. Additionally, the paper points out that AI algorithms are prone to biases, which can worsen existing inequalities in global trade. To address these issues, the authors recommend establishing clear guidelines and harmonizing regulatory frameworks, which would improve interoperability, reduce compliance costs, and facilitate smoother cross-border trade. Open-source AI models can be proposed as an essential tool for achieving regulatory uniformity since their collaborative source codes can drive standardization, lowering proprietary barriers and promoting fairness in global trade.

As businesses increasingly leverage AI to navigate the complexities of global markets, policymakers must integrate AI considerations into trade agreements. Doing so ensures that AI's benefits are distributed inclusively, transparently, and sustainably. AI technologies have the potential to stimulate significant economic growth, job creation, and innovation by improving productivity and opening new business opportunities worldwide (Igbinenikaro & Adewusi, 2024). The paper suggests that through trade agreements that support AI research, development, and deployment, policymakers can foster investment, stimulate economic activity, and create a level playing field for businesses to succeed. Algorithmic transparency will become an essential factor in building global trust, ensuring the reliability and fairness of AI systems. Lastly, the paper also takes into consideration the fact that while Global trade agreements need to make AI technologies accessible for the broader public benefit, they should also provide comprehensive protection for AI-related patents, inventions, copyrights, and trade secrets, shedding light on the critical importance of Intellectual Property Rights (IPR) in global integration (Igbinenikaro & Adewusi, 2024). This paper raises questions regarding how AI can be integrated into global trade agreements while addressing inequalities between developed and developing economies and ensuring data privacy in AI-driven trade systems. The is more scope in

pursuing detailed studies on AI's implications for trade negotiations and limited focus on harmonizing AI-related trade policies across diverse economic regions.

4. Hypothesis

1. An open-source AI strategy facilitates a greater integration into global trade when compared to a restrictive strategy.
2. Open-source AI models are associated with lower training costs than closed-source AI models, depicting increased economic growth through greater accessibility to AI-driven innovation.
3. Contrasting AI strategies lead to dichotomy in global trade policies due to intellectual property theft risks, unequal competitive advantages, risk of trade barriers and other geopolitical divides.

5. Methodology

This research aims to analyze how increasing accessibility to AI models using an open-source code is more beneficial for integration of global trade and economic growth, when compared to a restrictive AI strategy, which due to its limited access lacks transparency, hinders the development of successful trade relationships between international economies and facilitates concentration of rapid AI development only in the hands of specific organizations.

5.1. Quantitative Technique

In order to support the quantitative analysis, panel data has been collected for AI models launched across multiple countries during the time period of 2016–2023, which was chosen due to the availability of comprehensive and reliable data for this period. For the purpose of determining the suitability of AI strategies for global integration, a panel regression technique using the Feasible Generalized Least Squares (FGLS) method has been utilized. It controls for differences in countries such as AI investments, government subsidies and regional costs, providing a more accurate impact of change in openness score on the change in training costs. This model is suitable since it has been beneficial to analyze the relationship between training costs and openness score, which may vary across countries but are assumed to remain consistent over time for each country.

The following equation represents the common model:

$$Y_1 = \boldsymbol{\beta}_1 + \boldsymbol{\beta}_2.D + \boldsymbol{\beta}_3.X_1 + u_1$$

Classification of Data Variables is as follows:

Table 1

Variable Type	Variable	Unit	Data Source
Dependent	Y_1 = Trade	% of GDP	World Bank Data
Independent	D = Qualitative Dummy Variable	1 - Open Source AI Models 0 - Closed Source AI Models	N/A
	X1 = Openness Score	Range of 0 – 10	N/A

The rationale associated with the selected variables is as follows:

i. Y1 = Trade (% of GDP):

Trade has been selected as the 'dependent variable' for this regression model. Trade is a crucial indicator for assessing the transference of goods and services from one economy to another, and therefore, acting as a successful measure of international cooperative policies. As innovations in AI technology have slowly begun to penetrate in trade patterns, trade can be used as a variable to understand the impact of AI strategies on global collaboration, economic competitiveness and protectionism. Further, it has the potential to be used as a successful metric in order to denote the dichotomy in the adoption and implementation of AI strategies which result in the creation of a divide in trade partnerships.

ii. D = Qualitative Dummy Variable:

A qualitative dummy variable has been selected as the first independent variable for this regression model. This variable is representative of the different AI strategies that can be employed by an economy. A value of 1 is associated with open-source AI models, whereas a value of 0 is associated with closed-source AI models. Utilizing this dummy variable is a beneficial tool for determining the difference between the AI strategies, with regards to their contribution to international trade and global integration.

iii. X1 = Openness Score:

An openness score has been created as the second independent variable for this regression model. Openness Score refers to the degree to which the AI model and its source code has been made accessible to the public and other developers. While a high openness score suggests that the AI model's design, data and algorithm is easily accessible for modification and reuse, a low openness score is suggestive of restrictive access and limited visibility of the internal functionality of the AI model. This openness score has been developed using the following 10 parameters:

- Performance Metric: Is data on accuracy, precision and recall available publicly?
- Model Availability: Is the AI model's code or pre-trained code available for use or modification?
- Data Availability: Is the training dataset made publicly available?
- Data Licensing: Is the data license clearly stated and open for use?

- Bias and Fairness Reporting: Is information or reports on bias testing and fairness evaluation publicly available?
- Document Quality: Is extensive and transparent documentation on the AI model publicly available?
- Community Support: Can this AI model be used by a large and active community or is it restricted to an organization?
- Pre-Trained Model Usage: Is the pre-trained model available for download and use?
- Model Customization: Is fine-tuning support for the model easily available?
- API Access: Does this AI model have a direct open API access?

Out of a sample size of 46 AI models, an individual openness score has been calculated for each model. For every parameter accepted, a score of 1 has been provided to the AI model and for every parameter rejected, a score of 0 has been provided to the AI model. Summation of all the 10 parameters, therefore indicates the openness score of the respective AI model, with the score of each AI model ranging between the values of 0 to 10.

For the purpose of understanding the role of training costs in AI development contributing towards economic growth, a fixed-effects panel regression model with a Weighted Least Squares (WLS) method has been employed. The following equation represents the common model:

$$Y_2 = \alpha_1 + \alpha_2.X_2 + u_2$$

Classification of Data Variables is as follows:

Table 2

Variable Type	Variable	Unit	Data Source
Dependent Variable	Y_2 = Training Costs (inflation-adjusted)	U.S Dollars	Stanford University Artificial Index Report 2024
Independent Variable	X_2 = Openness Score	Range of 0 - 10	N/A

The rationale associated with the selected variables is as follows:

i. Y_2 = Training Costs (inflation - adjusted) in U.S Dollars:

Training Costs (inflation adjusted) in U.S Dollars has been selected as the 'dependent variable' for this regression model. The training cost of an AI model refers to the expenditure incurred for training a model effectively. This includes expenditure on computational resources such as processing power, data acquisition and energy associated costs. This variable is a useful metric to draw a comparison between open-source and closed-source AI models since open-source AI models offer publicly available pre-trained models for development which reduces training costs concerned with initial experimentation, scaling and modification. On the other hand, closed-source AI models due to their emphasis on proprietary frameworks face high optimization costs due to their requirement of private datasets, in-house expertise for modeling and expenditure on employment of licenses. Ultimately, lower training costs of AI models not only foster innovation but also support national economic growth due to greater adoption across economic sectors.

ii. X_2 = Openness Score:

Similar to the previous regression model, an openness score has been employed as the independent variable for this regression model. Openness Score refers to the degree to which the AI model and its source code has been made accessible to the public and other developers. While a high openness score suggests that the AI model's design, data and algorithm is easily accessible for modification and reuse, a low openness score is suggestive of restrictive access and limited visibility of the internal functionality of the AI model.

Using the same 10 parameters as previously mentioned, an individual openness score has been calculated for a sample size of 32 AI models. For every parameter accepted, a score of 1 has been provided to the AI model and for every parameter rejected, a score of 0 has been provided to the AI model. Summation of all the 10 parameters, therefore indicates the openness score of the respective AI model, with the score of each AI model ranging between the values of 0 to 10.

5.2. Qualitative Technique

To further support the research hypothesis, a case study based on e-commerce giant Amazon and logistics based company FedEx has also been conducted, in order to explore the role of differing AI strategies in tech-driven trade processing and practices.

6. Analysis

6.1. Quantitative Analysis

6.1.1. Analyzing the implications of open-source AI models on global trade integration

A panel regression analysis was conducted with Trade (% of GDP) as a dependent variable and openness score and open-source dummy as an independent variable to investigate the functional relationship.

Table 3

Regression Result (Feasible Generalized Least Squares Method)

Variables	Coefficient	S.E.	T. Stat	P-Value
Intercept	15.9837	9.1968	1.7380	0.0893752
Open-Source Dummy	-28.1960	6.8735	-4.1021	0.0001788
Openness Score	5.3904	2.0052	2.6881	0.0101795

Table 4

Regression Statistics

Total Sum of Squares	27942
Residual Sum of Squares	22.339
R-Squared	0.22674
Adjusted R-Squared	0.19077
F-Statistic	9.143 (2 and 43 DF)
P-value	0.00049125
Observations	46

The regression equation derived is as follows:

$$Y_1 = 15.9837 - 28.1960D + 5.3904X_1$$

The open-source dummy carries a value of 1 for open-source AI models and carries a value of 0 for closed-source AI models. The open-source dummy acts as a qualitative indicator, allowing us to distinguish the non-numeric factors between the two categories of AI strategies. The slope coefficient of the open-source dummy is -28.1960. This indicates that the contribution of closed-source AI models is higher than the contribution of open-source AI models towards trade as a percentage of GDP by 28.1960%, keeping openness score constant. The P-value of the open-source dummy coefficient is 0.0001788. The P-value is less than the significance level (5%), so we reject the null hypothesis. Thus, the data presents sufficient evidence to declare that the open-source dummy variable is statistically significant in predicting the contribution of AI-models towards trade as a percentage of GDP.

The openness score, developed using 10 parameters, is a metric for determining the level of public accessibility of an AI model and its source code. The slope coefficient of the openness score, as an independent variable, is 5.390. This indicates that as the openness score increases by 1 unit, trade as a percentage of GDP increases by 5.390%, holding the type of AI model constant. The P-value of the openness score coefficient is 0.0101795. The P-value is less than the significance level (5%), so we reject the null hypothesis. Thus, the data presents sufficient evidence to declare that the openness score is statistically significant.

When closed-source AI models are employed (D = 0), the equation is denoted as Y1 = 15.9837 + 5.3904X1, suggesting that the base trade percentage of GDP for closed-source models with an openness score of X1 = 0 is 15.9837%. On the other hand, when open-source AI models are employed (D = 1), the equation is denoted as Y1 = -12.2123 + 5.3904X1, suggesting that the base trade percentage of GDP for open-source models with an openness score of X1 = 0 is -12.2123%. This negative value is indicative of the fact that open-source AI models initially signal lower levels of trade relative to GDP. It also denotes an initial disadvantage that open-source AI models are likely to face due to the presence of global trade barriers such as limited commercial support, regulatory challenges or lower adoption rates in trade-associated industries. However, for both the types of AI models, as openness score increases by 1 unit, trade as a percentage of GDP increases by 5.390%. This ultimately

indicates that even though open-source AI models start with a lower baseline towards trade contribution when compared to closed-source AI models, trade integration improves steadily with a higher openness score, potentially offsetting the initial lower baseline associated with open-source AI models. Raising openness score eventually positions open-source AI models as strong contributors to global trade with the ability to surpass closed-source models once openness score is sufficiently high.

The coefficient of determination (R square) is 0.22674, suggesting that the regression model does not show a relationship between the type of AI model, openness score and trade integration, indicating that other factors beyond AI model type and openness score do play a crucial role in influencing trade in an economy.

The F statistic of this model is 9.143 at (2,43) degrees of freedom. The critical value of a 5% test is 3.23, thus the null hypothesis ($\boldsymbol{\beta}2 = \boldsymbol{\beta}3 = 0$) is rejected. Moreover, the overall P-value of 0.00049125 is less than the level of significance 0.05, proving a strong relationship between trade as percentage of GDP as a dependent variable and open source dummy and openness score as independent variables. Since there is less than 5% probability that the null hypothesis is true, this indicates that overall the model is statistically significant and that there is strong evidence against the null hypothesis.

The basic assumptions of the Classical Linear Regression Model require the presence of no heteroscedasticity, and no autocorrelation, in order to ensure that the coefficients derived are consistent and unbiased in nature (Gujarati & Porter, 2009). Due to the initial presence of heteroscedasticity, this model was estimated using the Feasible Generalized Least Squares (FGLS) technique. To further test the presence of heteroscedasticity, the Breusch-Pagan Test was conducted which resulted in a P-value of 0.9961. A P-value higher than 0.05 in this case (0.9961 > 0.05), suggests that there is no statistically significant evidence of heteroscedasticity in this model.

Due to the initial presence of autocorrelation in the regression model, the Cochrane-Orcutt test was conducted in order to correct the first-order autocorrelation in the residuals of the regression model, since correlation between independent variables and the error term violates OLS assumptions, leading to biased and inconsistent estimates. The Cochrane-Orcutt test resulted in a transformed Durbin-Watson test statistic of 2.16541 and a P-value of 7.449e-01. Since the Durbin-Watson test statistic is slightly above 2, it suggests a small tendency towards negative autocorrelation, however it lies very close to the no autocorrelation threshold. Moreover, a P-value higher than 0.05 in this case (7.449e-01 > 0.05) suggests that the residuals of the regression model after the Cochrane-Orcutt transformation, do not exhibit statistically significant autocorrelation, deeming the estimates consistent for analysis.

6.1.2. Analyzing the role of AI training costs on economic growth

The Variance Inflation Factor (VIF) of this model was calculated as 1.494115, which is less than 5, suggesting that perfect multicollinearity does not exist in this model and the estimates of the regression coefficients are stable and reliable in nature.

A fixed-effects panel regression analysis was conducted with Training Costs as a dependent variable and openness score as an independent variable to investigate the functional relationship.

Table 5

Regression Result (Feasible Generalized Least Squares Method)

Variables	Coefficient	S.E.	T. Stat	P-Value
Openness Score	-12822140	538825	-23.797	<2.2e-16

Table 6

Regression Statistics

Total Sum of Squares	3.4577e + 16
Residual Sum of Squares	28.985
R-Squared	0.24719
Adjusted R-Squared	0.066516
F-Statistic	566.273 [1 and 25 DF]
P-value	<2.22e-16
Observations	32

The equation derived in this regression model does not contain an intercept value. This is due to the fact that the fixed-effects model has focused on within-unit variation and has eliminated the intercept of each country, in order to control each country's unique characteristics. Therefore, the equation is expressed as:

$$Y_2 = -12822140X_2$$

The openness score, developed using 10 parameters, is a metric for determining the level of public accessibility of an AI model and its source code. The slope coefficient of the openness score, as an independent variable, is -12822140. This indicates that as the openness score increases by 1 unit, training cost of AI models decreases by $12822140. The P-value of the openness score coefficient is 2.2e-16. Since the P-value is less than the significance level for the hypothesis test (2.2e-16 < 0.05), we reject the null hypothesis and declare that the openness score is statistically significant in predicting the training costs of AI models, thus contributing towards economic growth.

Based on the regression model, we have observed that as openness score increases by 1 unit, training costs decrease by $12822140, making AI technology development and deployment more affordable, leading to broader adoption and accessibility. High training costs are a significant concern which denies small firms the opportunity to compete with larger conglomerates. However, adoption of open source models will make AI development more accessible to smaller companies, startups, academics and non-profit organizations without investing excessive capital, stimulating rapid advancements which will help strengthen the economy. This will further encourage AI-driven innovation in developing economies, enabling more sectors to leverage AI solutions in order to enhance their operational efficiency and productivity. Therefore, allowing lower training costs to act as a driver of high economic growth.

The model's explanatory power is observed to be moderate and not a good fit (R square < 0.7) since a significant proportion (75.281%) of the variation in the dependent variable is unexplained by

the model. This implies that other factors beyond openness score (some possible examples could be: computational resources, regulatory and compliance requirements and complexity of the AI model) play a crucial role in influencing the training costs under the development of AI in an economy.

The F statistic of this model is 566.273 at (1,25) degrees of freedom. The critical value of a 5% test with (1,25) degrees of freedom is 4.2417. As F statistic 566.273 exceeds 4.2417, the null hypothesis ($\alpha 2 = 0$) is rejected. Moreover, the overall P-value of 2.22e-16 is less than the level of significance 0.05, proving a strong relationship between training cost as a dependent variable and openness score as an independent variable. Since there is less than 5% probability that the null hypothesis is true, this indicates that overall the model is statistically significant and that there is strong evidence against the null hypothesis.

To further test the presence of heteroscedasticity, the Breusch-Pagan Test was conducted which resulted in a P-value of 0.5717. A P-value higher than 0.05 in this case (0.5717 > 0.05), suggests that there is no statistically significant evidence of heteroscedasticity in this model.

Due to the initial presence of autocorrelation in the regression model, the Cochrane-Orcutt test was conducted in order to correct the first-order autocorrelation in the residuals of the regression model, since correlation between independent variables and the error term violates OLS assumptions, leading to biased and inconsistent estimates. The Cochrane-Orcutt test resulted in a transformed Durbin-Watson test statistic of 1.97016 and a P-value of 4.719e-01. Since the Durbin-Watson test statistic is slightly below 2, it suggests a small tendency towards positive autocorrelation, however it lies very close to the no autocorrelation threshold. Moreover, a P-value higher than 0.05 in this case (4.719e-01 > 0.05) suggests that the residuals of the regression model after the Cochrane-Orcutt transformation, do not exhibit statistically significant autocorrelation, deeming the estimates consistent for analysis.

Multicollinearity exhibits a correlation between two or more independent variables, impacting the accuracy of the estimates of the regression model. This regression model does not exhibit multicollinearity due to the inclusion of a single independent variable.

6.2. Qualitative Analysis

6.2.1. AI Shaping Global Trade: A case study of Amazon and FedEx

Artificial intelligence is opening up new frontiers in global trade, especially those hitherto pursued for efficiency, innovation, and sustainability. The two giants of e-commerce and logistics, respectively, are Amazon and FedEx; they have shared with the world how their open-source and closed-source models of artificial intelligence, respectively, affect international operations. Amazon generated revenues of $574.79 billion for 2023, moving upwards of 1.6 million items across borders daily and uses AI in many ways (Statista Research Department, 2024). Innovating open-source tools like TensorFlow and PyTorch in Alexa's natural language processing to further improve interactions with its customers worldwide. In the meantime, Amazon deploys closed-source AI to enable its proprietary recommendation systems to learn from browsing patterns and purchase histories to make personalized recommendations. This AI-driven personalization alone contributes to over $35 billion a year and showcases AI's ability to scale profitability across the world. Amazon Logistics' infrastructure also draws profoundly upon AI for efficiency in global trade (Amazon, 2023).

FedEx primarily uses closed-source AI systems to protect the security and proprietary advantage of its logistics operations. Such systems power innovations, such as its SenseAware ID system, which provides real-time shipment conditions reporting in support of predictive risk management for high-value deliveries, such as pharmaceuticals (FedEx, 2024). As an added protection of proprietary AI-driven algorithms and predictive maintenance systems for its fleet, FedEx also implements more efficiency and higher customer service standards.

Predictive inventory management systems analyze seasonal trends, economic indicators, and customer habits to ensure stock level optimization in more than 100 countries (Markets and Markets, 2023). Real-time integration of traffic and weather data through AI algorithms reduces the cost of last-mile delivery by 10% while minimising carbon emissions in conformity with international goals on sustainability. These innovations significantly impact cross-border trade, ensuring faster deliveries and meeting consumer expectations in an increasingly interconnected economy. By comparison, FedEx generated $93 billion in revenue in 2023 and moved more than 15 million packages daily (Markets and Markets, 2023). It leverages AI to optimize its worldwide logistics network. SenseAware ID uses machine learning and IoT to track vulnerable international shipments, such as pharmaceuticals, in real-time and ensure a safe and reliable high-value global supply chain. By utilising weather and traffic information, route optimisation algorithms powered by AI have reduced travel time by 25% and fuel consumption by 15%, further sealing FedEx's position in enabling sustainable global trade. Collectively, these companies show how AI implementation strengthens global trade. Open source AI engenders collaboration and rapid innovation, while closed-source systems ensure proprietary control and data protection, necessary for maintaining competitive advantage in the $500 billion global AI trade sector.

Of course, the financial stakes and transformative potential that AI brings to global commerce are underlined by the significant investments in AI technologies by Amazon, including a $4 billion partnership with Anthropic to offer a more competitive AWS ecosystem. Finally, FedEx moves into sustainability via AI-driven efficiencies that matter for broader goals of reducing environmental impacts in international trade. Together, Amazon and FedEx make key contributions to reshaping the logistics sector and e-commerce, with strategic underlinings on AI usage to drive low-carbon, efficient, and connected global trade.

7. Policy Recommendations

Based on the findings of this analysis, the following policy recommendations are proposed to harness the potential of open-source AI models towards developing a more integrated global economy. The use of dual-licensing structures could provide a balance between accessibility and proprietary control of AI models. With a dual-licensing framework, open-source AI models can be made free to use for academic and non-commercial purposes, while commercial applications entail the need for royalty or licensing payments. In this way, open-source AI models would retain their relative collaborative advantage as well as allow developers and firms to protect their commercial interests. This could be a license for AI models such as BLOOM-176B, which scored high in openness. Academic and nonprofit organizations would use the model at no cost; commercial entities using it for profit would pay into the model financially. The regression analysis carried out in the present study indicates that a one-unit increase in openness scores can raise trade as a percentage of GDP by 5.39%.

With dual licensing, policymakers have a balancing point in promoting innovation and economic growth with international trade.

Open-source AI model development and deployment should be incentivized through tax credits or grants by governments and international organizations, particularly for the computing resources required to train such models. Indeed, as indicated by our research: Open-source models reduce training costs by roughly $12.8 million times the unit increase in openness scores. Lowered barriers to entry and better accessibility-extend to smaller enterprise entrants, startups, and academic institutions. This policy may also provide collaborative infrastructure to train AI models through public-private partnerships and reduce operation costs. For example, a model funded by the government and private firms can be used to target areas such as health and education, in which AI is expected to create a transformative effect. Tax breaks and other resource-sharing policies, will encourage participation, democratize AI usage and bring in more economic inclusivity-as findings on openness and innovation have suggested from the research.

A globally acknowledged "AI Transparency Certification" can be designed to grade various AI models on openness, transparency, and ethical considerations. Such a certification will include data access, bias audits, or potential customization among other parameters provided in the detailed openness score methodology in the paper. This certification could become a benchmark for deploying AI models in international trade agreements, ensuring only ethically sound and accessible models are utilized. The regression analysis underlined how higher openness scores contribute positively to trade integration. Encouraged by incentives to be transparent, developers will help governments establish trust in the AI ecosystems while mitigating the risks of algorithmic biases and unethical practices. The initiative would, therefore, along with the research findings and its recommendations for openness to democratize AI access and ensure global collaboration.

Institutionalizing international treaties of data sharing will aid in addressing privacy and security concerns arising during training. The treaties can be a secure framework where exchanges across borders are allowed, yet protection for datasets necessary to train the AI models is assured. As demonstrated in the study, open-source models, with their lower costs and collaborative potential, can play a pivotal role in advancing trade integration. However, their success often depends on access to diverse and high-quality datasets. This can be manageable under a global trade organization, such as the WTO, through a multilateral governance committee to avert misuse and allow access to data resources for smaller economies. This would create the opportunity for equitable participation in AI development and transcend geopolitical tensions, one of the issues resulting from the divergence of global trade policies based on intellectual property challenges.

Cybersecurity for open-source AI models should be enhanced to prevent misuse by bad actors. As the research underlines, open-source models spur innovation but, by virtue of their public availability, are also more vulnerable to exploitation. In this respect, the regulations should require developers to embed tamper-proof mechanisms in models and regularly audit them to track any modifications made. For example, a compliance framework may mandate that high-risk models, such as those used in financial or defense industries, include security guardrails in their construction. Such frameworks should also define recourse for negligence in protecting public AI tools. Including policies along these lines would minimize exposure while continuing to allow for open-source models that may encourage innovation and collaboration.

Lastly, integrating specific AI-related provisions into trade agreements can balance the protection of intellectual property with the benefits of open-source collaboration. This may refer to minimum contribution thresholds to open-source ecosystems, with member countries being obliged to release a certain number of AI models or datasets annually in order to benefit from the trade benefits.The research underlines the economic benefits of open-source strategies that democratize AI access and integrate global trade. Trading agreements incorporating these provisions will ensure a fair distribution of AI's benefits across countries, reduce monopolistic behaviors and increase inclusiveness in the AI ecosystem.

8. Future Scope

While this research has been able to uncover the significant contribution of AI towards global trade integration and economic growth by highlighting the need to adopt open-source models, it possesses certain drawbacks that could be resolved for an improved understanding.

This research has focused solely on identifying a functional relationship of open-source AI models using the openness score, on trade as a percentage of GDP and training costs associated with development of AI models. However, other factors such as investment in AI, trade agreements, regulatory standards and geopolitical tensions could also influence the link between AI openness and its economic outcomes. Due to limitations in data accessibility, these factors could not be incorporated into this study. Future research, therefore, with broader data access would provide a deeper insight for policy discussions by incorporating the contributions of these areas.

In terms of developing the openness score, equal weightage has been assigned to all parameters, assuming that all factors contribute equally to openness, which may not reflect the exact reality. Some parameters can have the tendency to have a greater impact in determining the openness of an AI model. However, determining the precise weight for each parameter is challenging due to limited empirical evidence and the subjective nature of such judgments. Therefore, assigning equal weightage, although imperfect, was chosen for the purpose of maintaining simplicity and consistency in this study. Future research could explore methods to assign differentiated weights to the parameters in order to examine the detailed contribution of each factor towards a model's openness.

Further, ethics of AI adoption, in the recent economy, has had the tendency to influence policy formation. Security concerns related to intellectual property or data distribution could lead to the establishment of newer governmental regulations which can impact the international sharing of AI models, specifically those that are open-source in nature. Thereby altering the economic impact of open-source AI models in the long-run.

Lastly, the study assumes a consistent global approach toward adopting open-source AI models across different countries. However, variations in technological infrastructure, digital readiness, and economic priorities might affect the extent to which nations are willing or able to adopt open-source practices. These differences can lead to uneven advantages and disadvantages in understanding the global economic implications of AI openness. Future research could therefore explore how such variations in technological and economic environments across countries influence the impact of open-source AI on trade and growth.

9. Conclusion

This paper provides a comprehensive exploration of how open-source and closed-source AI models are affecting global trade, economic integration, and growth. The analytical findings show that open-source AI models allow for greater inclusiveness, lower training costs, and greater innovation potential given their collaborative nature and openness. Such aspects will democratize AI technology, enabling smaller firms, non-profits, and even academic institutions to make more meaningful contributions toward advancements in AI. Such contributions will drive economic growth by diversifying the scope of technological applications across various industries. However, such open-source models come with inherent risks that will limit such potential: The inferences are that these models lowered the barriers and increased global knowledge sharing but might face the problem of intellectual property misuse, potential and likely regulatory oversights and uneven adoption between nations. For example, the high openness scores lead to better access if matched by policies preventing openness from being misused by questionable actors. This risk requires well-crafted regulatory frameworks that allow open collaboration without compromising security.

Closed-source AI models allow for instant economic benefits, and they exert strong control over intellectual property, thus protecting investments and ensuring market competitiveness for large firms. These models are more refined and commercially viable solutions that might lead to industry-specific breakthroughs, ensuring short-term economic gains. However, they are susceptible to monopolistic behavior and concentrate power on only those firms with adequate funds to indulge in proprietary development. Thus, the possibility of wide-scale technological development is killed and an economic disparity among the advanced and laggard nations.

The quantitative analysis in this paper illustrates how, initially, the closed-source models generate more to trade as a percentage of GDP. As the openness of open-source models increases, their integration also improves. This infers that open-source models would outperform their closed-source counterparts, subject to adequate support structures and regulations. The second important dimension is a reduction in the costs of training and making advanced AI technologies accessible to emerging economies and diversified sectors to promote economic inclusivity and sustainable growth.

Among a few problems are those that open-source readiness differs from country to country based on technological infrastructure, digital literacy, and national economic priorities. Countries with a more mature AI ecosystem can do more with open-source models: further saving potential; importance of significantly higher cross-sector innovation and financial resilience; developing economies would find it difficult to deploy such technologies without specific support and international coordination. It will call for well-tailored strategies redressing disparities in infrastructure and readiness to ensure a fairer distribution of benefits derived from open-source AI. International organizations and policy leaders have to balance fair trade agreements and data-sharing protocols with the rights of innovators while achieving worldwide trust and cooperation in their endeavors. Safe and transparent data exchange and model auditing are vital for rescuing open access from risks. The development of universal standards for the ethical use of AI and algorithmic transparency will ensure that breakthroughs will not increase current inequalities.

Open and closed sources of AI models give unique opportunities and pose challenges for world trade and economic growth. Combining the effort of open-sourced models with the controlled advantage of high performance of the closed system can benefit an AI ecosystem for all stakeholders

while appropriating policy, investing in infrastructure, and establishing strict ethics rules. Proper guidelines, infrastructure, and ethics will enable nations to encourage innovation, thereby preventing the erosion of the public interest. We notice these dynamics; therefore, we should build a future in which change through AI brings technological innovation, leading to sustainable growth, flexible economic boundaries, and more cooperation between international entities.

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Appendix

Appendix A

Table 1: This table includes data of sample size 46, used for panel linear regression conducted for the purpose of analyzing the contribution of AI models towards global trade. Trade (% of GDP) represents the dependent variable. Openness Score and the dummy variable (based on Access Type) represent the independent variables.

Table 1

Model	Year of Publication	Access Type	Dummy	Country of Origin	Trade (% of GDP)	Openness Score
Xception	2016	Closed Source	0	USA	26.45259779	6
GNMT	2016	Closed Source	0	USA	26.45259779	4
JFT	2017	Closed Source	0	USA	27.12533822	3
Transformer	2017	Closed Source	0	USA	27.12533822	7
BERT-Large	2018	Open Source	1	USA	27.44535913	9
BigGAN-deep 512x512	2018	Closed Source	0	UK	64.54264825	5
Transformer (Adaptive Input Embeddings)	2018	Closed Source	0	UK	64.54264825	6
AdaNet	2018	Open Source	1	USA	27.44535913	7
AlphaStar	2019	Closed Source	0	UK	64.66513364	4
T5-11B	2019	Closed Source	0	USA	26.27805493	8
RoBERTa Large	2019	Open Source	1	USA	26.27805493	8
SciBERT	2019	Open Source	1	USA	26.27805493	7
DistilBERT	2019	Open Source	1	USA	26.27805493	8
XLNet	2019	Open Source	1	USA	26.27805493	7
ALBERT	2019	Open Source	1	USA	26.27805493	8
MT-DNN	2019	Open Source	1	USA	26.27805493	6
CTRL	2019	Open Source	1	USA	26.27805493	5

GShard (dense)	2020	Closed Source	0	USA	23.10475333	4
GPT-3 175B (davinci)	2020	Open Source	1	USA	23.10475333	5
ELECTRA	2020	Open Source	1	USA	23.10475333	7
Reformer	2020	Open Source	1	USA	23.10475333	7
Longformer	2020	Open Source	1	USA	23.10475333	7
Pegasus	2020	Open Source	1	USA	23.10475333	6
SqueezeBERT	2020	Open Source	1	USA	23.10475333	6
XGLM-7.5B	2021	Open Source	1	USA	25.25348466	6
GLaM	2021	Closed Source	0	USA	25.25348466	5
Gopher (280B)	2021	Closed Source	0	UK	59.34864775	5
Florence	2021	Closed Source	0	USA	25.25348466	5
T0-XXL	2021	Closed Source	0	USA	25.25348466	7
Megatron-Turing NLG 530B	2021	Closed Source	0	UK	59.34864775	4
HyperCLOVA	2021	Closed Source	0	South Korea	80.19945693	4
CLIP	2021	Open Source	1	USA	25.25348466	7
DALL-E (v1)	2021	Open Source	1	USA	25.25348466	6
BigBird	2021	Open Source	1	USA	25.25348466	7
BLOOM-176B	2022	Open Source	1	France	73.2498526	9
U-PaLM (540B)	2022	Closed Source	0	USA	27.0400163	5
PaLI	2022	Closed Source	0	USA	27.0400163	6
GLM-130B	2022	Closed Source	0	China	38.35148058	5
OPT-175B	2022	Open Source	1	USA	27.0400163	8
Flamingo	2022	Closed Source	0	UK	69.52766202	6
GPT-NeoX-20B	2022	Open Source	1	USA	27.0400163	9
Gemini Ultra	2023	Closed Source	0	USA	27.74	5
Falcon 180B	2023	Closed Source	0	UAE	159.45	9
Llama 2-70B	2023	Open Source	1	USA	27.74	9
StarCoder	2023	Open Source	1	France	67.57711106	9
BloombergGPT	2023	Closed Source	0	USA	27.74	5

Appendix B

Table 2: This table includes data of sample size 32, used for panel linear regression conducted for the purpose of analyzing the role of training costs in AI development, contributing towards economic growth. Training Costs (inflation adjusted) in U.S Dollars represents the dependent variable. Openness Score represents the independent variable.

Table 2

Model	Year of Publication	Access Type	Dummy	Country of Origin	Training Costs (inflation adjusted) in U.S Dollars	Openness Score
Xception	2016	Closed Source	0	USA	20285.33284	5
GNMT	2016	Closed Source	0	USA	194739.1953	2
JFT	2017	Closed Source	0	USA	33440.73321	2
Transformer	2017	Closed Source	0	USA	929.9259292	5
BERT-Large	2018	Open Source	1	USA	3287.63529	5
BigGAN-deep 512x512	2018	Closed Source	0	UK	11648.17885	3
Transformer (Adaptive Input Embeddings)	2018	Closed Source	0	UK	5358.051967	2
AlphaStar	2019	Closed Source	0	UK	388902.659	2
T5-11B	2019	Closed Source	0	USA	236631.5548	5
RoBERTa Large	2019	Open Source	1	USA	160017.6469	5
SciBERT	2019	Open Source	1	USA	638.7439274	5
GShard (dense)	2020	Closed Source	0	USA	969111.5897	2
GPT-3 175B (davinci)	2020	Open Source	1	USA	4324882.624	2
XGLM-7.5B	2021	Open Source	1	USA	193060.0432	4
GLaM	2021	Closed Source	0	USA	2093016.024	2
Gopher (280B)	2021	Closed Source	0	UK	3499807.68	2
Florence	2021	Closed Source	0	USA	172410.9443	2
T0 - XXL	2021	Closed Source	0	USA	64175.36891	5
Megatron - Turing NLG 530B	2021	Closed Source	0	UK	6405652.563	2
HyperCLOVA	2021	Closed Source	0	South	986971.6223	2
BLOOM-176B	2022	Open Source	1	France	1990911.832	5
U-PaLM (540B)	2022	Closed Source	0	USA	12523793.1	2
PaLI	2022	Closed Source	0	USA	254719.2577	2
GLM-130B	2022	Closed Source	0	China	1635572.685	4
OPT-175B	2022	Open Source	1	USA	1493974.648	4

Flamingo	2022	Closed Source	0	UK	815069.4909	2
GPT-NeoX-20B	2022	Open Source	1	USA	310840.9894	5
Gemini Ultra	2023	Closed Source	0	USA	191400000	0
Falcon 180B	2023	Closed Source	0	UAE	25816323.8	5
Llama 2-70B	2023	Open Source	1	USA	3931897.157	4
StarCoder	2023	Open Source	1	France	585626.3877	5
BloombergGPT	2023	Closed Source	0	USA	952967.7279	2

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The Economics of Olympics - What Happens After the Torch Goes Out?

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With India officially submitting its 'letter of intent' to bid for the hosting rights of the 2036 Summer Olympics, it becomes imperative to assess whether the event's economic promises match the realities of hosting. For developing economies like India, the stakes are high: the Olympics are often touted as a transformative opportunity for long-term economic growth, yet the track record of past host cities paints a mixed picture. This paper investigates whether hosting the Olympics delivers the much-acclaimed 'Olympic legacy' by analyzing case studies of four host cities Montreal (1976), Los Angeles (1984), Sydney (2000), and London (2012). This study uses an ANCOVA (Analysis of Covariance) model to analyze the relationships between GDP per capita and Olympic hosting, as well as GDP per capita and the changes in foreign direct investment (FDI) and unemployment rates attributed to hosting the Olympics. The results show limited evidence that hosting the Olympics leads to significant long-term changes in GDP per capita. While countries like Australia and the USA experience structural shifts post-Olympics, for its counterparts the event's economic impact is largely transient, with temporary boosts in net investment and employment failing to translate into sustained economic growth. The qualitative analysis which reviewed the new norms and recent Olympic Games in Rio de Janeiro (2016), Tokyo (2020), and Paris (2024), sheds light on the inefficacy of these norms in driving meaningful change. However, given the recency of its implementation, the study offers policy recommendations that highlight areas for improvement to better grasp the Olympics' potential for long-term economic benefits.

***JEL Classification**: C30, H54, L83*

1. Introduction

The Olympic Games have evolved into a global phenomenon that transcends the boundaries of sports, shaping the political, economic, and social landscapes of host nations. Envisioned as a celebration of human excellence and international unity, the Olympics have now grown into a mega-event that involves billions in infrastructure investment, security, and logistical planning. As a result the Olympics are also a testament to the host's ambitions.

For host countries, the opportunity to host the Games is regarded as a unique chance to showcase national prowess, improve global visibility, and stimulate economic growth. The question, however, remains: **Does hosting the Olympics generate lasting economic benefits for hosts which justify the substantial costs and risks it demands?**

The belief in the transformative power of the Olympics is driven by promises of increased tourism, foreign direct investment (FDI), improved urban infrastructure, and job creation. Cities bid for the Games with such expectations and leaders promise to deliver a lasting 'Olympic legacy'.

However, the reality of hosting the Olympics is complex and contentious. While some host cities experience tangible economic benefits, others are left with overwhelming debt and abandoned facilities that serve as a testament to poor planning and mismanagement. The Montreal Games of

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1976 are infamous for their financial failure, saddling the city with a debt that took decades to pay off, (Matheson and Baade, 2004) while the 1984 Los Angeles Games stand as an outlier, thanks to their profitable, privately funded model (Wenn, S. R. , 2017). More recently, the London 2012 Olympics have been lauded for their urban redevelopment efforts, particularly in East London, but questions remain about the long-term financial impact (Preuss, 2004).

For developing nations, this question becomes particularly pertinent. Countries like India, with ambitions to host the Olympics, must carefully weigh the costs against potential gains. India is a country with growing global aspirations, yet significant challenges remain in terms of infrastructure, urban development and allocation of public finances. Hosting an event of such magnitude could potentially worsen existing development issues or serve as a catalyst for modernization and growth. Therefore, understanding the economic legacy of past host cities is essential to provide a roadmap for developing countries that are considering future Olympic bids.

This research seeks to dissect the variety of outcomes by focusing on four cities - Montreal (1976), Los Angeles (1984), Sydney (2000), and London (2012) to identify common factors that influence the economic success or failure of hosting the Games.

2. Objectives

1. To assess the short-term and long-term economic impacts of hosting the Olympics on host cities.
2. To analyze the factors that differentiate economically successful Olympics from financially burdensome ones.
3. To emphasize the role of infrastructure, funding models, and strategic urban planning in the economic outcomes of host cities.
4. To provide recommendations for future Olympic hosts.

3. Review of Literature

The economic and social impacts of hosting the Olympics have been widely debated in academic literature, with scholars focusing on both the short-term and long-term benefits. Initial studies primarily centered on budgetary overruns and financial mismanagement, but recent research has expanded to cover a more comprehensive range of topics, including urban development, foreign direct investment (FDI), tourism, and soft power. While some argue that the Olympics offer limited long-term economic benefits and often lead to debt and underutilized infrastructure, others highlight their potential to boost urban development and enhance a nation's global standing.

As one of the earliest comprehensive studies of the economic impact of the Olympics, Baade and Matheson (2004) focused on the disparity between projected economic benefits and actual outcomes. They found that while many host cities anticipate significant boosts in tourism, job creation, and infrastructure development, these benefits are often overstated. For instance, while the Sydney 2000 Olympics were initially heralded as a success, a closer examination reveals that the economic gains were largely concentrated in the short term, with limited long-term benefits. They emphasize that cities frequently overestimate the multiplier effect of Olympic-related spending, leading to inflated expectations about GDP growth.

A recurring theme in the *Ex-Post* (Post Olympic) literature is the challenge of avoiding "white elephant" infrastructure - expensive facilities that fall into disuse post-Games. Porter (1999) critiques the tendency of host cities to invest heavily in specialized venues without ensuring their long-term viability. The Montreal 1976 Olympics are often cited as a quintessential example, where numerous facilities became financial burdens long after the event concluded. For instance, the Quebec government had to introduce a special tobacco tax in May 1976 to help pay off the Olympic Stadium's construction debt (Tobacco Tax Act, 1976).

To mitigate this risk, Preuss (2004) advocates for legacy planning, where Olympic infrastructure is designed for multipurpose use and integrated into the city's long-term development strategy. The success of London 2012 in repurposing Olympic venues for community use shows effective legacy management, preventing the creation of underutilized infrastructure and ensuring continued economic benefits.

Kasimati (2003) provides a detailed analysis of the macroeconomic impacts of hosting the Games, with a focus on tourism growth and international trade. Her study of the Sydney 2000 Olympics shows how the Games increased tourism both before and after the event, offering a different perspective from the cost-overrun narrative. Kasimati's research is one of the few empirical studies that use econometric models to predict long-term tourism benefits. However, like Preuss, her focus is narrow, concentrating on short-term boosts in tourism and missing the broader economic picture, such as job creation or urban regeneration.

While the economic impacts have been well-explored, the political and social dimensions of hosting the Games are equally important. Grix and Lee (2013) introduced the concept of soft power in their study of the Beijing 2008 Olympics. They argue that hosting the Games can enhance a nation's global image, allowing it to project power and influence without military force. Their analysis of China shows how the country used the Olympics to bolster its international standing, but they caution that the benefits of soft power are often intangible and difficult to measure.

Although these studies offer valuable insights into the economic and political dimensions of hosting the Olympics, they often suffer from narrow focuses either emphasizing cost overruns or short-term benefits. Moreover, few studies attempt to holistically assess the long-term economic, social, and political impacts of hosting the Games. This study aims to fill that gap by adopting an econometric model to assess the isolated effect of Olympic outcomes in the long run.

4. Hypothesis

This study hypothesizes that hosting the Olympics significantly increases the GDP Per Capita of host countries.

5. Methodology

This study adopts a quantitative as well as qualitative approach to examine the economic implications of hosting the Summer Olympics on host countries. The quantitative analysis focuses on four case cities: Canada (Montreal, 1976), USA (Los Angeles, 1984), Australia (Sydney, 2000) and UK (London, 2012) while the qualitative analysis reviews the IOC's new norms by applying it to the recent Olympic Games in Rio de Janeiro (2016), Tokyo (2020) and Paris (2024).

a. Sample Selection

The countries selected for this study - Canada (1976), the United States (1984), Australia (2000) and the United Kingdom (2012) were chosen to examine the factors that differentiate economically successful Olympics from financially burdensome ones and emphasize the role of infrastructure or lack thereof, funding models, and strategic urban planning in the economic outcomes of host cities. The range of years for which economic benefits are studied, varies from at least 15 to at most 21 years, providing sufficient data to evaluate both immediate and sustained economic impacts if any.

b. Variable Description

- Dependent Variable (Y) - GDP Per Capita (USD)

The World Bank defines GDP Per Capita as the gross domestic product divided by the midyear population. It is a measure of the average standard of living. One of the primary objectives of hosting the Olympics is to enhance the economic well-being of the host nation's citizens. For example, London's 2012 Olympic bid aimed to regenerate East London, which was infamous for being the most poverty-stricken and neglected area of London (Mayor of London, 2005). Thus, to evaluate the Olympics' impact on economic growth, GDP Per Capita is used as a key indicator. By utilizing GDP Per Capita, this study captures the Olympics' influence on the host nation's economic growth and its translation into tangible benefits for its citizens. The data on GDP Per Capita has been sourced from the World Bank website (World Bank Open Data, n.d.)

- Independent Variables (X)

1. *Foreign Direct Investment (Net Inflows in USD)*

Foreign Direct Investment (FDI) is defined as an investment reflecting a lasting interest and control by an investor in one economy over an enterprise located in another economy, typically involving the acquisition of at least 10% of the voting rights in that enterprise (UNCTAD, 2023).

FDI and infrastructure are interdependent drivers of economic growth (Kumari & Sharma, 2015). While FDI supports infrastructure expansion, strong infrastructure draws additional foreign investment. Hosting the Olympics often attracts significant foreign direct investment as countries invest in infrastructure, tourism, and sports facilities, which can subsequently lead to increased economic activity and higher GDP per capita. Thus, FDI has been used as an indicator of global visibility and infrastructure development because it signifies the confidence of foreign investors in a nation's economic environment, governance, and market potential. The data on FDI Net Inflows has been sourced from the World Bank website (World Bank Open Data, n.d.).

2. *Unemployment Rate (%, National Estimate)*

Unemployment Rate is defined as the percentage of the total labor force that is unemployed but actively seeking employment, as per the International Labour Organization (ILO, 2023). Tourism plays a crucial role in job creation across various sectors, including food, agriculture, crafts, and construction (Zhao et al., 2023). Hosting the Olympics often leads to increased tourism, which stimulates job creation and reduces unemployment rates as countries invest in services and infrastructure to accommodate visitors. Therefore, the unemployment rate has been used as an indicator of tourism benefits and job creation because it reflects the positive impact of increased tourist activity on the labor market and the overall economic vitality of the host nation. The data for unemployment rate for the United States and Australia has been sourced from the World Bank website (World Bank Open Data, n.d.)

3. *Inflation (Consumer Prices, Annual %)*

According to the International Monetary Fund, inflation measures how much more expensive a set of goods and services has become over a certain period, usually a year (Inflation: Prices on the Rise, 2019) Inflation can significantly affect economic indicators like GDP per capita and FDI inflows by altering the real value of investments and consumption patterns. In the historical context of hosting the 1976 Montreal Olympics, the global inflation following the 1973 oil crisis is part of the period considered for this regression and any rise in material costs, construction and operational expenses occurring as a result may prove misleading. Thus, the inflation rate is used as a control variable to ensure the model accurately captures the Olympics' impact on FDI inflows and GDP per capita. The data on inflation rates for Canada has been sourced from the World Bank database. (World Bank Open Data, n.d.)

4. *Dummy Variable (D_i)*

A dummy variable indicates the Olympic period, with D = 1 representing Olympic and the post-Olympic years and D = 0 representing pre-Olympic years.

c. Quantitative Analysis

- Model Specification

To understand the relationship between changes in GDP Per Capita and the independent variables we use an ANCOVA (Analysis of Covariate) model which is characterized by combining both a dummy variable and a continuous independent variable/s. Four different countries have been selected to examine how hosting the Olympics has impacted or failed to impact their economic growth. The variables used in the general equation for each of the 4 models for the selected countries are given below:

Table 1

Model Specification

Country	Model	Y	X1	X2
Canada	$Y = \beta0 + \beta1*D_i + \beta2*X_1 + \beta3*X_2 + \beta4D_i*X_1$	GDP Per Capita	FDI	Inflation
USA	$Y = \beta0 + \beta1*D_i + \beta2*X_1 + \beta3*D_i*X_1$	GDP Per Capita	Unemployment Rate	-
Australia	$Y = \beta0 + \beta1*D_i + \beta2*X_1 + \beta3*D_i*X_1$	GDP Per Capita	Unemployment Rate	-
UK	$Y = \beta0 + \beta1*D_i + \beta2*X_1 + \beta3*D_i*X_1$	GDP Per Capita	FDI	-

- Interaction Term **(D_i*X_1)**

The dummy variable is introduced in the interactive or multiplicative form as we are interested in knowing whether there exists a difference in the effect of X on Y when D = 1. This specification allows us to interpret the intercepts and slopes of the two groups (D = 0, D = 1) separately.

d. Contextual Insights

1. Canada, 1976

This model uses FDI and Inflation data for Canada over a 21-year period from 1970 to 1990. FDI inflows are an indicator of foreign confidence in a country's economy. The impact of hosting the Montreal Olympics on Canada's GDP per capita can be better understood by analyzing whether the country attracted or lost foreign investment before, during, and after the event. It is included as an independent variable as pre-Olympic FDI figures may signal a boost in investments in anticipation of Olympics and post-Olympic figures could indicate long term potential of the Canadian economy depending on its ability to stage a successful mega event like the Olympics.

Inflation can affect the real value of investments and distort economic growth metrics like GDP per capita. Given Canada's post-Olympics debt situation, inflation could have been a significant factor influencing economic conditions. By controlling for inflation, the model isolates the true effect of hosting the Olympics on FDI inflows and GDP per capita, rather than mistakenly attributing any observed changes to inflationary pressures or fiscal instability. This allows for a clearer understanding of whether the Olympics directly influenced investment flows or if other economic factors were at play.

2. USA, 1984

Despite the media glorification of the privately funded model of the LA Games, it raises critical concerns about the actual benefits for the local community, particularly in light of the homelessness crisis that persisted during and after the event. While the inflow of private capital and corporate sponsorships might indicate a pathway to growth, the reality is that many of these jobs were transient and failed to provide lasting stability for marginalized populations (Chandler, 2018) Thus examining unemployment offers a more authentic lens for understanding the link between tourism benefits and economic growth. It also highlights the disparities that often arise from mega-events. For this analysis, the data period considered for the regression analysis spans from 1978 to 1997 intended to capture the economic effects during the lead-up to the event, the event year, and the subsequent years to assess the long-term impacts on unemployment and economic growth.

3. Australia, 2000

Despite securing a third opportunity to host the Summer Olympics, there has been limited examination of Australia's infrastructure development and global visibility following its past Games. As Australia prepares for the upcoming Brisbane Olympics (2032), analyzing FDI can reveal how effectively Australia has capitalized on its own Olympic legacy in comparison to other repeated hosts like the United States, who often capitalize on their Olympic legacy to enhance their global prominence. This analysis may offer insights into the pace of economic growth and the lasting impact of hosting the Olympics on Australia's visibility as a competitive investment destination. On the other hand, unemployment rate is selected as the independent variable for the regression model as following the Games, Australia saw a sharp drop in unemployment, from 6.8% in 2001 to 4.3% by 2008. It would be reasonable to verify if this growth in employment could be attributed to the Games. Examining this trend is key to understanding how mega-events like the Olympics create lasting job growth and improve labor market conditions for years to come. The data period considered spans 18 years from 1993 to 2010.

4. *United Kingdom, 2012*

The relationship between FDI and economic growth is well-documented; research indicates that FDI not only facilitates infrastructure expansion but also signals investor confidence in a nation's economic environment (Fourie & Santana-Callego, 2011; Report 5 Post-games evaluation summary ,2013). The Economic & Social Research Council highlights the additional inward FDI resulting from the London Olympics which reflects this dynamic. Given that the London Olympics were hosted after the 2008 recession, this period is critical for understanding how FDI inflows might have impacted GDP per capita. The recession may have constrained funding for infrastructure, making it imperative to analyze how these investments influenced Olympic preparation and economic recovery. This model explores whether FDI accelerated or slowed down economic growth during this period, providing valuable insights into the long-term effects of hosting such large-scale events on national economies. The period under consideration covers 15 years from 2005 to 2019.

6. Analysis

6.1. Quantitative Analysis

6.1.1. Canada

Table 2

Regression results

Variables	Coefficient	S.E.	T. Stat	P
Intercept	-1512	4859	-0.311	0.7597
Dummy	16100	6471	2.489	0.0242*
FDI	0.000003893	0.000002068	1.883	0.0780
Inflation	-521.5	295.8	-1.763	0.0970
FDI*Dummy	-0.000003267	0.000002189	-1.492	0.1551

*Note: N = 17, Adjusted R-squared = 0.7585, * = significant at 5% LoS*

The fitted equation is thus,

$$\hat{Y} = -1512 + 16100*D + 0.000003893*X1 - 521.5*X2 - 0.000003267\ X1*D.$$

The average GDP Per Capita for pre-Olympic years is given by the conditional expectation of Y when D = 0.

$$E(Y \mid D= 0) = \beta0 + \beta2*X1 + \beta3*X2 = -1512 + 0.000003893*X1 - 521.5*X2$$

The average GDP Per Capita for post-Olympic years is given by the conditional expectation of Y when D = 1.

$$E(Y| D= 1) = (\beta0 + \beta1) + (\beta2 + \beta4)*X1 + \beta3*X2 = (-1512 + 16100) + (0.000003893 - 0.000003267)*X1 - 521.5\ X2 = 14579 + 0.000000626*X1 - 521.5*X2$$

The model reveals that the differential intercept is significant at a 5% level of significance which means that there is a significant difference in Canada's average GDP per capita in the pre-Olympics vs post-Olympic years. However, the differential slope is not statistically significant which means that the effect of FDI on GDP Per Capita is not significantly different in the post-Olympics period (1976 onwards) compared to the pre-Olympics period. This may indicate a subpar reaction of the global markets post the announcement of the Montreal Olympics in 1970 which ideally should have stimulated FDI inflows during the pre-Olympic phase. By the time of the Olympics, the debt and cost overruns had made headlines globally, potentially deterring foreign investors. Rose & Spiegel (2011) argue that while the Olympics can attract international attention, the 'Olympic Effect' on trade and investment is often symbolic rather than substantive. As β1 is significant and β3 is insignificant we can infer that the model is a parallel regression. Although the slope coefficients for both FDI and inflation are insignificant at a 5% level of significance, the model suggests that, on average, a 1 USD increase in FDI before the Games is associated with an increase of 0.000003893 USD in GDP per capita for Canada, assuming inflation remains constant.

6.1.2. USA

Table 3

Regression results

Variables	Coefficient	S.E.	T. Stat	P
Intercept	5382	7062	0.762	0.45705
Dummy	36801	0.762	0.45705	0.00186 **
Unemployment Rate	1012	0.45705	3.720	0.27975
Unemployment Rate*Dummy	905	9894	0.00186 **	0.01428 *

*Note: N = 17, Adjusted R-squared = 0.6982, * = significant at 5% LoS, ** = significant at 1% LoS*

The fitted equation is thus,

$$\hat{Y} = 5382 + 36801*D + 1012*X - 3905*X*D.$$

The average GDP Per Capita for pre-Olympic years is given by the conditional expectation of Y when D = 0.

$$E(Y|D=0) = \beta0 + \beta2*X = 5382 + 1012*X$$

The average GDP Per Capita for post-Olympic years is given by the conditional expectation of Y when D = 1.

$$E(Y|\ D=1) = (\beta0 + \beta1) + (\beta2 + \beta3)*X = (5382 + 36801) + (1012 - 3905)*X = 42183 - 2893*X$$

The model shows that the differential intercept is highly significant at a 1% LoS. The differential slope is also statistically significant with a p-value less than 0.05. Accordingly, it can be said that there is a significant difference in USA's average GDP per capita in the pre-Olympics vs post-Olympic years. After hosting the Los Angeles Olympics, a 1% increase in the unemployment rate led to a decrease of 2893 USD (β2 + β3) in GDP per capita compared to the impact before the Olympics. As both the differential coefficients are statistically significant, we obtain a case of dissimilar regression affirming

the existence of a structural change in USA's GDP Per Capita explained by hosting of the Summer Olympics in 1984.

6.1.3. Australia

Table 4

Regression results

Variables	Coefficient	S.E.	T. Stat	P
Intercept	29964	15941	1.880	0.08112
Dummy	66772	20216	3.303	0.00523**
Unemployment Rate	-1084	1826	-0.594	0.56214
Unemployment Rate*Dummy	-10437	2904	-3.595	0.00293**

*Note: N = 15, Adjusted R-squared = 0.7279, * = significant at 5% LoS, ** = significant at 1% LoS*

The fitted equation is thus,

$$\hat{Y} = 29964 + 66772\ D - 1084*X - 10437\ X*D$$

The average GDP Per Capita for pre-Olympic years is given by the conditional expectation of Y when D = 0.

$$E(Y|D= 0) = \beta0 + \beta2*X = 29964 - 1084*X.$$

The average GDP Per Capita for post-Olympic years is given by the conditional expectation of Y when D = 1.

$$E(Y|D=1) = (\beta0 + \beta1) + (\beta2 + \beta3)*X = (29964 + 66772) + (- 1084 - 10437)*X = 96736 - 11521*X$$

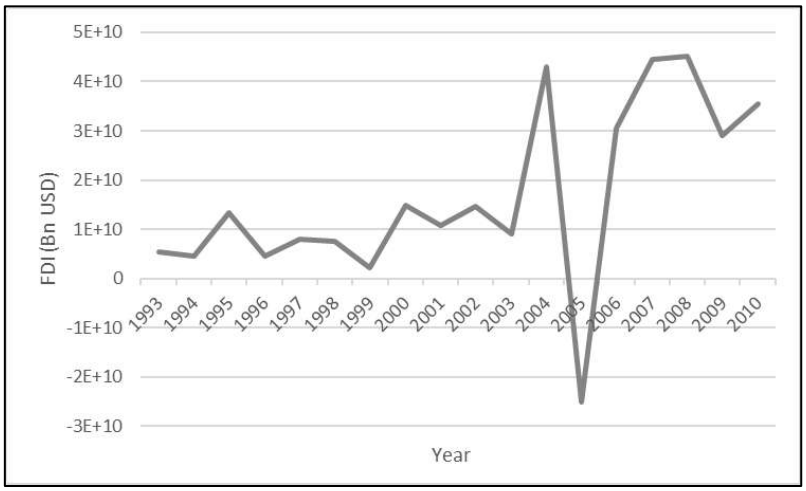
The model shows that both the differential intercept and differential slope are highly significant at a 1% LoS. A statistically significant differential Intercept (β1) suggests that hosting the Olympics has had a notable impact on Australia's GDP Per Capita. The Reserve Bank of Australia's analysis noted that Olympic-related activities did in fact, contribute to economic growth during that period (Reserve Bank of Australia, 1999). Similarly, the impact of the Unemployment Rate on GDP Per Capita has undergone a significant shift in the post-Olympic period as indicated by the differential slope. After hosting the Sydney Olympics, a 1% increase in the unemployment rate led to a decrease of 11,521 USD (β2 + β3) in GDP per capita compared to the impact before the Olympics.

The impact on employment is also shaped by how well the local labor market can absorb the temporary jobs created, which doesn't always result in positive outcomes (Humphreys & Zimbalist, 2008). Previous studies show that hosting major events like the Olympics typically doesn't lead to an increase in income levels for existing workers, meaning the broader population doesn't see significant economic benefits (Hagn & Maennig, 2009; Matheson, 2009). For similar events, such as the World Cup, the economic benefits were found to be even smaller (Hagn & Maennig, 2008, 2009).

As both the differential coefficients are statistically significant, we obtain a case of dissimilar regression which conveys the occurrence of structural change in Australia's GDP Per Capita explained by hosting of the Summer Olympics in 2000.

Figure 1

Impact on Australia's FDI Inflows



Australia's Foreign Direct Investment (FDI) trends from 1993 to 2010 highlight a sharp increase in 2000, the year Sydney hosted the Olympics, with the net inflows reaching $14.89 billion. This is expected as there is an inflow of investment into infrastructure, tourism, and services linked to the event. However, as seen in the graph, FDI inflows fell significantly in the following years, particularly in 2001 and 2002. According to a study by the New South Wales Government, the economic benefits of the Games were concentrated in the lead-up to and during the event, with construction and services sectors seeing temporary growth (Haynes.J, 2001) Similarly, research by the Australian Sports Commission suggests that while there was a short-term boost in investment, the long-term economic impact, including sustained FDI inflows, was relatively modest (NSW Treasury & The Centre for Regional Economic Analysis University of Tasmania, 1997) In conclusion, although the Olympic Games triggered a temporary spike in investment the overall impact on long-term FDI was short-lived.

6.1.4. United Kingdom

Table 5

Regression results

Variables	Coefficient	S.E.	T. Stat	P
Intercept	39520	39520	21.518	2.44e-10 ***
Dummy	4469	1.837e+03	2.020	0.0685
FDI	0.00000002743	21.518	2.642	0.0229 *
FDI*Dummy	-0.00000003694	2.44e-10 ***	-2.616	0.0240 *

*Note: N = 12, Adjusted R-squared = 0.264, * = significant at 5% LoS, ** = significant at 1% LoS, *** = significant at 0.1% LoS*

The fitted equation is thus,

$$\hat{Y} = 39520 + 4469*D + 0.00000002743*X - 0.00000003694*X*D$$

The average GDP Per Capita for pre-Olympic years is given by the conditional expectation of Y when D = 0.

$$E(Y|D= 0) = \beta0 + \beta2*X = 39520 + 0.00000002743*X.$$

The average GDP Per Capita for post-Olympic years is given by the conditional expectation of Y when D = 1.

$$E(Y|D=1) = (\beta0 + \beta1) + (\beta2 + \beta3)*X = (39520 + 4469) + (0.00000002743 - 0.00000003694)*X$$
$$= 43989 - 0.00000000951*X$$

The model reveals that the differential intercept is not significant at a 5% level of significance which means that there is no substantial change in UK's GDP per capita attributable to hosting the London Olympics. However the differential slope is statistically significant, with a p-value less than 0.05. This means that the effect of FDI on GDP Per Capita is different in the post-Olympics period (2012 onwards) indicating that for every 1 USD increase in FDI, GDP per capita is reduced by 0.00000000951 USD in the post-Olympics phase compared to the pre-Olympics period. This suggests diminishing returns from FDI in the years after the Olympics

As β1 is insignificant and β3 is significant we can infer that the model is a concurrent regression. The slope of FDI is also observed to be significant at a 5% LoS which means that for every 1 USD increase in FDI before the games, the GDP Per Capita increases by 0.00000002743 USD on an average. In practice however, a significant slope coefficient may potentially include the effect of a spike in investments due to anticipation of Olympic hosting as the pre-Olympic years considered in this study are post declaration of bidding results.

The UK saw a notable surge in FDI, peaking at £96.81 billion in 2005 before stabilizing at £43.27 billion in 2013. Moreover, the UK Trade & Industry (2013) report suggests the Olympics brought an additional £2.5 billion in inward FDI, along with £5.9 billion from Olympic-related sales and promotions, and another £1.5 billion in overseas contracts. Employment also saw an increase, with the Olympics contributing 31,000 jobs to the UK economy, particularly in construction and high-value contracts. Between 2005 and 2014 employment grew at a rate of 0.47% per year on average, while London's employment rate grew at a rate of +2.25% during the same period (UK Trade & Investment, 2013).

6.2. Qualitative Analysis

In the past, major sporting events were rarely questioned on economic grounds. Public support and political backing were driven by social reasons. Events were seen as promoting sport, national pride, and positive values. They also showcased a country's culture, political system, and tourism appeal. An efficiently run event reflected a nation's industrial capabilities.

However, the 1976 Montreal Olympics changed this view. Significant long-term losses for the local community revealed flaws in planning and management (Barutta and Fahrion 1994; Wright 1978). After the 1984 Olympics in Los Angeles (the only candidate to bid in 1971) many believed lessons from Montreal had been learned. Yet, examples of emotionally driven decisions and poor planning in event bidding continued. Costly mistakes were especially common in infrastructure development. An important consideration highlighted in the methodology of this study is that while major events like the Olympics take place quadrennially, their economic impact is spread unevenly across the time before, during, and after the event. Hence, there may be beneficiaries and losers who should be compensated for the sake of allocative efficiency, especially intertemporally/over time.

Historically, the financial impact of hosting the Olympics often contradicted the optimistic projections made by the IOC, which selectively reported only operating revenues and expenses, excluding crucial capital expenditures borne by the hosts. A misleading picture of profitability or economic growth is thus created, while the reality is that host cities frequently face long-term financial burdens. Montreal took over thirty years to pay off the debt from the 1976 Games, and similar patterns of cost overruns are seen in cities like Athens and Sydney, where projected revenues and legacy contributions fell short of expectations (Chalip, 2004; Official Report of the XXVII Olympiad, 2001). The IOC also required host cities to guarantee all debts, placing the financial risk squarely on them without offering any support.

In 2014, the IOC introduced a new norm titled 'Olympic Agenda 2020' to address the issues previously discussed. This model is a transparent partnership, which promises a greater financial and operational commitment from the IOC. The following figures illustrate the economic structure of funding the games, as outlined by the IOC.

Figure 2

Privately Funded Aspects of the Games

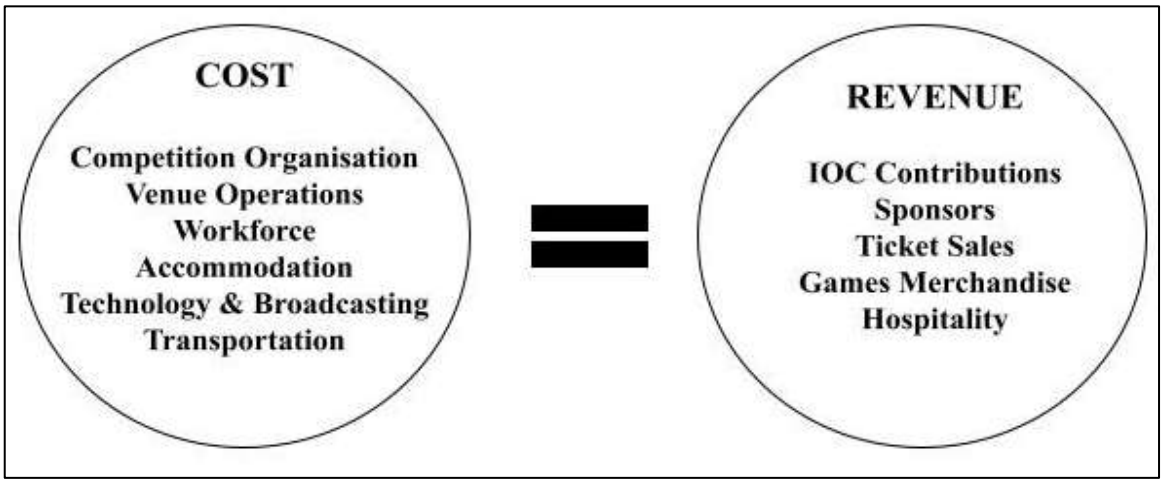
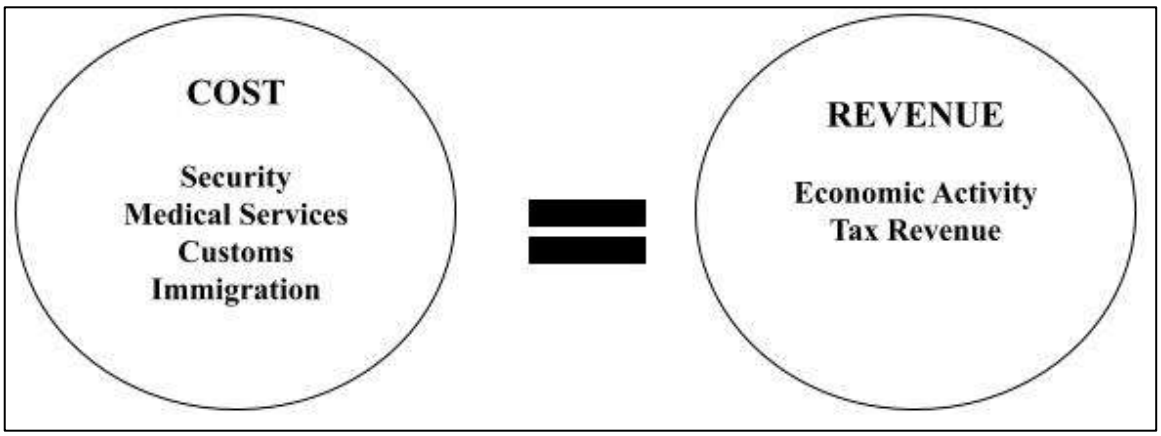


Figure 3

Government Funded Aspects of the Games



Source: International Olympic Committee, 2018

In 2021, the IOC introduced 'Olympic Agenda 2020+5,' following the 2020 Agenda aiming to make the Games more financially sustainable for host cities among other recommendations. These reforms encourage using existing venues and infrastructures to minimize new constructions, helping reduce costs. For example, the Paris 2024 Games made use of the Stade de France, a venue built in 1998. However, some critics argue that financial benefits are overstated, as costs like infrastructure, security, and logistics remain significant.

The IOC generates 91% of its revenue from selling broadcast rights (61%) and sponsorships (30%) while other commercial activities, like merchandise and hospitality packages, are less significant (IOC, 2021) Major sponsors such as Coca-Cola, Visa, and Samsung contribute billions in exchange for global exposure. Tokyo 2020 saw record sponsorship revenue of over $3.3 billion (Iyer, 2019). Ticket sales also constitute a major source of revenue, with London 2012 earning $1.1 billion. However, Tokyo's ticket revenue was severely impacted by the pandemic with no revenue being generated from ticket sales, which was otherwise expected to reach $800 million before the Games. (https://www.cnbctv18.com, 2024).

Table 6

IOC's Revenue Share

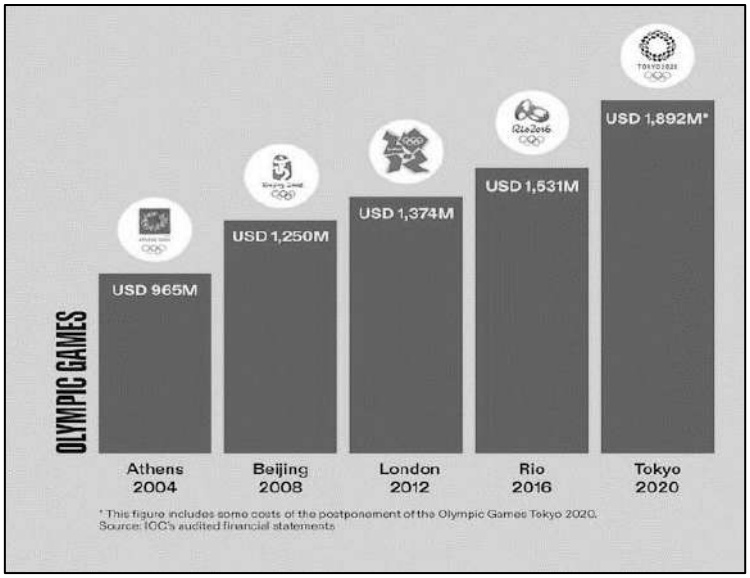
Revenue Category	Broadcast Rights	TOP Programme marketing rights	Other rights	Other revenue
Share	61%	30%	5%	4%

Source: International Olympic Committee, 2021

There are costs of organizing the Olympics which are substantial and primarily borne by the host city. These costs include competition organization, venue operation, workforce, and accommodation. London 2012's operational costs for 26 sports across multiple venues were approximately £2.1 billion. (Berman G., 2010) Tokyo 2020 faced even higher expenses due to pandemic-related costs, such as health protocols. In 2012, the IOC's contribution towards staging the Olympics was around $1.374 billion to London, which rose to $1.892 billion for Tokyo 2020 including postponement costs (IOC, 2021) Venue operation costs cover utilities, security, and services during events. Beijing 2008 spent $500 million on the Bird's Nest stadium (Xie, S.,2024) Accommodation costs include constructing or converting residential complexes for athletes and officials. London's Olympic Village project cost £1.1 billion but was later converted into apartments, recouping some of the costs.

Figure 4

IOC Contributions to support the Games over the years



Source: International Olympic Committee, 2021

Transport infrastructure is another major expense. London spent £1.2 billion on transportation, including the Olympic Javelin rail link. This investment ensured smooth travel for athletes, officials, and spectators. However, Rio 2016 struggled with delays and increased costs for transportation projects after the city announced a state of financial emergency and only managed to finish work on the metro lines a few days before the Olympics (Gillespie, 2016) On the other hand, Paris 2024 benefited from public-private partnerships to expand the metro system, which will serve both the Games and the city's long-term development. Whether the smoothness with which London and Paris were able to deliver its Olympic promise was due to the UK and France being developed nations as compared to a developing Brazil or due to the recent relaxation of IOC requirements and cost reforms is hard to pinpoint. But it is not farfetched to say that with the recent reforms in place, it ideally must encourage developing nations to partake in the bidding process, however the upcoming hosts are all developed countries and in fact repeated hosts like the US, Australia for Summer Olympics 2028, 2032 and France and US again for the following Winter Olympics.

Public sector spending covers security, healthcare, customs, and immigration. London 2012 allocated £600 million for security, with a focus on counterterrorism after the 2005 bombings (Metropolitan Police Service, n.d.) Tokyo 2020 saw security costs rise due to pandemic concerns and national security issues. Medical services, such as healthcare facilities for athletes and spectators, also come at a high cost. Rio 2016 spent over $100 million on healthcare due to concerns about the Zika virus, while Tokyo's costs spiked due to COVID-19 testing and quarantine protocols. Moreover Rio had to procure a 900 Million USD bailout from the government in order to pay for policing and it still couldn't cover the salaries for all of their public employees (Gillespie, 2016) Customs and immigration services are among the government's financial responsibilities including expedited visas for foreign workers.

The government benefits from the economic activity generated by the Olympics, particularly in tourism, foreign direct investment (FDI), and local business growth. The figures published for these benefits are difficult to verify owing to the differences in accounting methods hence deriving from the conclusions drawn by various economists and independent researchers, Olympic Games related

benefits are not experienced country wide and expectedly so. Few studies comparing local benefits post games do not confirm a general long term impact but ex-ante studies anticipate growth in tourism, FDI inflows and tax revenue which are sometimes realized as in the case of Sydney and London.

In conclusion, while the Olympic Games offer host cities a chance to showcase themselves and spur economic activity, the financial burden remains heavy. Despite ongoing reforms, the financial challenges of hosting the Games continue to be significant, with the return on investment varying depending on the city's unique circumstances. Moreover the distinction between costs borne by private and public entities is a recent claim by the IOC, it is but obvious that previous games suffered from an imbalance of financial responsibility and despite the reforms Tokyo 2020 suffered similarly. Another aspect which cannot be ignored is that ideally, these reforms should encourage developing countries to participate in the bidding process, however, the current landscape suggests that financial and logistical challenges continue to favor wealthier nations. This situation highlights the need for an evaluation of the IOC's strategies to ensure that the Olympic Games can be a platform for diverse global representation rather than a privilege reserved for a select few.

7. Limitations

1. *Winter Olympics*

Only the Summer Olympic games have been considered in this study for ease of comparison as the Winter Games and Summer Games differ significantly in terms of audience appeal and scale, leading to varying benefits and costs associated with hosting them. The Summer Games typically attract a larger global audience, resulting in a greater number of visitors, media coverage, and sponsorship opportunities. This difference makes the economic impacts of the Summer Games notably greater.

2. *Data Availability*

A fair attempt has been made to capture both long term and short-term economic effects with respect to selection of the sample. As data required was time series in nature, choice of cities for analysis have been made considering the number of years available to assess long term impact. Due to unavailability of recorded economic data or lack of regional data during certain time periods, other host cities like Rio De Janeiro, Beijing, Barcelona, Athens were dropped from the potential sample.

3. *Autocorrelation*

Given the time series nature of the data, the models exhibit autocorrelation, indicating that residuals are not independent across time periods. While this may affect the reliability of standard error estimates and statistical inferences, the study's primary focus was to examine long-term trends and relationships arising out of the Olympics hosting status of a nation.

8. Policy Recommendations

It is often argued that the Games are not a business and are not entitled to provide financial gains in the same way as commercial events like the World Cup. The mission of the Olympic Movement includes fostering international cooperation, promoting cultural exchange, and inspiring future generations of athletes. This mindset is visible in some bidding cities that prioritized urban development, cultural growth, and global recognition over financial profit when aiming to host the Olympics. Hosts like China, Brazil and Russia have used the Games as a stage to demonstrate their development on the global front. However, this line of reasoning overlooks the financial responsibilities and expectations placed on host cities and stakeholders. While the International Olympic Committee (IOC) operates as a non-profit organization, it generates substantial revenue through broadcasting rights, sponsorships, and ticket sales, which are critical for funding the Games. This revenue model creates an implicit expectation for host cities to manage their budgets effectively and deliver economic benefits. As per Business Insider's estimates, the IOC redistributes around 90% of its revenue back into the Olympic Movement, including support for athletes and national Olympic committees, which underscores the financial interdependencies involved in hosting. However it is observed that despite the IOC's claims, , athletes receive only a small portion of these funds while the majority

Additionally, the infrastructure investments made by host cities often require them to justify these expenditures through anticipated economic returns, such as increased tourism and improved local infrastructure. As seen with events like the Super Bowl or FIFA World Cup, successful hosting can lead to significant economic boosts. Thus, treating the Olympics purely as a cultural or symbolic event without acknowledging its financial implications diminishes the reality that its sustainability also depends on the financial probity and scale of public-private partnerships. Ultimately, integrating financial strategies into Olympic planning is crucial for ensuring that both hosts and stakeholders can achieve their desired outcomes while fostering long-term community benefits.

Some policy recommendations which could prove beneficial for improving the host city's returns and the IOC's credibility include:

1. *Olympic Hosting Capability Index (OHCI)*

Building an Olympic Hosting Capability Index (OHCI) will help to standardize the evaluation of potential host cities through a multi-criteria assessment framework. This index addresses the need for transparency in the bidding process prevalent so far and systematic decision-making aligning with the IOC's goals of sustainable and cost-effective hosting. By incorporating key performance indicators such as infrastructure readiness, financial stability, environmental impact, and public sentiment, the OHCI would ensure a holistic and transparent evaluation of cities' readiness to host the Games. By enabling data-driven evaluations, the establishment of an index minimizes subjective biases, fosters public trust in the selection process, and counters the risks for both the IOC and host nations.

2. *Public Support Surveys*

Public support for the Olympics can have a significant impact on the overall success of the Games as shown in the workforce analysis in this study as well. When local communities are engaged in the decision-making process, they are more likely to support the event and its long-term outcomes. Past

Olympic events have faced criticism for neglecting the perspectives of local populations, leading to resistance and protests, as seen in the 2024 Paris Games with the pension reforms controversy. Quantifying community engagement introduces a social criterion to evaluating Olympic hosting bids. Pre-bid surveys and post-Games assessments provide measurable data on public sentiment and involvement. While the IOC encourages stakeholder engagement, this recommendation extends that principle by incorporating community perspectives into decision-making processes which can boost the likelihood of sustainable legacies. It would further improve the reputation and minimize resistance towards the hosting of the Games.

3. *Temporary Venue Building*

The use of temporary venues is a cost-effective strategy that addresses the long-term environmental and financial burdens of maintaining Olympic structures. Building permanent venues for every event is not always necessary, especially when the infrastructure is only needed for a short duration. Temporary venues can significantly reduce the financial outlay, limit environmental impacts, and prevent the "white elephant" problem where underused facilities become costly to maintain after the Games. This approach is particularly relevant given the global push for sustainability and cost-efficiency in mega-events like the Olympics, which must balance the spectacle with practical outcomes. Creating temporary venues, like the seaside volleyball courts, reduces both construction costs and operational overhead by eliminating long-term maintenance needs. Keeping in mind the importance of maintaining an Olympic legacy in the host cities, temporary constructions must counter over-building, over-servicing and over-spending like in the case of Montreal, Beijing and Rio.

4. Contingency Funds

The unpredictable nature of global events, such as political instability or economic crises, can severely impact the successful hosting of the Olympics. By creating contingency or ‘risk’ funds, the IOC can provide a safety net for host cities, ensuring that they are prepared to handle unforeseen challenges without compromising the quality of the Games. This recommendation is especially relevant as past Olympics have faced unexpected hurdles, such as the COVID-19 pandemic disrupting the Tokyo 2020 Games. Having a financial cushion to manage such risks could help avoid the need for drastic cuts to the event's scale or quality. The IOC should require host cities to establish contingency funds as part of their bidding process. These funds could be a percentage of the estimated total cost of hosting the Games, allocated specifically for unforeseen expenses. Additionally, the IOC could create a global risk assessment team that regularly evaluates the financial and political stability of prospective host cities to ensure they are prepared for any potential crises. Eg: London, 2012 Olympics may serve as a good precedent to analyze for its transparent and successful use of contingency funds (Berman.G, 2010)

5. Anti-Corruption practices

The history of Olympic bidding processes has been marred by corruption scandals, with instances of bribery and unethical practices influencing host city selections and sponsorship agreements. Although the IOC has implemented an Integrity and Compliance Hotline for confidential reporting and its collaboration with IPACS addresses issues like conflict of interest in bidding, strengthening anti-corruption practices at the local level is essential to maintain the integrity of the Games and prevent financial mismanagement. Implementing frequent checks, audits, and independent

verification systems will reduce the risk of fraudulent claims and ensure that both the host cities and sponsors are held accountable. This recommendation is particularly pertinent in light of recent scandals, such as the bribery investigations surrounding the Tokyo 2020 Olympics, which highlighted the need for stricter oversight and transparency.

9. Conclusion

This research aimed to answer the question: Does hosting the Olympics generate lasting economic benefits for hosts which justify the substantial costs and risks it demands? The study analyzed the economic impacts of the Olympics on four host cities—Montreal, Los Angeles, Sydney, and London focusing on the changes in unemployment rates and FDI before, during and after the Games as proxies indicating economic growth.

The study's empirical findings show that in Canada, the 1976 Montreal Olympics led to a significant one-time change in GDP per capita, as indicated by a statistically significant differential intercept. However, the insignificant differential slope suggests that FDI did not have a different impact on GDP before and after the Olympics which reflect the failure of the 1976 Olympics to evoke confidence among global investors. In the USA model, both the differential intercept and slope were highly significant revealing a structural shift in GDP per capita following the 1984 Los Angeles Olympics. A 1% rise in unemployment rate resulted in an additional decrease of 2,893 USD in GDP per capita during the post-Olympic years. Australia too saw similar changes, with both differential intercept and slope being highly significant. Here, a 1% increase in unemployment rate led to a larger decrease of 11,521 USD in GDP per capita post-2000 Sydney Olympics, indicating a lasting economic shift. Australia was found to be a sole beneficiary of long term economic benefits with sustained employment associated with hosting the games however its FDI inflows were largely unaffected. In the UK, while FDI's impact on GDP post-2012 showed diminishing returns, no significant change in GDP per capita was observed, as the differential intercept was not statistically significant. However Pre-Olympic changes in Foreign direct investment (FDI) were observed in the case of the UK indicating favorable anticipation of the Olympics by global investors as indicated by a statistically significant slope coefficient.

These findings suggest that while the Olympics can successfully serve as a short-term economic stimulus, host cities should be mindful of the need for long-term planning to ensure sustainable benefits and make the most of its hosting endeavor. A review of the IOC's new norms alongside its impact on cost-revenue channels provided in this study highlights that policymakers should consider strategies at the grassroot levels i.e evoking public support and tackling corruption at the local levels to foster long-lasting regional economic growth at the least.

For future research, expanding the scope of the study to include more host cities in a panel regression model, as well as considering additional variables such as corruption, government effectiveness, to test whether poor governance is associated with non-compliance to Olympic budgets could provide deeper insights into the impact of the Olympics. Moreover, it would also be of interest to many that, despite most bid winners being developed nations, hosting events like the Olympics could economically benefit developing nations more. With proper planning, these events can drive the development of transportation, communication, and sports infrastructure in less-developed areas. Comparing bids and outcomes between developing and developed nations could reveal gaps between theory and practice.

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The World Is Your Classroom: Globalization and the Convergence of Educational Attainment Levels

DRISHTI S. JAIN*

This study investigates the relationship between globalization and educational attainment across 189 countries, focusing on how increased global integration influences mean years of schooling. Through quantitative analysis – including a Chi-square test, Mann-Whitney U test, and regression analysis – this paper reveals a significant association between globalization (measured by the KOF Globalization Index) and educational outcomes. The results demonstrate that highly globalized countries generally achieve higher average years of schooling, suggesting that global integration positively correlates with academic advancement. Qualitative analysis complements these findings, highlighting how increased digital learning, cross-border collaboration, and cultural exchange contribute to a more interconnected educational landscape. Ultimately, the study underscores the transformative role of globalization in fostering educational access and quality, proposing pathways for integrating global perspectives to benefit students worldwide.

***JEL Classification**: F60, I21, I25*

1. Introduction

As reported by the World Bank in 2018, only half of the students in developing nations meet the global minimum proficiency standards. In contrast, the figure stands at 86% in more developed countries. Their analysis reveals that developed countries have better learning outcomes as compared to developing ones. This stark disparity highlights the urgent need to understand how globalization influences education systems and whether it can serve as a tool to bridge the widening gap in educational attainment globally.

Globalization, often regarded as a powerful force shaping the modern world, has significantly influenced various sectors, including education. As national borders blur, educational systems worldwide have been affected by the increased flow of information, resources, and cultural exchanges. While globalization's economic, social, political, cultural, and environmental effects have been extensively studied, its impact on educational attainment levels across countries remains relatively underexplored. This research aims to address this gap by investigating whether globalization has a measurable impact on educational outcomes and, more specifically, whether this impact is positive or negative. Along with the direction of this impact, magnitude identification is also an aim of this paper.

2. Objectives

1. To analyze if global consolidation has any significance in educational attainment.
2. To investigate the variability of educational attainment levels of different countries across high and low levels of globalization.

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3. To assess the quantity by which global integration contributes to or hinders educational attainment levels.
4. To study and examine globalization's impact on educational systems around the world.

3. Review of Literature

Existing literature articulates the factors that induce, multiply, and impact globalization. As found by (Bryant & Javalgi, 2016), global integration is directly proportional to human capital development expenditure. Through regression analysis, the paper established that human capital investment is antecedent to growth in economic activity. Similarly, (Newburry & Thakur, 2010) researched that investment in Career Capital, which they explain as an outlay in institutional characteristics, leads to the development of human resources and global integration of MNCs. While talking on the same lines of global human capital, (Lutz & KC, 2011) stated that a more educated population accelerates economic growth, has lower levels of disability, and advances longevity. The study (McConnel, 1996) on the Japan Exchange and Trading (JET) Program revealed that the driving force behind this program was cultural isolation and a need to expose the Japanese people to a more nuanced assimilation. This has been thus, proved countless times before that globalization or acts and events that help in the global openness of a nation are often birthed out of the growth of human capital and the need to develop human resources.

Just as human capital indicators affect globalization, global integration also impacts them in return. On one hand (Martens et al., 2010) stated that there are favorable effects of globalization on health whereas on the other hand, (Kraemer et al., 2015) explained the differences between the trade fulfillments of globalized e-commerces versus the ones that aren't globalized. The social impact of globalization has also been talked about previously when (Simas et al., 2014) calculated that countries with higher GDP have higher Bad Labor Footprints (import of incompetent labor) as compared to the countries with low levels of GDP. It is widely incorporated as the definition of globalization that, it results in trade and financial openness (Pham, 2017), upward driving of economic growth (Ying et al., 2014) along with diversity and amalgamation of cultures (Albrow et al., 1994). Considering the environmental impacts, there have been certain differences among researchers. Global propagation and use of renewable energy lead to a reduction in CO2 emission (Ali et al., 2022) while contradictorily, (Le & Ozturk, 2020) iterate that globalization induces a trade-off effect between economic activities and environmental quality which increases pollution in developing nations.

While discussing the various impacts of globalization, we turn our attention to its influence on education- an area where the existing literature is notably sparse and has received comparatively less focus. While (Pang, 2013) talks about how globalization advanced to a commodification of education that expands higher studies and prepares individuals for a global platform, (Jackson, 2016) concluded that globalization might have beneficial or harmful impacts on education based on one's power beliefs; and education vice versa molds the very idea of globalization. (Lee, 2014) did a policy analysis on Malaysia's education being affected by globalization and (Al' Abri, 2011) performed a similar analysis for Onami education. Both these papers deduced that globalization does have an effect as it introduces a common medium and a prevalent language- English- for learning, along with promoting institutional life-long learning. (McGinn, 1997), (Barron et al., 2006), (Spring, 2008) audit along similar lines discovering that globalization leads to cultural diversity among the classrooms and books, standardization of curriculum, and uniformity in education around the globe.

While these papers contribute valuable insights into the topic, they also expose significant research gaps, laying the groundwork for hypothesis-building in this study. Unlike prior works that focus on specific countries or simply assert that globalization has an impact, this paper takes a global perspective, conducting a quantitative analysis as well to determine whether that impact is positive or negative. By providing statistical and empirical evidence of the interrelationship between globalization and educational attainment levels, this study aims to offer a more comprehensive understanding and add meaningful value to the ongoing discourse.

4. Research Question

Does globalization significantly influence educational attainment levels across different countries?

5. Methodology

5.1. Quantitative

The study will utilize panel data from reliable sources like the World Bank Open Database, IMF, UNESCO, KOF Globalization Index, OECD, etc.

1) Data Collection: The primary dependent variable, education attainment, will be measured by mean years of schooling. The key independent variable will be the KOF Globalization Index which captures the social, economic, and political dimensions of globalisation. KOF stands for "Konjunkturforschungsstelle", which is the Swiss Economic Institute at ETH Zurich. It considers 43 variables to provide an index for all the countries worldwide on a scale of 1 to 100.

2) Chi-square Test for Independence: Countries are categorized as high, medium, and low for a contingency table of both variables. The test is operated on a 3×3 contingency table. Two tertiles are used to bin the data into three equal parts with the help of the following given breakpoints:

1st tertile: 33rd percentile 2nd tertile: 67th percentile

The Hypotheses drawn are as follows:

Null Hypothesis (H_0): Globalization levels and educational attainment levels are independent (i.e., there is no relationship between the two variables).

Alternative Hypothesis (H_1): Globalization levels and educational attainment levels are not independent (i.e., there is a significant relationship between the two variables).

3) Mann-Whitney U Test:

Countries will be divided into two groups based on their globalization index as high and low, by calculating the median of the globalization index. The Mann-Whitney U test is chosen because it does not require the data to follow a normal distribution, making it an appropriate method for non-parametric analysis when comparing differences between two independent groups. Null Hypothesis here is that educational attainment levels are not statistically different in highly globalized and less globalized countries.

4) Multivariate Classical Linear Regression Model

Dependent Variable	Mean years of schooling	Measures educational insights.
Independent Variable	KOF Globalisation Index	Captures the degree of economic, social, and political globalization.
Control Variables	GDP per capita	Indirectly impacts the ability to fund and prioritize education.
	Government Expenditure on Education	Directly influences the access to and quality of education.

Data will be cross-sectional to provide a direct comparison of how countries fare in a given year in terms of their globalization levels and educational attainment. This will help by not only determining if there's a significant relationship between globalization and educational attainment but also quantifying the strength and direction of that relationship.

5.2. Qualitative

This section delves into the beneficial effects of globalization on education, supported by empirical evidence from various perspectives. The qualitative analysis aims to examine how educational set-up is influenced by the consolidation of modern and traditional methods of learning into a framework of varied establishments like countries, NGOs, private partnerships, and welfare initiatives.

6. Analysis

6.1. Quantitative Analysis

A total of 189 countries were categorized into groups, as shown in Table 1 which represents the observed frequencies (O_{ij} values), and Table 2 which displays the Expected Values. The results obtained for a l.o.s. of 0.05 are as follows:

Chi-square Statistic χ^2_{cal} = 94.4527
Degrees of Freedom df = 4
P-value = 1.4898E-19

Given the extremely small p-value (close to zero), we reject the null hypothesis, indicating a highly significant association between globalization and educational attainment levels. This result suggests that educational attainment is not independent of globalization, meaning that the average years individuals spend in school tend to vary with a country's level of global integration.

This finding implies a direct relationship between globalization and education: as countries become more globally integrated, their levels of educational attainment also tend to rise, also seen in Table 4. The significant relationship can be measured using the Odds Ratio. By categorizing countries into high and low globalization groups based on the median and creating a 2x2 contingency table, the strength of the association is determined. The odds of achieving high educational attainment are 3.27 in highly globalized countries and 0.32 in less globalized ones. This indicates that the likelihood of

having a higher average level of schooling is 10.25 times greater in highly globalized countries compared to their less globalized counterparts.

In essence, globalization may facilitate educational access, resource allocation, and cross-border exchange of knowledge, all of which contribute to higher mean years of schooling.

To further enhance whether educational attainment levels differ significantly between countries with high and low globalization, a Mann-Whitney U Test was conducted. Table 4 categorizes and ranks countries based on their globalization index as either high or low, with their corresponding mean years of schooling displayed. From Table 5, the lowest U value of 1385, which corresponds to the high globalization group (Sample 1), was selected for further analysis. Finally, Table 6 provides the calculation of the test statistic for the selected U value. The Z score calculated for U (Z = -8.1736) is significantly lower than the critical Z value (-1.95), and the corresponding p-value is extremely small. Thus, we reject the Null Hypothesis.

The results, reinforcing the Chi-square test outcome, suggest a significant difference in educational attainment between countries with high and low globalization, as also reflected by Table 4.

The regression analysis provided distinct insights that complemented the findings from the previous test. While those tests offered valuable information regarding associations and differences in distributions, regression analysis allowed for a deeper exploration of the predictive relationships between globalization and educational attainment. Specifically, the regression model revealed that both GDP per capita and the KOF Globalization Index are statistically significant predictors of mean years of schooling, with globalization emerging as a particularly strong factor. A KOF Coefficient of 0.118 can be interpreted as one unit increase in the KOF Globalisation index will increase one academic year in schooling. This supports the hypothesis that increased global integration correlates with advancements in educational attainment globally.

The R-squared value of 0.4795 indicates that approximately 47.95% of the variance in mean years of schooling is explained by the model. While this figure suggests a moderate fit, it also implies that nearly 52% of the variance remains unexplained. This relatively low R-squared value could be attributed to several factors, including the complexity of educational attainment as a multifaceted outcome influenced by numerous external variables not captured in this model. (Hallinger & Lee, 2012) Factors such as cultural influences, local educational policies, and socioeconomic conditions may also play significant roles in shaping educational outcomes.

The choice of control variables—GDP per capita and government expenditure on education—was strategic. GDP per capita serves as an indicator of economic prosperity, which often correlates with better educational resources and opportunities. Meanwhile, government expenditure on education is a direct measure of investment in human capital development. However, the regression results indicated that while GDP per capita hardly contributes to educational attainment, government expenditure did not have a statistically significant impact in this context. This finding suggests that merely increasing spending on education may not be sufficient to drive improvements unless accompanied by broader economic growth and effective policy implementation.

In summary, regression analysis has reinforced the hypothesis that globalization positively influences educational attainment. The results underscore the importance of considering both economic factors and global integration when assessing educational outcomes, while also highlighting areas for further research to explore additional variables that may contribute to this complex relationship.

6.2. Qualitative Analysis

1. *Increased Resource Availability*: Increasing global trade enables governments and educational institutions to import quality learning materials, advanced technology, and modern infrastructure that enhances teaching and learning environments. (UNESCO, 2015) Between 2000 and 2015, the EFA initiative helped reduce the number of out-of-school children globally by nearly half, from 100 million to approximately 58 million. This success underscores the transformative potential of international collaboration and targeted education policies. Furthermore, countries implementing EFA frameworks observed significant progress in gender parity and access to quality primary education.
2. *Digital Education*: Through improved infrastructure, global digital platforms, and new communication technologies, the digital connection now transcends borders, bridging cultures and economies with far-reaching impacts on how we live, work, and interact in a globalized world. Platforms like Coursera, Khan Academy, and edX make global education accessible online, enabling individuals to gain skills and certifications from institutions worldwide. This has been particularly valuable for students in remote areas with limited educational resources. During the COVID-19 pandemic, many institutions relied on digital platforms for continuity in learning. According to the World Economic Forum (2020), 1.2 billion students were affected by school closures, and over 60% shifted to online learning platforms like Google Classroom and Zoom. Digital learning expands classrooms to the remotest regions like rural India, where due to increased income and programs such as PM e-Vidya and Diksha Portal, education has become more accessible. Similarly, digital connectivity in urban Kenyan schools has allowed students to participate in global educational programs, mirroring the odds ratio findings.
3. *Benefits of Studying Abroad*: Studying abroad is facilitated by the global forwarding of migration. It enhances language skills, provides high-quality education, and opens global career opportunities. International students accounted for an 85% increase in cultural awareness and adaptability, as per the European Commission (2018). Exposure to different teaching styles and international networks boosts academic and personal growth, making them more competitive and globally minded-in an increasingly interconnected world. Fulbright scholars from different cultural backgrounds collaborate, gaining not just knowledge but also interpersonal skills and a more nuanced understanding of global issues (Bista, 2016).
4. *Updated Curricula*: Globalization drives educational institutions to adopt updated, globally relevant curricula, integrating diverse perspectives and advanced skills essential for a competitive workforce. It fosters the inclusion of international standards, digital literacy, and multicultural understanding. By emphasizing innovation and global issues, globalization prepares students to excel in interconnected economies, enhancing both their career readiness and adaptability. Schools adopting International Baccalaureate (IB), in USA and Canada curricula introduce students to global content, which promotes critical thinking, cultural awareness, and global competency (Marsh et al., 2019). These nations' high KOF indices and educational outcomes highlight the synergy between global integration and curriculum innovation.

5. *Advanced Moral Spectrum*: Globalized learning expands students' moral perspectives by exposing them to diverse cultures, ideas, and ethical frameworks, encouraging open-mindedness. (Mustakova-Possardt, 2004) Through a broader curriculum that includes global histories, philosophies, and current events, students learn to question stereotypes and regional myths. This instills moral values like empathy, intercultural competence, and tolerance, helping students build a well-rounded, ethical worldview unbound by prejudice.
6. *Global Programs*: Globalization has fostered initiatives aiming to strengthen academic excellence, cross-cultural understanding, and societal impact.
    a. The Fulbright Program offers international exchange scholarships, connects scholars worldwide, and promotes cultural diplomacy and academic collaboration. By immersing participants in diverse environments, it fosters mutual understanding and innovative research across disciplines.
    b. Erasmus facilitates student and staff exchanges across Europe, enriching education through exposure to various cultures and academic systems. It promotes intercultural learning, language skills, and professional readiness, equipping participants to contribute meaningfully to an integrated European and global society.
    c. Teach for All addresses educational inequity by empowering teachers worldwide to serve in under-resourced communities. This initiative, driven by local adaptations of the model in multiple countries, aims to improve educational outcomes, promote leadership, and support socio-economic development by fostering empathy and inclusive learning environments. These initiatives exemplify how globalization supports academic advancement, international collaboration, and impactful social change.

7. Limitations and Future Scope

Data unavailability for certain countries poses a significant challenge, as information gaps can skew results and limit the generalizability of findings. Additionally, the reliance on existing indices, such as the KOF Globalization Index, may overlook nuances of local factors that influence educational outcomes, such as cultural differences and regional policies. The study also acknowledges that while it captures a substantial portion of the variance in educational attainment through regression analysis, nearly 52% remains unexplained, indicating that other critical variables- like local governance, community engagement, and socioeconomic disparities- should be explored further. Future research could benefit from qualitative analyses that delve deeper into these contextual factors, as well as longitudinal analyses to assess the long-term impacts of globalization on education.

8. Policy Recommendations

1. Global Education Integration Initiative (GEII): This policy aims to bridge the gap between educational institutions in highly globalized countries and those in less globalized countries. It would foster cross-border partnerships, enabling students to access scholarship programs, exchange programs, and collaborative activities that expand their academic and cultural horizons.
2. An International Collaboration Network for Educators and Researchers would establish connections between educational professionals across the globe, encouraging an environment of knowledge-sharing and innovation. This network would facilitate virtual workshops, collaborative research projects, and international conferences where educators can exchange best practices and

insights from different cultural and educational contexts. Previously mentioned global programs have exemplified the success of such networks in enhancing the quality of education and ultimately, benefiting the students.

3. Language Proficiency Development Programme (LPDP): Even though most of the curriculum is structured with English as the common medium of instruction and learning, this program would accelerate the furtherance of a common global language. Introducing extensive training programs to equip teachers with effective language teaching methodologies, leveraging technology to create interactive and engaging linguistic environments, and standardizing assessment with international benchmarks will confirm better inculcation of regional studies in the global platform.
4. Digital Learning Accessibility Project: This project advocates for funding to expand digital infrastructure, such as reliable Wi-Fi devices, and technical support, for schools in less connected areas. By providing these tools, the focus is on closing the digital divide in education, particularly in rural and underserved regions.
5. The Curriculum Globalization & Cultural Integration Program will promote a globally inclusive curriculum that values local cultures. This program would integrate global issues- such as environmental sustainability, digital citizenship, and intercultural studies- into the national curriculum. It will equip students for a globalized working environment through courses that include theoretical and practical understanding and incorporate indigenous knowledge. It will also introduce coming-of-the-age concepts like AI, entrepreneurship, languages of global relevance (like Mandarin, Spanish, and Arabic), human rights, etc. to the coming generation so that it opens new career paths for them.

9. Conclusion

This research has successfully illuminated the profound connection between globalization and educational attainment, revealing that as nations become more integrated into the global landscape, their educational outcomes improve significantly. The statistical analyses demonstrate a clear trend: countries with higher globalization indices tend to have greater average years of schooling. This finding not only supports the notion that globalization can be a powerful catalyst for educational advancement but also emphasizes the need for continued exploration into how these dynamics can be harnessed to reduce educational disparities worldwide. As we reflect on these insights, it becomes evident that fostering global connections is essential for creating equitable educational opportunities, ultimately contributing to a more informed and capable global citizenry.

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Appendix

Appendix A

Table 1: 3×3 Contingency Table Observed Values					
		Globalization			
		High	Medium	Low	Total
Mean Years of Schooling	High	42	14	5	61
	Medium	19	35	12	66
	Low	2	16	44	62
	Total	63	65	61	189

Table 2: 3×3 Contingency Table Expected Value					
		Globalization			
		High	Medium	Low	Total
Mean Years of Schooling	High	20.3333	20.9788	19.6878	61
	Medium	22	22.6984	21.3016	66
	Low	20.6667	21.3228	20.0106	62
	Total	63	65	61	189

Table 3: 3×3 Contingency Table Statistic Value				
		Globalization		
		High	Medium	Low
Mean Years of Schooling	High	23.0874	2.3216	10.9577
	Medium	0.4091	6.6669	4.0616
	Low	16.8602	1.3287	28.7594

Appendix B

Table 4: Categorized Mean Years of Schooling Ranks					
High (S1)	S1 Ascending	S1 Ranks	Low (S2)	S2 Ascending	S2 Ranks
13.9	2.9	10	10.5	1.3	1
12.5	5.7	35	10.5	1.6	2
12.6	6.1	43.5	7.8	1.9	3
12.7	6.4	47	7.3	2.3	4.5
14.3	6.6	50	9.8	2.3	4.5
12.3	7.2	54.5	11.2	2.4	6.5
13.4	7.3	58.5	7.2	2.4	6.5
13	7.3	58.5	10.5	2.5	8
12.9	7.4	61.5	3.9	2.8	9
11.7	8	68	10.4	3.1	11
13	8.1	69	5.2	3.3	12
11.7	8.3	71	8.6	3.5	13
10.6	8.5	74	7.7	3.7	14
13.1	8.6	76.5	11.6	3.9	16
12.9	8.6	76.5	10.7	3.9	16
9.6	8.8	81	7.6	3.9	16
11.4	8.8	81	8.8	4	18
13.9	8.8	81	8.6	4.2	19
12.2	8.9	84.5	12.7	4.4	20
10.7	8.9	84.5	7	4.5	21.5
13	9	86.5	6.1	4.5	21.5
11.9	9	86.5	4.4	4.6	23
13.5	9.1	88.5	4.2	4.8	24
13.5	9.2	92	8.4	4.9	25.5
13.6	9.2	92	10.4	4.9	25.5
12.3	9.2	92	12.4	5.1	27

12.9	9.2	92	9.6	5.2	28.5
13.2	9.4	95	6.2	5.2	28.5
12.2	9.6	97	8.8	5.3	30
10.7	9.8	99.5	9.2	5.6	32
12.7	9.9	101.5	9.9	5.6	32
12.4	10	103.5	11.9	5.6	32
11.4	10	103.5	11.3	5.7	35
11.4	10.1	105.5	2.3	5.7	35
11.5	10.1	105.5	7.8	5.8	37.5
12.6	10.2	107	3.9	5.8	37.5
13.3	10.4	109	4.9	5.9	40
12.8	10.5	112.5	4.5	5.9	40
13.4	10.6	115.5	9.6	5.9	40
11.1	10.6	115.5	4.8	6	42
12.7	10.7	118.5	5.6	6.1	43.5
12.9	10.7	118.5	11	6.2	45.5
11.1	10.7	118.5	4.9	6.2	45.5
9.2	11	123.5	7.4	6.5	48.5
10.4	11.1	126.5	3.1	6.5	48.5
9.1	11.1	126.5	1.6	6.8	51
8.8	11.1	126.5	11.4	7	52
10.1	11.2	129.5	10.8	7.2	54.5
8.8	11.3	132	2.4	7.2	54.5
10	11.3	132	8.3	7.2	54.5
13.8	11.4	135.5	5.7	7.3	58.5
12.6	11.4	135.5	5.6	7.3	58.5
12.7	11.4	135.5	6.5	7.4	61.5
8.8	11.5	138	7.2	7.5	63
12.4	11.6	139.5	5.3	7.6	64
11.6	11.7	142	7.5	7.7	65
10.7	11.7	142	5.2	7.8	66.5
7.4	11.7	142	2.8	7.8	66.5
6.1	11.8	144	3.9	8.3	71
8.6	11.9	146	10.9	8.3	71
11.1	11.9	146	4.5	8.4	73
10.2	12	148	4.6	8.6	76.5
11	12.2	150	7.2	8.6	76.5
10	12.2	150	5.7	8.8	81
11.3	12.2	150	6	8.8	81

12.2	12.3	153	3.5	9.1	88.5
12.3	12.3	153	7.3	9.2	92
11.8	12.3	153	8.3	9.6	97
10.5	12.4	156.5	1.3	9.6	97
11.3	12.4	156.5	12.8	9.8	99.5
8	12.4	156.5	6.5	9.9	101.5
9.8	12.5	159	2.4	10.4	109
10.1	12.6	161	13	10.4	109
9.2	12.6	161	6.8	10.5	112.5
9	12.6	161	5.9	10.5	112.5
7.2	12.7	165	5.9	10.5	112.5
10.6	12.7	165	9.1	10.7	118.5
8.3	12.7	165	3.7	10.8	121
8.1	12.7	165	5.8	10.9	122
9.4	12.8	168.5	3.3	11	123.5
8.9	12.9	171.5	5.8	11.1	126.5
12.4	12.9	171.5	5.6	11.2	129.5
11.2	12.9	171.5	2.3	11.3	132
11.9	12.9	171.5	6.2	11.4	135.5
8.5	13	175.5	5.9	11.6	139.5
8.9	13	175.5	11.1	11.9	146
6.6	13	175.5	2.5	12.4	156.5
9.2	13.1	178	4	12.7	165
8.6	13.2	179	5.1	12.8	168.5
2.9	13.3	180	1.9	13	175.5
5.7	13.4	181.5			
12	13.4	181.5			
9.9	13.5	183.5			
11.7	13.5	183.5			
9.2	13.6	185			
7.3	13.8	186			
6.4	13.9	187.5			
9	13.9	187.5			
7.3	14.3	189			

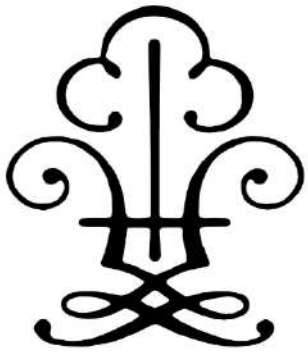
Appendix C

Table 5: Calculation of U values for both samples				
Sample 1			Sample 2	
Sum of Ranks (R1)	12475		Sum of Ranks (R1)	5480
No. of observations (n1)	99		No. of observations (n1)	90
U1	1385		U1	7525

Table 6: Calculation of test-statistic	
Mean of U ($\frac{n1 \times n2}{2}$)	4455
S. D. of U ($\sqrt{\frac{n1 \times n2 \times (n1 + n2 + 1)}{12}}$)	375.5995
Z-score ($\frac{U - \mu U}{\sigma U}$)	-8.1736
Z-tab	-1.95

Table 7: Regression Statistics	
Multiple R	0.6924834093
R Square	0.4795332722
Adjusted R Square	0.4689115023
Standard Error	2.364692878
Observations	151

Table 8: Regression Statistics				
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.1415	1.3148	1.6288	0.1055
GDP per capita	2.807×10^{-5}	1.255×10^{-5}	2.2374	0.0268
Govn. Expenditure on Education	-0.0349	0.0389	-0.8954	0.3720
KOF	0.1185	0.0210	5.6538	0.0000



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