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Navigating Debt Burden: An analysis of Economic Freedom, Logistics Performance and Foreign Aid using Method of Moments Quantile Regression

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Abstract: Navigating debt burden is important because it helps to manage and reduce the impact of debt effectively. This paper examined the influence of economic freedom (EF), logistic performance (LP) and foreign aid (FA) on debt burden (DEB) in 35 debt-prone economies between 2007 and 2018. The empirical findings based on the Method of Moment Quantile Regression (MMQR) confirm that LP and FA have a significant positive association with DEB across all quantiles. Interestingly, the outcomes also reveal that the relationship between EF and DEB is not straightforward and shows a varying pattern across different levels of debt. The findings suggest a positive relationship for lower quantiles and a negative relationship for higher quantiles, thus highlighting the complexity of the relationship between EF and DEB. The robustness checks of the Pool Mean Group (PMG/ARDL), Fully Modified Ordinary Least Squares (FMOLS), Fixed Effects (FE), and Random Effects (RE) validate and reinforce the results of MMQR. We suggest a tailored and personalized strategy to meet the unique characteristics and nuances of each situation rather than using a one-size-fits-all approach.

Keywords: Economic freedom; Logistic performance; Foreign aid; Debt burden; MMQR

JEL: H63; O57; R41; F35; C14

1. Introduction

The world is abuzz with discussions around debt burden (DEB), economic freedom (EF), logistic performance (LP), and foreign aid (FA). These aspects play a crucial role in shaping the global economic landscape. Research has demonstrated that nations with greater EF achieve better

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economic results than those with less freedom (Ahmed et al., 2023). In addition, the world economy receives an incredible $12 trillion in contributions from the logistics sector (Annual Report 202 | UNDP). Simultaneously, FA surpasses $204 billion annually in 2022, providing a glimmer of optimism for faltering economies (OECD, 2022). Despite these initiatives, the DEB continues to be a major roadblock to advancement.

Prominent academics, including Smith, Ricardo, and Friedman, contend that an economic system based on private property, competitive markets, and free trade yields good outcomes. Other scholars like Marx and Keynes argue that EF leads to sub-optimal outcomes. Ultimately, whether EF yields positive or negative outcomes is an empirical question. Nations in the top quartile of EF had an average per-capita GDP of $48,251 in 2020, compared to $6,542 for nations in the bottom quartile (Gwartney et al., 2023). EF boosts entrepreneurship, innovation & investment, thus fueling growth, creating jobs & improving well-being (Herrera-Echeverri et al., 2014; Ahmed et al., 2023). The multifaceted nature of EF encompassing multiple factors (ease of doing business, protection of property rights, free market access, minimal government regulations, absence of corruption, international trade, contract enforcement, and a stable legal system) are instrumental in forming a country's economic landscape.

Likewise, logistics services are paramount to bolstering economic progress by secured and prompt delivery from producers to consumers and enhancing the competitiveness of both production processes and export delivery, thereby attracting investments and profits (Yildiz et al., 2017; Gani, 2017; Yeo et al., 2020). Effective logistics help establish robust supply chains, improving coordination and reducing waste (Gani, 2017; Yeo et al., 2020). This increased productivity leads to customer satisfaction & economic efficiency (Partyka et al., 2021). In today's world, logistics are crucial for increasing exports, attracting FDI & fostering an interconnected global economy that enhances a country's revenue generation capacity & reduces its DEB.

Quintessentially, Countries in need of support rely heavily on foreign assistance. Nonetheless, how effective FA is in promoting sustainable

economic growth and reducing DEB is a steaming argument (Saibu et al., 2021). FA serves various purposes, such as improving well-being and growth in recipient countries through infrastructure development, entrepreneurship support & increased productivity (Sethi et al., 2019). It also fosters global unity and cooperation (Swiss, 2020) by building diplomatic connections between nations. Additionally, aid plays a critical role in addressing global challenges like humanitarian crises & natural disasters by providing swift assistance for recovery and rebuilding efforts. However, it is essential to ensure transparency & accountability in aid programs to avoid potential pitfalls like debt-traps & misuse by unscrupulous administrations. Additionally, aid initiatives should be aligned with specific local priorities & needs (Islam et al., 2023; Aluko et al., 2010).

Understanding the impact of DEB is crucial as it significantly influences economic stability & government policy decisions (Swamy, 2019). Accumulating high levels of debt poses numerous challenges for a country. One major consequence is the heavy burden of interest payments, which can lead to low creditworthiness & higher borrowing costs for debt-laden nations. This situation makes it harder for governments to access affordable funding, limiting their ability to invest in vital sectors. Improper debt management can also trigger inflation, currency devaluation, & financial crises (Patri et al., 2022), further destabilizing a country's macroeconomic environment. Governments often resort to structural adjustment programs recommended by IFIs to tackle these issues, but these measures can sometimes exacerbate the socioeconomic challenges faced by debt-ridden nations. Therefore, policymakers must carefully assess the level of debt to make informed decisions.

The real world is intertwined, and thus, a straightforward relationship among the variables mentioned above is far from reality. These variables can influence each other in a myriad of ways. e.g., a country's EF is constricted by escalating debt levels. An indebted country might also struggle to provide essential services to its inhabitants. Conversely, A higher level of EF frequently leads to better LP. Autonomous businesses operate efficiently, establish strong supply chains, enhance transportation networks & optimize logistical processes, fostering smoother trade flows & growth. Additionally, efficient logistics are vital for effective aid distribution. Moreover, EF can impact a country's reliance on FA. Increased

EF attracts more foreign investment, potentially leading to stronger domestic growth & reducing the need for external funding. While FA remains crucial for nations with limited EF, it can also support their long-term development efforts. In its entirety, the global socioeconomic landscape is intricately shaped by interconnected forces and recognizing these interdependencies allows us to navigate the complexities of our intertwined world (Hayaloğlu, 2023).

The primary objective of this study is to examine the empirical and theoretical dimensions regarding the impact of EF, LP and FA on the financial wellness of selected countries, specifically focusing on DEB with a set of macroeconomic indicators (Trade/GDP, GDP growth rate). The study aims to provide a comprehensive analysis of how these factors interplay & influence the economic stability and debt levels of nations. Centred on this core objective, the following hypothesis is postulated by this study: *H1:* There is a compelling and intertwined linkage among EF, LP, FA and DEB. *H2:* Increased levels of EF and GDP growth are anticipated to lessen DEB. Additionally, we foresee that an amplified reliance on FA and enhanced TO will be adverse to the DEB. *H3:* As LP advanced, countries may experience higher levels of debt to support and maintain their logistic operations.

With these considerations in mind, the following are the contributions made by this study: *(i)* Prior studies have largely overlooked the simultaneous consideration of DEB, EF, LP, and FA. An ongoing study is a pioneering endeavour that examines the interplay of these variables within a single comprehensive analysis. This endeavour dug into the intricate relationships and potential synergies between these variables, offering a more nuanced understanding of the complexities surrounding debt accumulation and management. *(ii)* This study narrows the investigation to debt-ridden economies shedding light on the challenges faced by them. Debt-ridden economies are often grappled with high debt burdens, limited financial resources, and complex geopolitical dynamics that impact their economic stability. By delving into the specific challenges and opportunities present in these economies, we offered targeted recommendations & strategies to

address debt sustainability. This customized approach enhances the applicability and relevance of findings, enabling a more impactful contribution to the ongoing discourse on debt management. *(iii)* This study further includes LP as a variable that represents a novel approach in DEB studies. This addition allows us to explore the impact of logistical efficiency on DEB, a facet rarely explored in existing literature. By exploring this aspect, our study fills a significant gap in the literature and provides a more comprehensive view of how logistics can impact debt management strategies. *(iv)* Prior studies used a variety of statistical tools, e.g., GMM, Quantile regression, VAR modelling, ARDL, and OLS, to examine how different factors relate to DEB (Sharma et al., 2023; Mohsin et al., 2021; Sethi et al., 2019). Nevertheless, to the best of the researcher's understanding, MMQR has not been utilized in this specific field. This endeavour seeks to bridge this vacuum by introducing MMQR. This method allowed for exhaustive inquiry across different quantiles to understand the delicate relationship between variables. Further, the study explored the causal relationship between variables using a causality test, which is followed by a robustness check.

The rest of the study is structured as follows: Section 2 renders an overview of existing literature; Section 3 lays out theoretical underpinnings and econometric methodology employed for the study. Section 4 presents the results and a further discussion. Finally, Section 5 capitalizes inferences & policy implications based on findings.

2. Literature Review

This study conducted a literature survey to understand debt dynamics, which highlighted that the relationship of debt with associated factors is not straightforward & may vary across different populations.

2.1 Economic Freedom and Debt: Exploring the Link

Literature has explored the origin & evolution of EF and DEB. Studies have shown an inverse relationship between EF & debt, indicating that countries with strong economic institutions tend to have lower DEB (Vojnovic, 2022; Roychoudhury & Lawson, 2010; Mura et al., 2023). Further, Berggren et al. (2019) found that regulatory autonomy reduces DEB. Khan et al. (2021) highlighted how EF strengthens finance in developing nations, emphasizing

efficient debt management & the impact of structural changes on financial outcomes. Ahmed et al. (2023) demonstrated the positive influence of EF on economic growth in South Asia, with different components of EF & economic crises playing distinct roles. Miraj Ul Haq (2020) identified that stable & democratic economies lead to increased EF, emphasizing that FA, regardless of its form, negatively affects economic freedom in the recipient country.

2.2 Logistic Performance and Debt Management

Contemporary studies found a significant diverging interplay between LP and debt dynamics. One study by (Cheng, 2023) evidenced a considerable negative relationship between LP and the commercial and industrial debt level indicating that with logistical efficiency, financial pressure on firms will reduce. Ye et al. (2024) pointed enhanced stability of logistics is crucial for handling cost of debt thereby highlighting that improve LP leads to favourable debt scenario. Another study noted that supply chain disruptions are negatively correlated to financial leverage. We can infer that firms will increase their financial leverage with the improvement of logistics thus greater reliance on debt (Ginn and Saadaoui, 2024). Another study by (Dzacka, 2024) evidenced a weak negative association between LP and level of debt in Ghana, pinpointing that stable LP does not necessarily reduce debt. This indicates that other elements are more pronounced in driving challenges of debt.

2.3 Foreign Assistance in Debt Management: Impact and Consideration

The engagement and effectiveness of IFIs in regulating & influencing debt has generated considerable debate in academic circles. While some studies advocated a positive impact on debt management & economic stability (Bjerg et al., 2011; Meraj et al., 2024; Bjørnskov and J.H. Schröder, 2013), others expressed concerns about the possible downsides of interventions from IFI (Tombofa et al., 2013; McGillivray and Ouattara, 2005). Studies revealed the diverse impacts of debt relief on economies (Tiruneh & Wamboye, 2017), the consequences of bailouts on borrowing trends (Fink

& Scholl, 2016) and the crucial need to assess financial aid's effectiveness in promoting growth and preventing crises (Stupachev, 2022; GÜNDÜZ et al., 2022). The importance of project size in fund allocation is also underscored (Krahnke, 2020). Studies also investigated the role of the IMF in restructuring public debt over time (Hagan, 2020; Jorra, 2012). Bird & Rowlands (2017) praised IMF programs for boosting growth in LICs. Guzman (2015) criticized the IMF's debt sustainability framework, advocating for changes. Smets and Knack (2014) discussed how IMF involvement impacts countries' debt maturity based on financial strength.

Table 1 Literature Summary

Author(s)	Sample	Time Period	Methodology	Expected Relationship
Magnini &Vojnovic, (2023)	71 countries across 5 continents	1990-2020	GMM	EF→ DEB (-)
Mura et al. (2023)	10 CEE Countries	1995-2020	VECM	DEB→ EF (-)
Tombofa et al. (2013)	Nigeria	1981-2010	ECM	FA→ DEB (+)
Bakhtiari et al. (2013)	Asian and LA Countries	1991-2010	FRM	FA→ DEB (-)
McGillivray & Ouattara, (2005)	Côte d'Ivoire	1975-1999	FRM	FA→ DEB (+)
Roychoudhury & Lawson, (2010)	93 countries	2000-2006	Regression Analysis	EF→ DEB (-)
Bjørnskov & J.H. Schröder, (2013)	93 countries	1976-2005	GMM	FA→ DEB (-)
Bjerg et al. (2011)	38 LDCs	1960–2000	FEM	FA→ DEB (-)
Ouattara, (2006)	68 countries	1980–2000	FE+RE	FA→ DEB (-)
Meraj et al. (2024)	Pakistan	Survey 2016-17	ECM+ARDL	FA→ DEB (-)

POWELL & Bird, (2010)	42 SSA countries	1988-2006	GMM	FA→ DEB~(T)
			PVAR	GDP→ DEB (-)
Swamy et al. (2015)	252 countries	1960-2009	ARDL	
	Uganda			GDP→ DEB (-)
Ssempala et al. (2020)	Pakistan	1980-2016	ARDL	
			GMM	TO→ DEB (+)
Ahmed et al. (2016)	Türkiye	1970-2012		TO→ DEB (+)
Kızılgöl et al. (2014)		1990-2012		

Note: DEB = Debt Burden, FA = Foreign Aid, EF = Economic Freedom, GDP= GDP growth rate, TO=Trade Openness, (~T) =varies over time, → = represents.

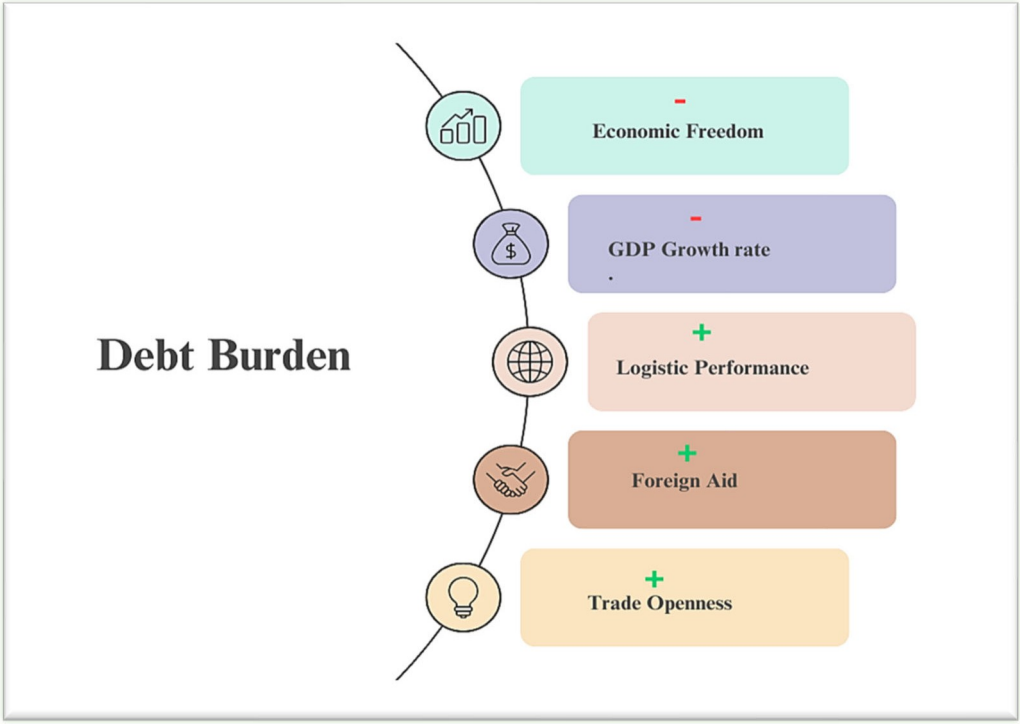

Fig. 1 Anticipated connections between DEB & key variables

Source: Authors own using existing literature

2.5 Literature Gap

It is evident from the literature survey that studies have ignored the interplay of factors in a single setting. Besides, the results from prior studies about the impact of FA on DEB are inconclusive. This shows room for further exploration. This study aims to fill this gap by examining the cumulative effect of LP, FA & EF on DEB of Asian-African countries. This focus provides unique & location-specific findings. With the incorporation of the least explored LP in relation to DEB, this study hopes to expand the scope of existing literature. Furthermore, it employs MMQR, which stands out from traditional approaches because of its reduced vulnerability to outliers & heteroscedasticity. It helps in understanding how the relationship between variables evolves across a spectrum of values. To the best of our

understanding, this novel technique has not been employed to study DEB, thus providing a robust comprehension of debt dynamics.

3. Theoretical Mechanism, Data and Methods

3.1 Theoretical underpinnings and model

Theoretical underpinnings provide a sound base to understand the subject matter & are as follows.

Debt Sustainability Analysis Frameworks: The debt sustainability analysis **(**DSA) framework evaluates a country's debt management capacity, considering factors like debt-to-GDP ratio, sovereign debt servicing capability & external debt risk assessment. This comprehensive approach aids policymakers in making informed decisions to maintain a stable financial footing over time. Studies utilized DSA to comprehend the influence of debt sustainability on EF (Grosu et al., 2022; Ahmed et al., 2023) and suggested that persistent DEB pose debt management risks for a country along with compromise on its EF. Further, how LP impacts DEB is studied by (Bouabdallah et al., 2017) in the eurozone and provided with a comprehensive DSA-based strategy to deal with financial uncertainties. DSA framework is reinforced by (Di Bella, 2008) to understand how FA & DEB impact the sustainability of debt.

Institutional Theory: DiMaggio and Powell (1983) suggested that both formal & informal rules shape economic outcomes & behaviour. It is, therefore, crucial to comprehend how institutional factors impact decisions relating to debt choices. Key ingredients of institutional theory are institutional isomorphism, proactiveness, cognitive abilities and normative dynamics. Hussain et al. (2016) found that improved EF positively influence economic growth, with a significant role played by institutional factors. Herrera-Echeverri et al. (2014) found that institutional quality and EF have a strong positive relationship with business generation in emerging economies. (Glenn et al., 2005) applied institutional theory to forecast

effects on environmental sustainability in reverse logistics monitoring systems. Institutional procedures & legislation also influence debt-relating decisions and affect borrowing costs (Zhang et al., 2016). Thus $\gamma_1 = \frac{DEB_{it}}{EF_{it}} < 0$.

Agency Theory: Agency theory (Meckling et al., 1976) sheds light on the competing interests of agents involved in debt management. Borrowers, lenders & policymakers often have different priorities. Agency theory is instrumental in understanding the principal-agent relationship (Carbonara et al., 2018). Otáhal (2012) used this theory to analyze the impact of agency problems on EF. It provided perspective on how information asymmetry, moral hazard & the alignment of the interest of lender & borrower shape the behaviour & decisions of the actors involved. Studies also used agency theory to gauge how the nexus of principals & agents in organizations impacts the efficiency of logistics (Uyar et al., 2021; Partyka et al., 2021). Further, the association between DEB & FA is investigated by (Winters et al., 2010), who reported that FA performs better with enhanced stakeholder engagement. Thereby, $\gamma_2 = \frac{DEBit}{LP_{it}} > 0$.

Resource Dependence Theory: Resource Dependence Theory (RDT) **(**Pfeffer and Salancik, 1978) argues that organizations & entities are at the mercy of their environment, and this necessitates adaptability to their environment to secure resources. Organizations try to cope with uncertain environments & increase their access to vital resources for their survival as they navigate a complex environment with minimal control due to dependency on multiple external elements such as suppliers, investors or government agencies. Drees et al. (2012) explained that mutual collaboration between two organizations is used as a pivot by organizations to enhance their legitimacy, which then improves their performance. RDT is used to highlight enhancing collaborations between organizations and logistics suppliers (Van et al., 2020; Jiang et al., 2022). Studies employed RDT to warn about over-reliance on external resources that could limit a country's EF, emphasizing the importance of carefully analyzing loan terms to avoid falling into a debt trap (Hailu et al., 2016; Aluko, 2010) Therefore, $\gamma_3 = \frac{DEB_{it}}{FA_{it}} > 0$.

This study developed the following model to establish the direction and magnitude of the relationship between variables.

$$DEB_{it} = f\ (EF_{it}, LP_{it}, FA_{it}, TO_{it}, GDP_{it}) \quad (1)$$

The baseline model for panel data settings can be defined as:

$$DEB_{it} = \gamma_0 + \gamma_1 EF_{it} + \gamma_2 LP_{it} + \gamma_3 FA_{it} + \gamma_4 TO_{it} + \gamma_5 GDP_{it} + s_{it} \quad (2)$$

This model represents modelling from country one to thirty-five; hence, subscript I =1,2, 3,…..,35, t=2007,2008,….,2018 showing time period & ε_{it} is the error term. Here, γ_0 represents the intercept term. Other coefficients represent the slope for independent variables. Coefficients facilitate the comprehension of the direction and magnitude of the impact of one variable on another.

3.2 Data

The composition of panel involves 35 economies (See ANNEX-I) and covers years spanning 2007-2018, providing a considerable degree of freedom. The sample ensures a diverse representation of economies whose selection is made upon careful considerations following the subsequent characteristics of policy convergence, availability of data & shared economic challenges. The dependent variable is DEB, which is measured by Gross debt-to-GDP. This proxy indicates the ability of a country to repay its debt relative to its economy's size. While net debt-to-GDP comes up with a more refined picture as it considers adjustments due to the poor availability of its data, gross Debt-to-GDP is the ideal selection for this research, and it is also backed by literature (Horton et al., 2010; Turan 2013). Independent variables are EF measured by EFI (Sharma and Tokas, 2023; İMRE et al., 2020), LP using LPI (Arvis et al., 2014; Semis et al., 2017; Marti et al., 2014) & FA whose magnitude & effectiveness is quantified by NODA (Perveen, 2021; Nicolás et al., 2022). In contrast, this study controlled for TO and GDP. (See Table 2 for description & sources of variables).

Table 2 Description of variables and source

Variables	Symbols	Measurement	Source	References
Debt Burden	**DEB**	Gross debt/GDP	World Economic Outlook (IMF)	Ssempala et al. (2020) Swamy, (2015)
Economic Freedom	**EF**	EFI (comprising 12 indicators that determine the score, indicating the level of effectiveness, with 0 (lowest) and 100 (highest possible) score.	Heritage Foundation	Vojnovic, (2023) Mura & Donath, (2023)
Logistic Performance	**LP**	LPI (comprising 6 key indicators showing level of significance. The score typically ranges between 0 (lowest) and 100 (highest).	World Bank	Yildiz et al. (2017) Karanina et al. (2020)
Foreign Aid	**FA**	NODA (aid + grant)	World Bank	Mazher et al. (2022) Sethi et al. (2019)
Trade Openness	**TO**	Trade/GDP	World Bank	Mohsin et al. (2021) Ahmed et al. (2016)
GDP Growth rate	**GDP**	annual %	World Bank	Swamy et al. (2015) Ssempala et al. (2020)

Note: **EFI=** Economic Freedom Index, LPI= Logistics Performance Index, NODA= Net Official Development Assistance Received

3.3 Estimation Strategy

Panel data demands initially to inquire about the nature & characteristics of data. A series of diagnostic tests are then performed to determine the most appropriate estimation technique to explore the empirical relation of a model. The current study has an econometric strategy involving seven steps (see Fig 2). In the *1st-step* of the estimation process, the parameters' slope coefficient heterogeneity (SHT) is tested by utilizing the Pesaran and Yamagata (2008) test. *2nd-step* involves checking cross-sectional dependency (CSD) using (Pesaran, 2007) test. The stationarity properties of the underlying variables are evaluated in *3rd-step* by performing 2nd-generation LLC (Levin, Lin, and Chu, 2002), Cross-sectionally augmented Dicky-Fuller (CADF) & cross-sectionally augmented Im-Pesaran-Shin (CIPS) (Pesaran, 2007) tests. Long-run cointegration association among the variables is confirmed by employing Persyn and Westerlund (2008) and Pedroni (1999) cointegration tests in the *4th-step*. In the *fifth step*, the long-term connections between variables are observed using the (MMQR) technique. *6th-step* deals with robustness checks by employing FMOLS, PMG, and FE. Causality direction among the variables is investigated by employing (Dumitrescu & Hurlin, 2012) test in a *final step*.

Fig. 2 Flow chart of estimation strategy

Source: Authors own

3.3.1 Slope heterogeneity test

The issue of varying slopes is frequently encountered while modeling data, even in the panels that show CSD. This study takes on (SHT) introduced by Pesaran and Yamagata (2008), to ensure the applicability of the dataset. The purpose of SHT is to find whether the strength or direction of the relationship is the same or different among distinct groups. Here, slope heterogeneity can be expressed as follows:

$$\tilde{\Delta}_{SH} = (N)^{\frac{1}{2}} (2X)^{\frac{1}{2}} \left(\frac{1}{N}\tilde{S} - X\right) \quad (3)$$

$$\tilde{\Delta}_{ASH} = (N)^{\frac{1}{2}} \left(\frac{2X(T-X-1)}{T+1}\right)^{\frac{1}{2}} \left(\frac{1}{N}\tilde{S} - 2X\right) \quad (4)$$

3.3.2 Cross-sectional dependency tests

Owing to the interconnectedness of the real world, CSD are often present in datasets which could overdo outcomes. Possible reasons for CSDs are spillover effects of economic policies, global financial crises, trade agreements, etc. Likewise, countries that receive foreign aid might be subject to certain conditions or policies that can create CSDs. Therefore, this paper has used Pesaran (2004) CD test, Pesaran (2004) scaled LM test and Breusch Pagan (1980) LM test to address this concern. The modified equation for this analysis is as follows:

$$CSD_{TM} = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=0}^{N-1} \sum_{j=i+1}^{N-1} \eth_{ij} \quad (5)$$

Where, the correlation of the pair-wise parameters is denoted as $\eth_{ij}$, N is the cross-sections while the period is depicted as T.

3.3.3 Unit root tests

LLC stationarity test by (Levin, Lin, and Chu, 2002) is utilized in this study together with (CIPS) and (CADF) that were put forth by (Pesaran, 2007). Stationarity tests are crucial for determining whether the variables present in the panel exhibit a consistent & uniform trend over time or not. CIPS & CADF are called 2nd-generation stationarity tests because they outperform standard tests of stationarity by taking into account CSD. They also offer reliable results for panels indicating the problem of slope heterogeneity. These tests further detect structural breaks and thwart spurious regression for accurate results. Following is the mathematical expression for the panel unit root test:

$$\Delta Y_{i,t} = \varphi_i + \varphi_i Y_{i,t-1} + \varphi_i \bar{X}_{t-1} + \sum_{i=0}^{v} \varphi_{i,t} \Delta\overline{Y_{t-7}} + \sum_{i=1}^{v} \varphi_{i,t} \Delta\overline{Y_{t-7}} + s_{it} \quad (6)$$

Here, $\bar{X}_{t-1}$ denotes the lagged parameter & the symbol of $\Delta\overline{X_{t-i}}$ Illustrates the first Difference of lagged parameter. Whereas the statistics for CIPS are based on the average statistics of CADF. The expression for CIPS is as follows:

$$\widehat{CIPS} = \frac{1}{N}\sum_{i=1}^{n} CADF_i \quad (7)$$

3.3.4 Cointegration test

The intended purpose of a cointegration test is to ascertain the presence of a long-term relationship between variables. It helps in determining if these variables move together in the long run, despite potential short-term variations. This paper utilizes the studies from (Persyn & Westerlund, 2008) and Pedroni, (1999). Westerlund cointegration is opted for, as it permits CSD in data, while Pedroni cointegration approach considers potential deviation in the cointegrating relationship across different groups in a panel.

3.3.5 MMQR Method

This study adopts an advanced method of moment quantile regression for estimation. The theoretical foundation of MMQR is based on assessing the correlation between variables across different quantiles of distribution. Mainstream statistical techniques have limitations in capturing differences in the impacts of experimental variables over distinct quantiles because of distributional and heterogeneous effects. This oversight is owing to their focus towards calculating single point estimates. This limitation could make the results less precise when substantial variations across quantiles exist. For this purpose, a technique of moment quantile is employed. Computation using this technique exhibits a thorough understanding of how explanatory variables steer response variables across different quantiles. This is contrary to the standard assumption of uniform relationship across all quantiles & thereby gives a precise idea about the varying impact of independent variables across the entire division (Lamarche et al., 2019; Ike et al., 2020; Chen et al., 2021; Javed et al., 2024).

As the real world does not conform to established normalcy standards, MMQR becomes more relevant as it handles skewed distribution. This

flexibility enables us to understand the relationships across a wide range of contexts (Canay, 2011). Results obtained from MMQR are compact and offer a clear explanation for estimated coefficients. Results can further be displayed using quantile plots, providing a handy, graphical & amplified version of communication that helps in better understanding. MMQR is robust to outliers, and extreme values do not sway the results because this method calculates for quantiles instead of estimating average values. It provides a perspective across different segments of distribution because of its consideration for a full spectrum of values for DEB, therefore yielding reliable estimates & fundamental trends in the dataset.

One possible difficulty in the MMQR panel could be the likelihood of unobserved variations across individual units. The underlying reason is that the effects of conditional heterogeneity tend to be centred around a mean value. This potential difficulty could underestimate the ability of independent variables to drive our interested outcomes. Thereby, careful consideration of unobserved heterogeneity is prescribed (Koenker et al., 2004).

A customized version of the location-scale model for MMQR estimation is given below (Machado and Silva, 2019; Adebayo et al., 2022).

$$\Omega DEB\left(\frac{\tau}{X_{it}}\right) = (ai + \beta iq(\tau)) + X_{it}\varphi + M_{it}xq(\tau) \quad (8)$$

Whereas $\Omega DEB\ (\tau/X_{it})$ reflects the distribution of DEB across different quantiles. Explanatory variables are denoted by vector $X_{it}\varphi$, while $ai + \beta iq\ (\tau)$ represents the scalar coefficients for different quantile levels in a dataset. Symbol (i) shows quantile fixed effect and (τ) denotes distributional effects. M_{it} is the vector of known differentiable transformations of explanatory variables, where i = 1… k and q (τ) is the (τ-th) quantile produced from the following optimization function:

$$\frac{Min}{q}\Sigma_i\Sigma_I\ \rho\ (R_{it} - (\beta i + M'itx)q) \quad (9)$$

The estimation function is as follows:

$$\rho\tau\,(A) = [\tau - 1]AI(A \le 0) + TAI(A > 0) \quad (10)$$

3.3.6 Robustness Check

Robustness checks evaluate the responsiveness of inquiry to different approaches and, therefore, strengthen the reliability and validity of a study. Ongoing study employs PMG/ARDL, FMOLS, FE, and RE. Following is the reasoning for employing these checks: The model of PMG/ARDL examines how different variables influence each other over time in group settings, keeping in mind the short and long-term impacts (Pesaran, 1999). FMOLS settles for endogeneity problems and tackles inaccuracies in the measurement of data (Pedroni, 2001). FE reflect individual characteristics of variables that show consistent behaviour over time, while RE captures variability in individual traits across all observations over time. This way, the reliability of results can be assured and timely corrections for the differences can be made (Teachman et al., 2001).

3.3.7 Dumitrescu-Hurlin panel causality

A causal relationship between the variables is figured out by (Dumitrescu & Hurlin, 2012) test. This test inspects for the direction of cause-and-effect linkage. This test is suitable for heterogeneous panels with varied characteristics among individual units. This expanded version of the Granger Causality test (1969) accounts for CSD and can also handle non-linear complex relationships. This improved version has dual predictive powers. While Granger causality focuses on unidirectional causality, this test focuses on the simultaneous influence of two variables on each other, suggesting a bidirectional cause-and-effect relationship. Furthermore, this test assumes that the causal association can differ across countries that are included in the panel in terms of strength and significance, contrary to Granger causality, which presupposes uniform causal linkage across all cross-sections. This leverage provides a good degree of flexibility in capturing causal variations across different group settings. Expression for causal estimation is crafted as follows:

$$X_{j,t} = \vartheta_j + \sum_{j=1}^{p} \varphi_t^i W_{i,t-j} + \sum_{j}^{p} \eth\varphi_t^i Q_{i,t-j} \quad (11)$$

Herein, autoregressive parameters are represented by the symbol of $\varphi^i{}_t$& j denotes lag length.

4. Results and Discussion

4.1 Results

The overall pattern and characteristics of data can be understood by the descriptive statistics shown in Table 3. Mean values serve as a reference point that helps us understand the distribution of data. Conversely, the spread of data can be cognized by standard deviation.

Table 3. Summary of descriptive statistics

	DEB	EF	LP	FA	GDP	TO
Mean	36.56381	56.35667	2611815	4.436989	5.091813	67.15974
Median	34.00000	56.20000	2550000	2.951930	5.306690	58.02539
Maximum	129.6000	74.50000	3.775321	37.36543	17.29078	192.4655
Minimum	4.100000	40.30000	1.610000	-0.052359	-14.10000	20.72252
Std. Dev.	18.94742	5.955914	0.355383	5.525697	3.042036	31.94861
Skewness	1.205750	0.063038	0.687784	2.391773	-0.783742	1.299844
Kurtosis	6.001478	3.155543	3.645250	10.86553	7.820593	4.163799
Jarque-Bera	259.4237	0.701557	40.39936	1483.106	449.6646	141.9741
Probability	0.000000	0.704140	0.000000	0.000000	0.000000	0.000000
Sum	15356.80	23669.80	1096.962	1863.535	2138.562	28207.09
Sum Sq. Dev.	150423.0	14863.15	52.91850	12793.46	3877.420	427679.0
Observations	420	420	420	420	420	420

Table 4 provides the findings of CSD tests. Breusch-Pagan LM, Pesaran CD & Pesaran scaled LM tests yielded statistically significant results at a 1% probability level, suggesting the presence of CSD in the overall data.

Table 4. CD-Tests results

Test	Statistics
Breusch-Pagan LM	2759.552***
Pesaran CD	30.91409***
Pesaran scaled LM	62.74724***

Note: Asterisk *** show a 1% level of significance.

The results from SHT (See Table 5) yielded significant results at 1% level. The statistics for delta and $\tilde{\Delta}$adjusted indicate that there is significant variation in the slopes of analyzed variables. This suggests that the relationship between the variables may differ across different groups. The $\tilde{\Delta}$ and $\tilde{\Delta}$adjusted values in SHT are measures of the magnitude of slope heterogeneity of variables. The $\tilde{\Delta}$adjusted takes into account the sample size and other factors to provide a more accurate measure of heterogeneity.

Table 5. Slope heterogeneity

Test	Statistics
$\tilde{\Delta}$	5.350***
$\tilde{\Delta}$adjusted	8.288***

Note: Asterisk *** shows a 1% level of significance**.**

Stationarity tests are computed for both levels and the 1st-difference of variables (See Table 6). LLC, CADF, and CIPS tests show significant results suggesting the presence of unit roots in variables. This means that the variables exhibit a trend over time. While the level results look at the variables in their original form, the 1st-difference results conform to looking at the variables after taking the Difference between consecutive observations. Negative coefficient values indicate that the variables are nonstationary. As for CADF and CIPS, the initial values of variables were not in the range of statistical significance, which led to conduct first difference test.

Table 6 Unit-root tests results

	LLC		CADF		CIPS	
Variables	**Level**	**1st Difference**	**Level**	**1st Difference**	**Level**	**1st Difference**
DEB	-6.1739***	-18.3755***	-2.187***	-2.624***	-2.036*	-3.283***
EF	-2.7685***	-4.1162***	-1.972*	-2.028**	-2.016	-3.307***
LP	-9.0096***	-15.8192***	-3.059***	-3.076***	-1.638	-1.868*
FA	-3.3160***	-8.5368***	-1.670	-2.423***	-2.379***	-3.553***
GDP	-9.4418***	-23.0625***	-2.050**	-2.912***	-2.424***	-3.613***
TO	-5.5045***	-9.9822***	-1.420	-2.136**	-1.513	-2.704***

Note*:* Asterisks ***, ** & * show a 1%, 5% & 10% level of significance, respectively.

This study further applied Westerlund and Pedroni cointegration tests to gauge the presence of cointegration association among variables (See Table 7). Westerlund cointegration test considers CSD and heterogeneity while giving robust results. Variance ratio (VR) shows significant cointegration at a 1% significance level. It measures the extent to which the variables being analyzed are influenced by common factors across the cross-sectional units. Likewise, the Pedroni cointegration test with a common AR (autoregressive) parameter shows significant test statistics at a 1% probability level, indicating interdependencies among countries.

Table 7. Cointegration tests results

	Pedroni test	**Westerlund test**
	Statistics	**Statistics**
VR mod.	-7.5788***	8.0498 ***
PP mod.	6.5973***	
PP	4.0841***	
ADF	5.1146***	

Note: Asterisk *** shows a 1% level of significance**.**

Given the confirmation of the long-run cointegration relationship among the variables, it becomes crucial to estimate the long-run coefficients of each regressor. Therefore, the present paper employed the MMQR approach (See Table 8).

Starting by summarizing the overall findings of MMQR for 0.10-0.90 quantiles, LP shows a consistent pattern of a statistically significant positive association across different levels of DEB. This suggests that as LP improves, DEB increases. The coefficient value in Q.10 (9.943993***) for LP indicates that for every unit increase in LP, the DEB increases by approximately 9.94 units. The p-value of 0.000 suggests a significant relationship that is highly unlikely to occur by chance. This means that LP has a significant impact on DEB. Similarly, the results of LP for the rest of the quantiles can be understood. The standard error values in MMQR results show the average amount of variation in the estimated coefficients of independent variables. A smaller standard error indicates a more precise

estimate, while a larger standard error suggests more uncertainty in the estimated coefficients.

FA and TO also show a consistent and statistically significant positive relationship with DEB. E.g., FA (0.10) shows a coefficient value of (.758). This tells that for every unit increase in FA, DEB increases by 0.759 with a 1% probability level, confirming a strong positive relationship between the explanatory variable FA and DEB. Similar is the interpretation for the rest of the quantiles. Moreover, the positive association of TO with DEB explains that with an increase in trade openness, DEB tends to increase.

Regardless of the quantiles, this study found a negative relationship between GDP growth and DEB. This suggests that as GDP growth increases, DEB tends to decrease across all levels of DEB. These findings indicate a robust and consistent pattern in this study. The relationship of EF seems to vary across different levels of DEB, which is quite interesting to observe. This association gradually drifts from positive to negative as we move from lower to higher quantiles. This gradual shift proposes the consideration that EF impact differently for different debt levels.

MMQR also provide location and scale results where the scale deals with the degree of variability between variables, and the location deals with the average relationship between the studied variables. Small values of scale convey the consistency of relationships across different quantiles and vice versa. Similarly, a larger value of location indicates a comprehensive strong positive relationship for a variable and smaller values of location are associated with an overall negative relationship for a variable against DEB.

Table 8. Method of moment quantile regression results

			Lower Quantile				Middle Quantile			Upper Quantile	
Variables	**Location**	**Scale**	**Q.10**	**Q.20**	**Q.30**	**Q.40**	**Q.50**	**Q.60**	**Q.70**	**Q.80**	**Q.90**
LP	13.6***	2.7	9.9***	10.6***	11.5***	12.2***	13.1**	14.0***	14.8***	16.1***	18.9***
	(2.834)	(1.897)	(2.612)	(2.449)	(2.385)	(2.438)	(2.661)	(2.975)	(3.355)	(4.070)	(5.708)
FA	.9***	.14	.75***	.79***	.84***	.87***	.92***	.97***	1.01***	1.08***	1.22***
	(.198)	(.132)	(.182)	(.171)	(.166)	(.170)	(.186)	(.208)	(.234)	(.284)	(.399)
EF	-.13	-.31***	.30**	.21	.11	.036	-.075	-.175	-.272	-.424*	-.741**
	(.157)	(.105)	(.144)	(.136)	(.133)	(.136)	(.149)	(.166)	(.187)	(.230)	(.319)
GDP	-1.1***	-.43**	-.53**	-.65**	-.79***	-.89***	-1.05***	-1.19***	-1.32***	-1.53***	-1.97***
	(.303)	(.203)	(.279)	(.262)	(.255)	(.261)	(.285)	(.318)	(.359)	(.439)	(.612)
TO	.16***	.014	.144***	.148***	.153***	.157***	.162***	.167***	.171***	.179***	.194***
	(.027)	(.0187)	(.0257)	(.024)	(.023)	(.024)	(.026)	(.029)	(.033)	(.040)	(.056)

Note*:* Asterisks ***, ** & * show a 1%, 5% & 10% level of significance, respectively.

Figure 7 shows a graphical plot of estimated quantiles against independent variables. It visualizes how the relationship between variables changes across different quantiles of DEB. The slope of the line in the plot determines the direction of a relationship. A downward slope line indicates a negative relationship, and an upward slope line indicates a positive relationship between the explanatory variable and DEB. A careful examination gives a negative relationship between EF and GDP with DEB, showing that with improved EF and GDP, the DEB of a country reduces. Likewise, LP, FA, and TO show a positive relationship with DEB, which means that with an increase in aid support foreign funding, improved LP, and increased TO, DEB also increases. Plots for LP, FA, GDP growth, and TO show that the relationship is consistent across different quantiles.

Concerning EF, an assorted linkage has been found that varied along different quantiles. This non-linear relationship points out that myriads of factors are at play in different areas of distribution. Possible explanations can be developed using agency theory for this pattern. For example, lower quantiles show a small part of true data and thus can be interpreted as quantiles with lower EF. This shrunken freedom leads to bad governance and higher costs associated with agencies leading to inefficient allocation of resources and burgeoning DEB.

On the other hand, higher quantiles are associated with higher EF, which, of course, improves governance mechanisms. By this channel of influence, agency costs can be cut down with improved allocation of resources and better management of debt (Solomon et al., 2021; Carbonara et al., 2018). From the lens of institutional theory, a framework of institutions is weaker in countries with poor EF and thereby, they have poorly developed financial markets. These systematic inefficiencies raise the borrowing costs that result in aggravated DEB. So is the case with alternative situations where countries with improved EF have strong institutions, and this strengthens their regulatory frameworks. These countries experience lower rates of borrowing that can ultimately reduce their DEB (Zhang et al., 2016; Echeverri et al., 2014). Discrete lines in Fig 3 express different thresholds of DEB. Whereas the shaded blue area shows the confidence interval.

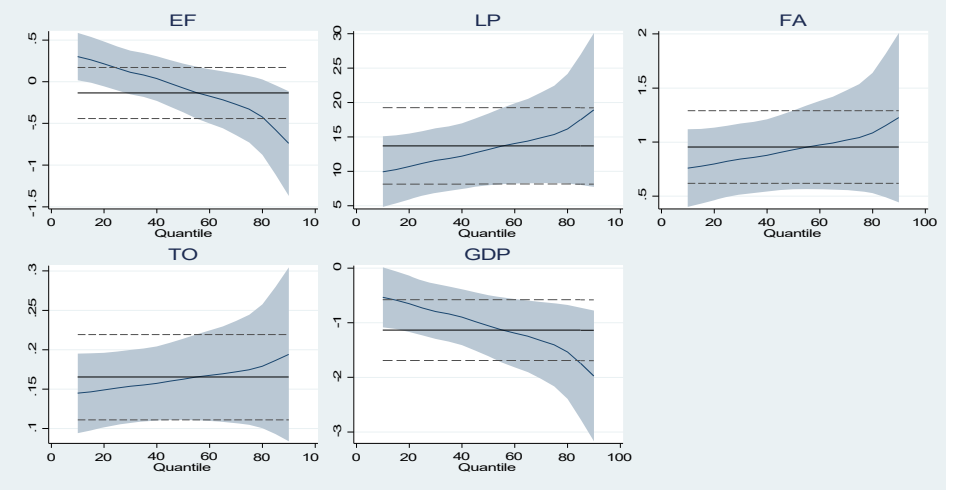

Figure 3 Plot of MMQREG results

The reliability of the results for this analysis is ensured by the employment of regression checks, including FMOLS, FE, RE and PMG/ARDL (Teachman, 2001; Pedroni, 2001; Pesaran, 1999). Results of these tests (See Table 9) confirm a significant association of EF, LP, FA, GDP and TO with DEB in selected countries. (Consult Fig. 4 for projected estimates from adopted methods).

Table 9 Robustness check

Variables	PMG	FMOLS	FE	RE
LP	17.51784***	19.12965***	19.05153***	18.40668***
FA	0.877319***	0.262593***	.3474221	.6029342**
EF	-0.219872**	-0.647921***	-.6750707***	-.4972969**
GDP	-1.819165***	-1.492189***	-1.395199***	-1.393895***
TO	0.166765***	0.042100**	.0716333	0.06013**

Note: Asterisks *** & ** show a 1%, & 5% level of significance, respectively.

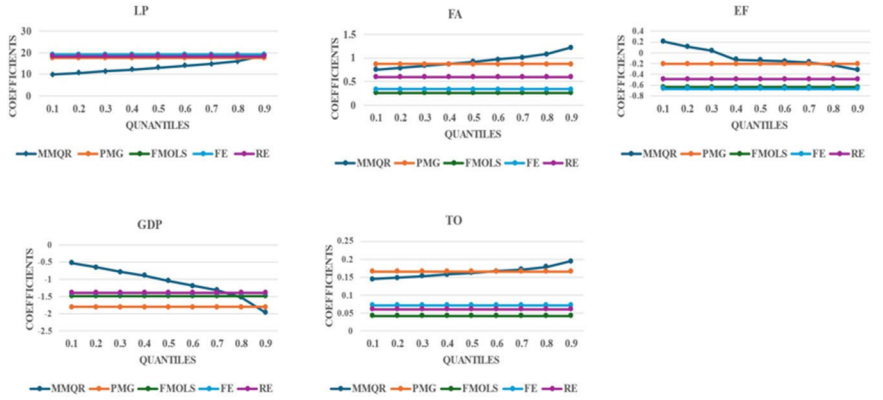

Fig. 4 Graphical illustration of projected estimates from adopted methods

The outcomes of a causal connection between explanatory variables and DEB are verified by (Dumitrescu & Hurlin 2012) estimation of panel causality. The analysis reveals a significant bidirectional causality between the variables, suggesting that there is a mutual influence between them. It highlights the interconnectedness of these factors in shaping DEB (See Table 10). Here, the w-bar statistic measures the strength of the causal

relationship between variables. A higher w-bar value indicates a stronger causal effect. Moreover, the z-bar statistic measures the significance of the causal relationship. A larger absolute value of the z-bar suggests a more significant relationship between the variables. The p-values associated with the z-bar statistic tell us about the hypothesis being tested. If the p-value is below (usually 0.05) significance level, it suggests that the results are statistically significant, and we reject H_0 in favour of the alternative hypothesis and vice versa. Bidirectional causal relationships are significant in highlighting the interconnectivity and interdependency of variables. A feedback loop could exist due to the ripple effect of changes in one variable to connected variables. (See Fig 5 to see Link chart).

Table 10 Dumitrescu-Hurlin panel causality results

Causality	W-bar Stat.	Z-bar Stat.	p-value	Result
EF→DEB	1.8816	3.6881	0.0002	Bidirectional
DEB→EF	4.7823	15.8225	0.0000	Causality
LP→DEB	2.8920	7.9147	0.0000	Bidirectional
DEB→LP	3.0607	8.6206	0.0000	Causality
FA→DEB	3.6543	11.1039	0.0000	Bidirectional
DEB→FA	4.6726	15.3636	0.0000	Causality
GDP→DEB	2.5153	6.3389	0.0000	Bidirectional
DEB→GDP	3.0405	8.5359	0.0000	Causality
TO→DEB	1.9970	4.1709	0.0000	Bidirectional
DEB→TO	3.1629	9.0481	0.0000	Causality
LP→EF	2.4107	5.9015	0.0000	Bidirectional
EF→LP	2.2351	5.1667	0.0000	Causality
FA→EF	2.5485	6.4779	0.0000	Bidirectional
EF→FA	1.5576	2.3326	0.0197	Causality
GDP→EF	2.1228	4.6970	0.0000	Bidirectional
EF→GDP	2.8778	7.8552	0.0000	Causality
TO→EF	2.6579	6.9355	0.0000	Bidirectional
EF→TO	2.7839	7.4624	0.0000	Causality
FA→LP	2.2579	5.2622	0.0000	Bidirectional
LP→FA	2.9516	8.1642	0.0000	Causality
GDP→LP	1.6931	2.8994	0.0037	Bidirectional
LP→GDP	2.9676	8.2310	0.0000	Causality
TO→LP	1.6711	2.8074	0.0050	Bidirectional
LP→TO	2.7701	7.4048	0.0000	Causality
GDP→FA	2.9844	8.3015	0.0000	Bidirectional
FA→GDP	1.7523	3.1470	0.0016	Causality
TO→FA	2.7702	7.4052	0.0000	Bidirectional
FA→TO	2.8540	7.7556	0.0000	Causality

TO→GDP	2.3004	5.4398	0.0000	Bidirectional
GDP→TO	1.7865	3.2901	0.0010	Causality

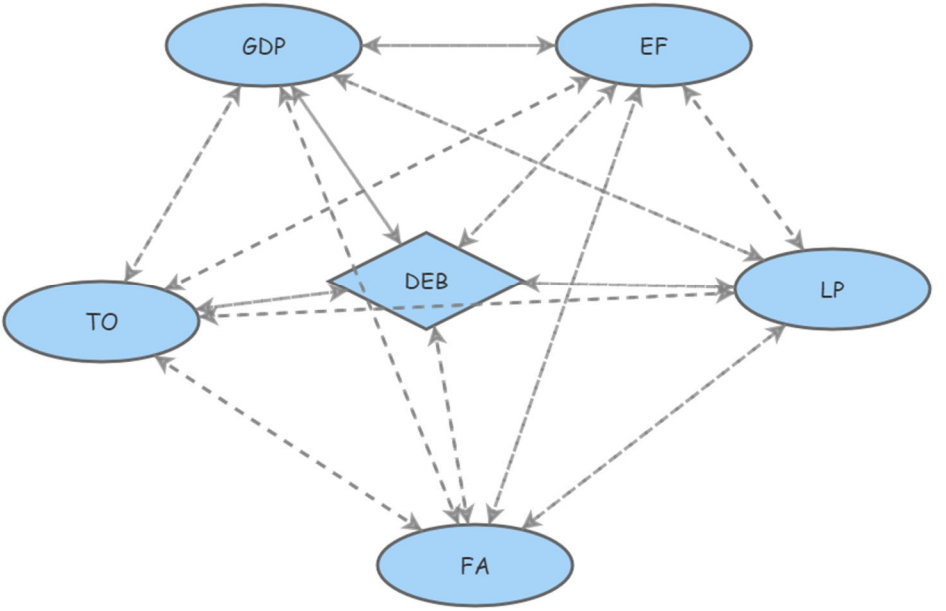

Fig. 5 Bidirectional Causal Links Chart

Source: Authors own

4.2 Further Discussion

The following study enriches the discussion in subsequent fields. *Firstly*, DEB is positively influenced by FA and TO (McGillivray & Ouattara, 2005; Ahmed et al., 2016). *Secondly*, an antagonistic association between EF and GDP growth with DEB has been established by the findings of current and prior studies (Sempala et al., 2020; Jovan Vojnovic, 2023; Donath et al., 2023). Ongoing study suggests that as the economy experiences higher GDP growth and greater EF, the weight of debt diminishes. *Thirdly*, when LP improves, trade becomes more open, and FA increases, which tends to result in higher DEB. The theoretical implications

of the research findings are significant as they align with the literature in terms of expected relationships.

These findings also give weight to the theoretical framework of DSA, which is proven to be a key tool in regulating DEB through monitoring and assessment of debt levels (Ahmed et al., 2023; Grosu et al., 2022; Bouabdallah et al., 2017). The empirical evidence of this study also supports the underlying principles of agency theory. A positive relationship between LP, TO and FA with DEB explains the lack of effective monitoring coupled with control mechanisms. It suggests that agents might prioritize short-term gains from TO and FA irrespective of the long-term ramifications on the sustainability of debt. Similarly, a negative relationship between EF and GDP growth with DEB can be contextualized by the fact that when agents have concentrated powers without institutional checks then it can lead to prioritization of skewed interests against general well-being. This can, hitherto, negatively impact GDP and increase DEB (Uyar et al., 2021; Partyka et al., 2021; Carbonara et al., 2018). The results further show alignment with the expectations of institutional theory, whose underpinnings explain the influence of factors under discussion on the outcomes and behaviours of countries (Zhang et al., 2016; Hussain et al., 2016). A negative correlation of EF & GDP with DEB indicates institutional constraints affecting financial decisions. Conversely, the positive relationship of independent variables with DEB shows how institutional structures shape resource flow and financial management, thus affecting the debt level. These results further show consistency with the principles of RDT & suggest that those countries often rely on external resources to address their needs. The idea that countries with greater access to resources, such as efficient logistics, TO policies, and FA, may also accumulate greater debt is also consistent with the outcomes of this analysis. A negative relationship between EF and DEB is a reflection of dependence on external sources for funding, and thus, institutional constraints can impact economic growth and debt management. These carefully crafted connections between results and theoretical underpinnings provide a sound ground for research findings (Jiang et al., 2022; Van et al., 2020).

5. Conclusion and Policy Implications

The present paper explored the effect of EF, LP, FA, GDP and TO on DEB for thirty-five debt-prone economies ranging between 2007–2018. Starting by conducting 2nd-generation diagnostic tests of stationarity, CSD, SHT and cointegration tests, this study has taken necessary steps to identify any potential outliers in data and ensured the accuracy and integrity of research. The findings based on the MMQR show that EF has a positive relationship with DEB at lower quantiles (0.10-0.40). As we headed to higher quantiles (0.50-0.90), which captured the majority of data, we saw a negative association between EF and DEB. When considering the overall distribution of the data, it is often more informative to focus on higher quantiles. Since they contain a majority of data, they provide a better understanding of larger or more extreme values in the dataset. Thereby, we may conclude that expanded EF dampens DEB.
Moreover, LP and FA have a statistically positive and significant effect on DEB across all quantiles, suggesting worsening DEB with augmented LP and ameliorated FA. Besides, TO relate positively with DEB, while GDP has a negative relationship with DEB. The results of this study perfectly align with our research objectives and provide strong support for the hypothesis we initially set out to investigate. Over and above, the empirical findings provide support for the theories incorporated in this study, thus demonstrating that this research is grounded in established frameworks and concepts. Besides, a supplementary layer of checks for robustness ensures the validity of results. Furthermore, supporting evidence from the Dumitrescu-Hurlin test strongly signifies bidirectional causality between variables. The indispensable nature of these results has important implications for policymakers as it highlights that any changes in EF, LP, and FA can have an impact on the DEB and vice versa.

Based on empirical findings, this research offers the following recommendations. *(i)* EF and DEB are negatively correlated (Vojnovic, 2023); therefore, the promotion of EF could favourably alleviate DEB. Strategic planning and implementing of a policy framework featuring alleviation of excessive regulations, promotion of free trade, safeguarding of property rights and fostering of a competitive environment can enhance EF. By adhering to the distinctive features of optimization of bureaucratic

procedures, the establishment of straightforward and equitable regulatory structures, and advocation for market-driven changes, countries can garner investment and mitigate DEB. *(ii)* As LP can improve DEB (Karanina et al., 2020; Yildiz et al., 2017), the efficiency of logistics ought to be prioritized, and this can be achieved by optimization of transportation routes, adaption of technology for real-time tracking and data analysis, improvement of supply chain communication nexus, and investment in infrastructure and automation. *(iii)* Owing to a positive correlation between FA and DEB (McGillivray and Ouattara, 2005; Tombofa et al., 2013), administration and spending of desired aid by rigorous implementation of policies that ensure openness, accountability, and proper governance of allocated funds with effective handling should be the centre of attention. Strengthening of institutions, improvement of monitoring and assessment procedures, and encouragement of sustainable development practices are sub-strategies to enhance aid effectiveness. *(iv)* Empirical findings further suggest a focus on the implementation of efficient debt management practices. By creating a strong DSA (Grosu et al., 2022; Bouabdallah et al., 2017), debt can be strategically managed. The significance of frequent audits and negotiation measures for debt rescheduling can also not be denied. *(v)* Advocation of a negative relationship between GDP and DEB (Ssempala et al., 2020), suggests that the focal point for the policies should be the promotion of sustainable GDP growth. An action plan to achieve this encompasses infrastructure investments by attracting FDI, initiation of public-private partnerships & capacity building of individuals and institutions through skill and resource enhancement methods. *(vi)* Lastly, a positive linkage between DEB and TO (Ahmed et al., 2016) implies that though TO can contribute towards economic progress, it can also potentially augment DEB. Therefore, maintaining a trade balance is indispensable to fix debt responsibility by eschewing overdependence on imports. By the stringent implementation of policies, e.g., diversification of exports by exploring new markets, improved trade competitiveness through brand building of products, selling of finished goods rather than raw or intermediate items and support for domestic sectors through control mechanisms, this balance can be achieved.

4.3 Limitations of Study

Contextualizing the results of this study by acknowledging limitations is pertinent. To begin with, a panel consisting of 35 countries spanning 12 years is limited in representing the true population & capturing the diversity

of countries worldwide. Furthermore, missing values of LPI are approximated by taking the weighted average, which resulted in a simplification assumption. Owing to the limited availability of data from 2007 to 2018 for LPI, time frame challenges are evident and possibly not capture all relevant policy shifts and economic dynamics influencing the results. Future studies can expand on an investigation with a larger and more diverse sample with alternative methods for handling missing data, such as exercising a longitudinal study covering a wider time frame.

Declaration of Competing Interest

The author declares that no financial/personal interest or belief could affect the objectivity of this manuscript.

Data Availability

Data will be made available on request.

Funding: We did not receive any funding to complete this study.

ANNEX-I

Table A. List of Countries

1. Tajikistan	17. Ghana
33. Tanzania	
2. Uzbekistan	18. Nigeria
34. Algeria	
3. Kyrgyz Republic	19. Cote d'Ivoire
35. Morocco	
4. Iran	20. Angola
5. Armenia	21. Cameroon
6. Malaysia	22. Burkina Faso
7. Indonesia	23. Mali
8. India	24. Chad

9. Philippines	25. Mozambique
10. Vietnam	26. Benin
11. Cambodia	27. South Africa
12. Pakistan	28. Zambia
13. Bangladesh	29. Mozambique
14. Nepal	30. Kenya
15. Kazakhstan	31. Uganda
16. Mongolia	
32.Rwanda	

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Rat race: An Application of Nudge Theory

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Abstract: The study looks at the problem of Rat Race through an example of social media, how alarming it is for young adults and how it affects an economy. It examines how this Rat Race of social media for likes, comments and followers are built in our minds and without realizing we use social media way too much than it is required, leading to supply-side shock. Hence, there is a need to intervene and suggest some measures to change the behaviors of the people. The study examines whether Nudge theory can help to overcome this problem or not by conducting pre- and post-experiment questionnaire on 88 candidates by exposing the participants to various offline activities like sports, field trips, volunteering. Their social media behavior and psychological responses were recorded before and after the intervention. Results indicate that carefully designed nudges can reduce screen time, improve mental health and potentially enhance productivity among youth.

Key Words: Rat Race, Nudge Theory, Behavioral Economics

1. Introduction

The Rat Race is a way of life where individuals are trapped in fierce competition for the sake of wealth, power and worldly satisfaction. When people say that they feel like running an endless race and want to quit the constant cycle of work-sleep-work-repeat, they are referring to ‘quit the Rat Race.’

The first recorded meaning of Rat Race is said to be defined in 1934, where a game ‘follow-the-leader' is played by a group of people who are asked to follow all the actions performed by an experienced pilot. However, after 1945 the phrase ‘Rat Race’ is explained as competitive struggle and is used in many different novels and articles. For instance, Jim Bishop uses the term Rat Race in his book ‘The Golden Ham: A Candid Biography of Jackie Gleason’.

"Television is a rat race, and remembers this, even if you win you are still a rat."

Examples of Rat Race can be seen within the professional as well as the personal lives of humans. Mostly, they have no idea why a particular trend occurs and why they follow that path, which can be exhausting

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routine and affect their productivity. Whether it is Rat Race in offices for promotions, parents spending huge amounts on private educational institutes or young adults running to brands such as Nike, ZARA, LV for overpriced garments. All such actions, in one end, add frustration to individuals' lives and lead to unhealthy competition, resulting in inefficiencies.

This routine can be more alarming than we can imagine, not only for individuals but for a country overall. Let's take the example of social media which is one of the biggest platforms for communication in the twenty-first century. Social media can be viewed as online facilitators or webs of individuals who enhance social connectivity. However, over usage of social media by individuals can act as a tool for cyber bullying, online harassment, and trolling. Social media also causes the issue of social comparison where people compare their own lives to the lives of their friends through their friends' posts. In 2017, a study declares that problematic social media use is related to lower life satisfaction and self-esteem scores. Another negative impact is the link between sleep disturbance and the use of social media. In 2011, researchers began using the term "Facebook addiction disorder" (FAD), a form of internet addiction disorder, which is characterized by compulsive use of the social networking site Facebook, resulting in physical or psychological complications.

This is not only affecting individuals but also the overall economy by decreasing the productivity level of labor. A reduction in productivity leads to inefficiencies and an increase in the cost of production of firms and eventually might affect the supply side of a country. This shows how dangerous it is to overuse social media and society needs to take a step before this constant useless routine affects them and the GDP (Growth Domestic Product) of their country.

Even though social media, in today's world, is playing an essential role on the learning behavior of university students to achieve sustainable education and the world has become a global village where technology has made it a smaller world. But the findings in different research papers have revealed that the usage of social media in Pakistan has a negative influence on a student's behavior as compared to positive aspects. Although the results may not be generalized to the entire student

community it clearly shows how much social media is affecting society and there is a need to address this problem.

The study examines how this Rat Race of social media for likes, comments and followers is built in our minds and without realizing we use social media way too much than it is required, leading to supply-side shock. Hence, there is a need to intervene and suggest some measures to change the behaviors of the people.

Nudge theory is a concept of decision making, behavioural economics and consumer behaviour that deals with choice architecture influencing the behaviour and decision making of individuals and groups. It basically suggests that positive reinforcement and indirect suggestions are ways in which we can change human behavior. It may not be a full-fledged management model but is considered to be helpful within any formal change management model. In Nudge theory, we need to first define the outcome, identify the obstacles and consider the individuals affected by it then by removing the obstacles; we introduce new ways or brainstorm the nudges and then review the result.

The theory of nudge was popularized by Richard Thaler and Cass Sunstein in their book Nudge: Improving Decisions about health, wealth and happiness. It has influenced American and British politicians. In their book they say:

"A nudge, as we will use the term, is any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not."

Above statement clearly shows that there is a difference between nudging certain behaviour and compelling a certain choice. For instance, a good nudge may consider being one which encourages a certain choice, but is transparent, which means that the choice architect should make the nudge clear and obvious. Choice should be retained with consumer who is able to make the final choice. A nudge should also have a good reason to believe that it is warranted, for example, strong health costs of smoking/eating too much sugar.

The study will look these two concepts together and will try to come up with a solution to overcome or at least reduce the negative effects of being in a social media Rat Race.

1.1 Problem Statement

Rat Race between young adults (aging from 18-25) on social media for followers, likes and comments might lead to trolling and negative comments which can increase depression rate. All these for worldly satisfaction which can disturb and might reduce the mental capability of a whole generation. Resulting in less productivity, inefficiencies and high cost of production which can eventually lead to supply side shock in an economy.

1.2 Research Question

To determine whether this Rat Race occurs in Lahore between the young adults (aging from 18-25) on social media for maximum number of followers, likes and comments, which increase trolling levels and eventually leads to attention-deficit hyperactivity disorder (ADHD) and depression. All this threatening the productivity and leading to inefficiencies, creating supply shock in an economy. We will conduct different experiments to provide those candidates with Nudges and determine how those Nudges affect their lifestyle. Does it help them with their depression and can reduce inefficiencies in an economy.

1.3 Research Objectives

i. To determine whether young adults in Lahore, using social media are in Rat Race
ii. To explain how this race leads to trolling and depression
iii. To determine that effect on generation and their mental health
iv. To check how it leads to economic disturbance through supply shock
v. To identify whether there is a solution to this problem through the methods of nudge theory
vi. To identity whether candidates can reduce their social media time 50% if these positive reinforcements are successful
vii. To check what are the benefits that the society face as a whole

2. Review of literature

2.1 Introduction

This literature study is an essential element in comprehending the complex connections between Rat Race, Nudging and Social Media activities. It examines the foundation of Nudging along with the consequences of using Social Media. Reviewing existing studies and evidence helps to provide an understanding of how Nudging can be leveraged to address the challenges posed by the relentless pursuit of social validation and engagement on social media.

2.2 Nudging

(Bar-Gill, 2022) says that even though the critical aspect of these nudge-type policy interventions (the mode of communication) remains unexplored, but these nudges are increasingly utilized by governments around the world to achieve policy goals related to health, safety, employment, environmental protection, retirement savings, debt, and more. (Pujara, 2022)Argue that the irrational or undesired behavior displayed by the people even in an informed public policy is a classic example of how real decisions are different from rational decisions. A method is used to see whether Indians invest or devise policy by carry out the marketing campaigns in such an effective manner, leading to help us bridge the gap of non-investment behavior.

(Sunstein, 2021) Explains their views on how Nudge has transformed the way individuals, companies and governments look at the world. The study shows that no choice is ever presented to us in a neutral way but by knowing how people think, we can make it easier for them to choose what is best for themselves, for their families and for society. By discussing how best to nudge us in the right directions, without ever restricting our freedom of choice.

(Sunstein C. R., 2017) Argue that, because of our human sensitiveness to an array of biases, we often make bad choices and decisions that make us poorer and more miserable than we might already be. However, insights from other disciplines, using behavioural economics suggest that apparently small and elusive solutions (nudges) can lead to mix and

unequal beneficial outcomes without unduly restricting our freedom of choice.

2.3 Social Media

Research shows that spending too much time on social media is linked with memory deficits, especially in your transitive memory. Transitive memory involves deciding what information is important enough to store in your brain and what information can be outsourced. (Fotuhi, 2020) says beyond lowering your ability to maintain your attention on any one selected topic, social media makes you addicted to your screens.

(Abbas, 2019) presents new empirical findings regarding social media usage, as social media has become a vital element of education, increasingly important in both course delivery and course assessments. These study findings revealed that social media has both positive and negative impacts on students' learning processes, and a balanced approach is recommended while using social media applications. (Andreassen, 2016) talks about how social media and video games are related to psychiatric disorders such as ADHD (attention-deficit hyperactivity disorder), OCD (obsessive-compulsive disorder) and depression. Being a female was significantly associated with addictive use of social media, whereas being male was significantly associated with addictive use of video gaming.

(Fozi, 2016) discusses how the availability of internet was made possible in 1992 which has developed several million users. The article explains different aspects of how internet has effect the country, for instance; the impact of social media on student's behavior in Pakistan and the impact of social media on democracy in Pakistan. The study claims that social media sites have been very critical in removing the geographical boundaries and provide a common platform all over the world. #

(Prabhakaroro, 2016) said that social media provides human not only an educative platform, but it also increases connections and communications and if used properly, also builds bridges over barriers and strengthens relationship. Negative correlates of social media include behavioral addition, the decrease in real life social community participation and academic achievement, as well as the relationship problems. Stalking and cyber bullying, identity theft, victimization to rumors, missing out

attitude, aggressive and callous behavior and host of other mental and social abnormalities are also the result of excessive use of social media.

(O'Keeffe, 2011) discussed that using social media sites is among the most common activity of today's children and young adults. Website that allows social interaction is considered a social media site, such as Facebook, MySpace, and Twitter; virtual words and gaming sites such as Club Penguin and Second Life; video sites such as YouTube; and blogs. These sites offer today's youth a portal for entertainment and communication and have grown rapidly in recent years.

2.4 Young Adults and Their Behavior

(Chiang, 2022) examines the relationship between experienced discrimination and emotional response, which is less pronounced among those who frequently observed discrimination in the media. Notably, subtle discrimination through personal experience or media exposure is positively associated with behavioral coping.

(Nichollas, 2022) examines the relationship between procrastination and grades, which turns out to be negative. To address procrastination, the first way is to communicate about social norms relating to submission times; and the second is the information nudge highlighting grade disadvantages of late submission. Disappointingly, neither nudge led to earlier average submission times which show that nudges might be less effective when trying to change habitual behaviors.

(Cho, 2020) conducts a survey of 842 adults and concluded that efforts to reduce stigmatization should address racial stereotypes and emotions, maladaptive coping, and biased media use by providing education and resources to the public. Fostering collective efficacy and media-based contacts with Asian Americans can facilitate these efforts.

2.5 Rat Race

(Ferreira, 2020) talks about how everyone wants to get of rat race. The study discusses what it is and why everyone wants to escape toxic working environment just for the sake of little amount of salary. Different ways are discussed, for instance giving yourself a reason why to quit, purchase essentials and acquire assets.

(Michael, 2019) explains 7 different strategies which help them to deal with Rat Race; the Status Quo Strategy, the Portfolio Income Strategy, the Passive Income Strategy, the Passion Income Strategy, the Windfall Strategy, the Sabbatical Strategy and the Gratitude Adjustment Strategy. These strategies give an idea how to overcome the problem of Rat Race.

3. Theoretical Framework

3.1 Rat Race of Social Media

In today's fast-paced world, social media has become the epitome of a rat race. Humans find themselves constantly chasing validation, recognition, and a sense of belonging within the virtual realms of platforms like Instagram, Facebook, and Twitter. It has become a never-ending race, fueled by the pursuit of likes, followers, and viral content. Each scroll and click is driven by the desire to keep up with the trends, to project an idealized version of one, and to stay relevant in the digital landscape.

The pressure to curate the perfect feed, gain popularity, and amass virtual acclaim has turned social media into a competitive arena, where individuals are constantly fighting for attention and comparison becomes the norm. In this relentless pursuit, authenticity often takes a backseat as people strive to present an exaggerated image of their lives. The race on social media is one that can leave individuals feeling inadequate, anxious, and disconnected from reality, as they become consumed by the need to outshine and outperform their peers.

An example of how this Social media Rat Race has affected young adults is when a viral video star, Larz, a 20 years old boy, on Dr. Phil show said that he does not talk to this family because ‘they are irrelevant’. He further added that:

“If they got followers or got rich I’d probably talk to them again… Now I have a career and I’m famous, like that’s what happens you get famous, you cut people off.”

Another case of this endless race is when a woman named Ayesha Akram, a tick-tock star is said to be allegedly assaulted by hundreds of men on Independence Day, in Lahore. However, an audio recording between Ayesha and suspect Amir aka Rambo has surfaced in which the police have discovered some mysterious elements. The police have reported to

the news outlet that they both were planning to take money from the suspects who have been arrested in the case. Minar-e-Pakistan incident is later on declared as deftly planned by Ayesha conniving with her friend in a bid to come under spotlight and gain empathy from the public. These are only two examples of how young generation in society has been using social media negatively and the government needs to take steps to reduce the social media Rat Race.

It is crucial to recognize the impact of this rat race and find a healthy balance between the virtual world and real-life experiences, where true connections and personal growth thrive beyond the confines of social media.

3.2 Someone Needs to Interfere

The false assumption is that almost all people, almost all the time, make choices that are in their best interest or at the very least better than the choices that would be made by someone else. (Thaler and sunstein)

Hence, our goal is to help people make the choices that they would have made if they paid full attention and possessed complete information, unlimited cognitive ability, and complete self-control. As long as these people, who are the Homo sapiens (Thaler), are not choosing rationally, some changes in the choice architecture could make their lives go better.

The concept of choice architecture is to simply provide Homo sapiens an organize context in which they can make decisions. For instance, if someone is a doctor and describes different treatments available to her patient, she is a choice architect. In this study, the author, as a choice architect, provide different ways in which young adults can spend their time rather than scrolling down the social media feed.

3.3. Interfering Through Nudge

Nudge theory is a concept that involves subtly influencing people's behavior and decision-making processes through indirect suggestions and positive reinforcement. While nudge theory can be a powerful tool for promoting positive behaviors, it is important to approach its implementation with caution and ethical considerations.

Interfering through nudge theory requires a delicate balance between respecting individual autonomy and promoting beneficial outcomes. The intention behind nudges should be to assist individuals in making informed choices that align with their own best interests and societal goals. It is essential to respect for personal autonomy in the design and implementation of nudges and prioritize transparency. People should be made aware of the nudges being employed and given the option to opt out if they choose to do so.

Ultimately, the application of nudge theory should be guided by ethical principles, promoting individual autonomy, transparency, and positive societal outcomes. It should serve as a tool to empower individuals rather than manipulate them, fostering a sense of choice and control in their decision-making processes.

The purpose of this study is to solely judge how simple types of incidents leads to depression, anxiety and AHAD problems among the young generation, how important it has become to address this problem and one of the ways in which it can be reduced is through the application of Nudge theory.

4. Research Methodology

The research will utilize a pre- and post-experiment questionnaire design to gather data from the participants before and after their engagement in the activities.

4.1. Participants

The study involves a total of 88 participants through random selection using WhatsApp text messages. The target group included young adults residing in various regions of Lahore, ensuring a mix of gender, age groups (within 18–25), educational levels, employment status, and social class. The participants are chosen from the target age group of 18 to 25 and must be active on social media platforms. 14 males are 18 to 19 years old, 18 of them are 20 to 21 years old, 17 of them are from 22 to 23 years old and rest of them are either 24 or 25 years old. Looking at females, 9 of them belongs to 22 to 23 years old, 4 of them are 24 to 25 years old and the rest 14 are equally divided between two groups of 18 to 19 and 20 to

21 years old. Prior consent and voluntary participation is obtained from all participants.

4.3. Procedure

1) Pre-Experiment Questionnaire: Before the experiment, participants will be administered a questionnaire to collect demographic information, their social media usage patterns, and their perceptions of the activities being investigated. This questionnaire will serve as a baseline measure of their attitudes and behaviors related to social media and activities.
2) Experiment: Participants are instructed to abstain from using their social media accounts during the experiment period, which consist of engaging in the various activities over a specified duration.
3) Post-Experiment Questionnaire: After the completion of the experiment, participants are given a second questionnaire to assess their experiences, attitudes, and levels of engagement in the activities after abstaining from social media. The questionnaire also explores their perceptions of social media abstinence and its impact on their overall well-being.

4.2. Data Analysis

In addition to the pre- and post-experiment questionnaires, the study uses bar graphs and pie charts to visually represent and evaluate the data responses obtained from the candidates. These visual representations along with the tables helps to analyze and present the findings, allowing for a clearer understanding of the patterns and trends observed in the data.

By employing bar graphs and pie charts, the study enhances the clarity and effectiveness of data presentation, enabling researchers and readers to quickly grasp the key findings and patterns within the collected data. With the help of tables, the interpretation and discussion of the results contributes to a comprehensive analysis of the impact of Rat Race on social media among young adults.

4.3. Ethical Considerations

Ethical guidelines regarding informed consent, participant anonymity, and data confidentiality is strictly followed throughout the study. Participants

are assured of their right to withdraw from the study at any time without consequences. The research adheres to all applicable regulations and ethical considerations. The questionnaire was reviewed by experts and a pilot test was conducted with 10 individuals outside the main sample to ensure clarity, relevance and consistency.

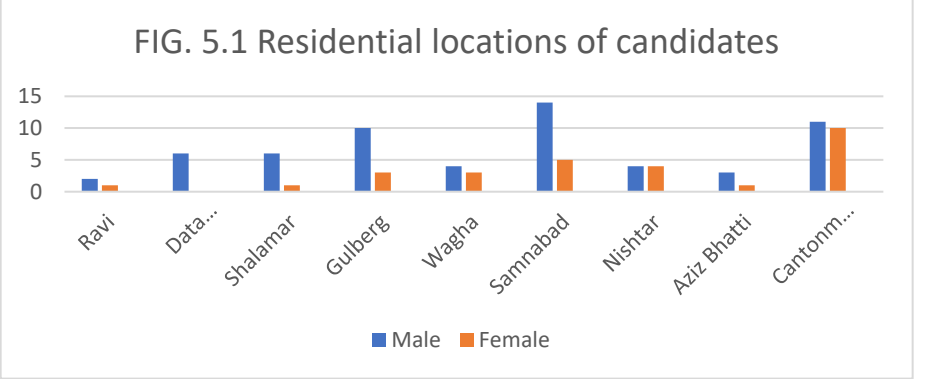
4.4. Limitations

The study acknowledges potential limitations, such as the self-reported nature of data, reliance on a specific age group, and the short-term nature of the experiment.

5. Results and Discussions

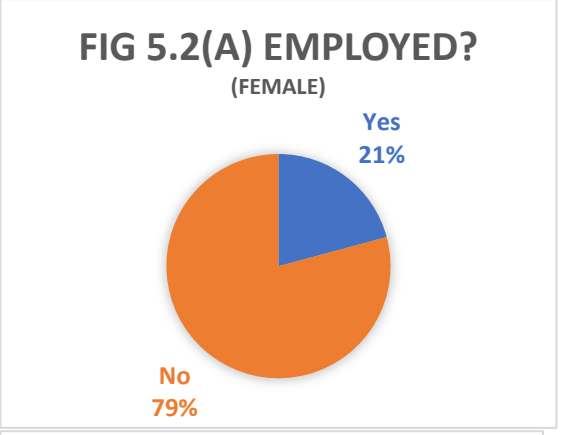
5.1 Pre- experiment questionnaire and discussion

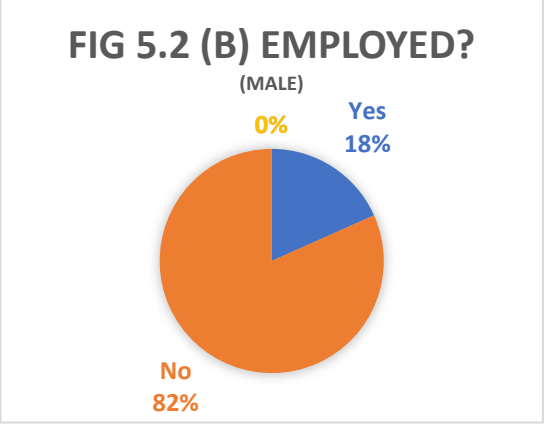
Lab in field experiments is conducted in which 88 young adults are asked a series of questions regarding their social media use. These candidates include females and males, 28 and 60 respectively. The sample is taken from different individuals, living in different area of Lahore. They are even categorized by different parameters such as age, residential location, social class groups, how many family members they have and whether they are employed or not. The purpose of introducing these parameters is to check whether they in any way differ the use of social media in the life of young adults. An unbiased sample is taken from within the residents of Lahore, living in different areas. These areas include Ravi, Data Gunj Buksh, Shalamar, Gulberg, Wagha, Samnabad, Nishtar, Aziz Bhatti and Cantonment. The results are shown below, in figure 5.1, of how many candidates belong to each area of Lahore.



Looking at the family size, total number of 59 candidates has 4 to 5 family members (in which 41 are male candidates and 18 are females). 15 of the males and 9 of the females have 2 to 3 family members, whereas only 4 males have and 1 female has 6 or more than those family members. The results show that almost all the candidates have small family with only 2 to 5 family members.

The next question is about whether these young adults are employed or not. This is one of the important questions as it helps to analyze whether there is any relation between being employed and time spent on social media. According to the questionnaire's result, 11 out of 60 males and 5 out 28 females are currently employed. And all of them are a part of educational institutes.



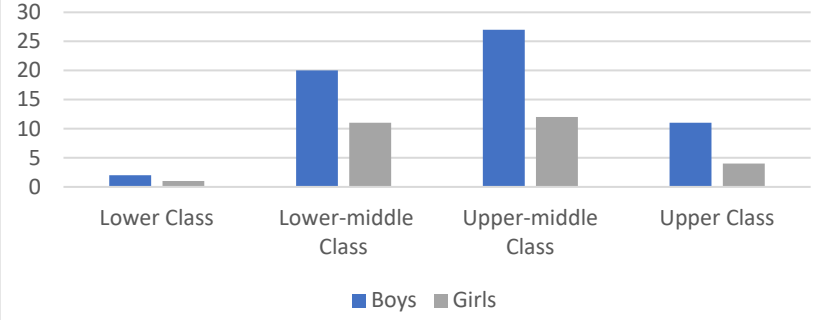


Majority of candidates (male and female) are not employed, however, all of them are a part of educational institutes. They are either part of under-graduate programs or post-graduate programs. The candidates who are a part of undergraduate programs include are 46 males and 22 females, in which only 3 males are and 1 female is employed. Under the post-graduate program, 8 males and 4 females are part of labor force out of 14 males and 6 females. The result implies that most of the employed young adults belong to post-graduate program and only total of 4 young adults are a part of under-graduate programs.

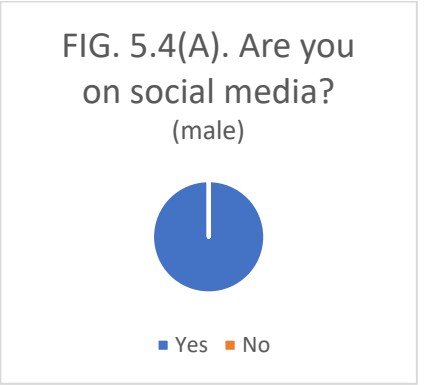
Candidates are also asked about which social class they belong to. The reason to include this parameter is also to analyze whether there is any difference in use of social media platforms due to difference in social class. The four types of social class include; lower class, lower-middle class, upper-middle class and upper class (also known as elite). Most of the young adults belong to Middle Class, which include lower-middle class and upper-middle class. In lower-middle class, there are 20 males and 11 females and in upper-middle class, there are total of 39 young adults (27 males and 12 girls).

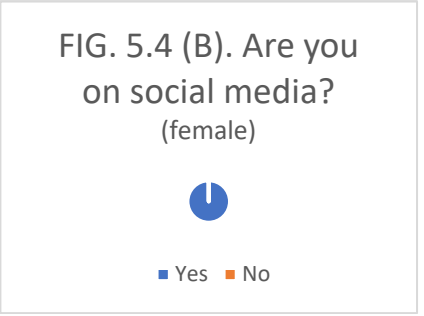
Whereas, the lower class of the economy consists of 2 males and 1 female and upper class has total of 15 young adults, 11 males and 4 females. The ratio of this social class represents that if a sample is taken from the population randomly, then majority of young adults in Lahore belong to the middle class of the social groups. Middle class is also known as working class. The data is represented in the figure 5.3.

FIG. 5.3. Social Class groups



Looking at the survey, all of these young adults whether graduate or post-graduate, employed or not, and part of any social group are on social media platforms. This simply explains that, in today's world, social media has become a part of every human being.





According to the results, presented in pie chat above (figure 5.3A and 5.3B), all of the sixty males and 28 females use social media platform. Indicating that social media has become a part of every individual in this world of globalization. In economics term, social media can be termed as 'bare necessity of life', meaning even though humans can live without it but, now, in today's world it has become a very important part of human life. But the real question is how much social media and whether its use is really worth it?

The first objective of this study is to determine whether Rat Race exists between young adults or not. To answer this, the first questionnaire asked all the 88 candidates how much time they spend on social media. These

results can be analyzed by comparing some of above mentioned parameter. For example; age, employed or not and social class groups.

The reason to analyze the data with these variables is to see whether there is any kind of pattern in the use of social media between ages, employment and social groups. Also, to estimate an average time use by different candidates.

5.2 Age and Time Spend on Social Media

First, let's look at different age groups between 18 to 25 years old and their time spend on social media platforms. The results can tell whether Race exists between all of these groups or some.

Table 5.1
HOW MUCH TIME DO THEY SPEND ON SOCIAL MEDIA?

	MALE				FEMALE				
AGE	0-2 HOURS	3-5 HOURS	6-8 HOURS	9 & MORE HOURS	0-2 HOURS	3-5 HOURS	6-8 HOURS	9 & MORE HOURS	
18-19	1	4	7	2	3	1	3	0	21
20-21	2	6	6	4	0	1	3	3	25
22-23	2	5	8	2	0	1	5	4	27
24-25	4	2	5	0	2	0	2	0	15
	9	17	26	8	5	3	13	7	
	60				28				88

The columns are first divided into parts 'female' and 'male' and then, into the average amount of time each individual has spent on social media (0-2, 3-5, 6-8 and 9 & more hours). The rows are divided into age groups from 18 to 25 years old.

The total numbers of candidates who use social media for only 0 to 2 hours are 14. This means that only 15.9% of the sample population uses these platforms for 0 to 2 hours. Looking at the details, in male category,

there are only 9 candidates. Age 24 to 25 have highest number of frequency (4 or 44.4%) for using social media for 0 to 2 hours, age 18 to 19 have only 1 (11.11%) frequency, while rest 4 (22.2% each) candidates are equally divided into 20 to 21 and 22 to 23 age group. On the other hand, female category has total of only 5 candidates who use social media for only 0 to 2 hours. 3 (60%) of them belong to 18 to 19 age group and rest 2 (40%) from 24 to 25.

Young adults who spend 3 to 5 hours on social media are 20 with a percentage of 22.7% from total 88 candidates. In male category, there are 17 candidates. Majority of them belong to 20 to 21 age group (6 or 35.3%), 5 of them from 22 to 23 ages, while 4 of them are either 18 or 19 years old and 2 are 24 or 25 years old. In female category, there are only 3 candidates who spend 3 to 5 hours on social media. There is first who belongs to 18 to 19 years old, second from 20 to 21 and third from 22 to 23, while there is no female candidate aging from 24 to 25 who use social media for 3 to 5 hours a day.

The 6 to 8 hours is the most common option selected by candidates participating in the experiment, 39. This means that 44.3% of the total population use social media applications for 6 to 8 hours. 26 males are divided into four groups; 8 in 22 to 23, 7 in 18 to 19, 6 in 20 to 21 and rest 5 in 24 to 25 age group. Whereas the female category has 13 candidates, 5 of them belong to 22 to 23 age group, 2 of them to 24 to 25 group and rest 6 are equally divided into 18 to 19 and 20 21 age group.
The rest 15 candidates claim that they use social media for more than 9 hours these include 8 males and 7 females. There is no young adult aging from 24 to 25 who claim that they use social media for 9 or more hours. 4 male aging from 20 to 21 and rest 4 are divided equally among 18 to 19 and 22 to 23 age group. In female category, there 3 females aging either 20 or 21 and 4 from age group 22 to 23. No female aging from 18 to 19 claims that they use social media for more than 9 hours.

By dividing these candidates into age groups and determining how much time each age group has spent on social media, examines that in case of both males and females age 22 to 23 has the highest ratio percentage of using social media for 6 to 8 hours which is most common option selected by candidates overall. According to the survey, it can be seen

young adults use social media platforms way too much. There are 24 hours in day and according to National Sleep Foundation guidelines healthy adults need between 7 and 9 hours of sleep per night. After which, these young adults have 15 to 17 hours per day. If 8 hours of that day is spending on social media, they are left with only 7 to 9 hours a day. What about other activities of life? School/University, hanging out with family and friends, eat or does office work.

22 and 23 is basically the only age you can use as leverage. Meaning that because it's the exact age between life-as-you-know-it and what will later be known as 'real life' (that's scientifically proven, of course), people expect you to make some mistakes. Mistakes like overcooking pot-roast or dating someone who may not be right for you. And that's okay, because you're just 22 or 23. But it is also said that the age 22 to 23 is very important time period of life, where individual's metabolism is probably at its peak. Having said that, they are also allowed to dream big without any inhibitions. Despite people saying that they can achieve anything at any age, the truth is adults simply cannot be career-selfish when they are married with three kids and own a dog and fish. The time is now. And if that time is now, then wasting time on social media is huge cost young individuals are paying.

5.3 Employment and Time Spend on Social Media

Secondly, let's look at whether being employed has any effect on spending time on social media or not. The table 5.2 is divided into males and females column and then further again into time each of them spend on social media. The rows answer the question of whether candidates are employed or not. The total sum is equal to 88 individuals.

TABLE 5.2
HOW MUCH TIME ON SOCIAL MEDIA

	MALE				FEMALE				
Employed?	0-2 HOURS	3-5 HOURS	6-8 HOURS	9 & MORE HOURS	0-2 HOURS	3-5 HOURS	6-8 HOURS	9 & MORE HOURS	
YES	6	4	0	0	5	1	0	0	16
NO	3	13	26	8	0	2	13	7	72

	9	17	26	8	5	3	13	7	
	60				28				88

Total of 16 candidates are employed out of 88 and rest 72 are unemployed. 6 females are employed in which 5 of them spend only 0-2 hours on social media and the 6th one claim that she spends 3 to 5 hours on average on these platforms. Considering the males, 6 of them spend time on social media for 0 to 2 hours, while the rest 4 claim those 3 to 5 hours.
Looking at the candidates who are not employed 22 females and 50 males. Only 3 unemployed males say that they spend only 0 to 2 hours on social media, 13 of them say they use it for 3 to 5 hours and 8 of them say they use it for more than 9 hours. However, majority of them with 26 candidates say that they spend 6 to 8 hours on social media, averagely. Females who are unemployed say that only 2 of them use social media for 3 to 5 hours while 7 of them spend more than 9 hours. Here, again majority female candidates spend 6 to 8 hours on average (13).

Hence, these results simply tell that young adults who are employed are less likely to spend more time on social media compared to those who are unemployed. Employed candidates are contributing towards the GDP (Gross Domestic Product) while the unemployed ones are just wasting their times on using these social media platforms.

The purpose of this study is not to make these young adults get a job, but rather to stop using too much social media so that they can focus more on their studies, physical and mental health. All these are important for their productivity level in future. A better skilled person who is physically and mentally stable can bring more benefit to the economy than a skilled person who is not physically and mentally stable.

5.4 Social Class Groups and Time Spend on Social Media

Thirdly, let's see if there is any pattern between different social class groups and their time spend on social media platforms. Social group's also known as socio-economic groups are divided according to their income and occupational levels. The class groups are divided into four sets; Lower Class, Lower-Middle Class (L-M Class), Upper-Middle Class

(U-M Class) and Upper Class (also known as elite Class). Candidates are simply asked which part of social class group they consider they belong to.

The results are shown in the Table 5.3

TABLE 5.3
HOW MUCH TIME DO THEY SPEND ON SOCIAL MEDIA?

	MALE				FEMALES				
Social group	0-2 HOURS	3-5 HOURS	6-8 HOURS	9 & MORE HOURS	0-2 HOURS	3-5 HOURS	6-8 HOURS	9 & MORE HOURS	
Lower Class	0	2	0	0	1	0	0	0	3
L-M Class	4	5	9	4	1	1	5	2	31
U-M Class	5	6	11	3	3	1	7	3	39
Upper Class	0	4	6	1	0	1	1	2	15
	9	17	26	8	5	3	13	7	
	60				28				88

Even though there are only 3 candidates who belong to Lower Class, the overall percentage tells that 2 of the boys spend 3 to 5 hours on social media while the girl only spend 0 to 2 hours on social media. Then, the Lower-Middle Class where the total number of candidate are 31 (22 males and 9 females). In which 4 males and 1 female use social media for only 0 to 2 hours, 5 males and 1 female use it for 3 to 5 hours, 9 males and 5 females use for 6 to 8 hours, while the rest 4 males and 2 females say that they use social media for 9 or more than 9 hours. The majority of candidates in Lower-middle Class use social media for 6 to 8 hours.

Upper-Middle Class also has their majority in 6 to 8 hours category with 11 males and 7 females. 7 out of total 39 candidates say they use social media for 3 to 5 hours, 8 (5 males and 3 females) say that they use it for 0 to 2 hours while the rest 6 say that they use these platforms for 9 or more than 9 hours. The Upper Class or the elite class with 10 males and 4 females has zero candidates who claim that they use this platform for 0 to 2 hours. 4 males and 1 female say that they use social media for 3 to 5 hours 1 male and 2 females claim that they use for 9 or more than 9 hours. The rest of the majority say that they use social media platforms for 6 to 8 hours per day on average, 7 candidates (6 males and 1 female).

Social groups of any society and economy have different characteristics. The purpose to include different socio-economic or social groups is that they often have certain factors in common that make them useful for market research and analysis. For instance, children of Upper-Middle or Elite class families are generally more likely to use social media more than children of Lower or Lower-Middle class. While this generalization does not mean that children of Lower or Lower-Middle class cannot or universally are not a part of social media Rat Race, this data may be used to help generate a better nudge in order to help more children from low-income families to quit the Rat Race, for instance, giving them a paid-job.

The reason to explain all three parameters in detail is to understand that majority of young adults belonging to different Class groups, age or whether employed or not use these social media platforms for 6 to 8 hours on average per day. Hence, it is safe to say that there is social media Rat Race between young adults (aging from 18 to 25), living in Lahore.

5.5. Why do we need to interfere?

The fast-paced and competitive nature of social media platforms can contribute to the phenomenon often referred to as the "social media rat race." This refers to the constant pursuit of attention, validation, and comparison with others, which can lead to negative effects on mental health and potential economic disturbances. Second, third and fourth objective of this study is how this race leads to trolling and depression, effect on generation and their mental health and how it leads to economic disturbance through supply shock.

The first questionnaire also asked few question to these candidates about the overall use of social media, how they feel about using it and what are

the reasons behind the use these platforms and much more. Tables 6.1 and 6.2 show the result of 88 candidates (60 males and 28 females). Table 5.4 examines the use of social media, how much they use social media and whether the reason for the use is likes, comments, followers, education or entertainment. Table 6.2 examines how these candidates feel about using social media by giving them few scenarios and determining how this leads to depression, attention-deficit hyperactivity disorder (ADHD) and further to, supply-side shock for the economy.

SAGE OF SOCIAL MEDIA PLATFROMS					
TABLE 5.4	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
Do you think that you use social media way too much?	3	12	24	43	6
Do you think that your friends use social media way too much?	12	20	38	10	8
Are you on social media because of peer pressure?	0	1	8	44	35
Are you on social media for likes?	3	3	27	23	32
Are you on social media for comments?	2	1	28	24	33
Are you on social media for followers?	3	2	27	23	34
Are you on social media for educational purposes?	0	6	14	50	18
Are you on social media for entertainment?	29	26	20	13	0
Do you think most of the things on social media are	5	12	30	16	25

useful?					
Do you post regularly?	27	33	20	7	1

Looking at the table 5.4, it can be easily be examined that young adults use social media for 6 to 8 hours, on average, does not agree to the fact that the time spend on it is way too much. For instance, when asked do they use social media way too much. Only 15 young adults agreed to it, rest 73 were either neutral or they disagree to this. This is one of the reasons that steps need to be taken for the future of an economy as the young adults are not going to realize the problem by themselves. The purpose of the using social media is entertainment. Majority of them (55) either strongly agreed or agreed to this reason while the rest 20 are neutral and 13 disagreed. They also agreed to the fact that they post on daily basis, 60 of them either strongly agreed or agreed to this, while 20 were neutral and only 7 of them disagreed to this.

EMOTIONAL WELL-BEING REALTED TO SOCIAL MEDIA					
TABLE 5.5	ALWAYS TRUE	OFTEN TRUE	SOMETIMES TRUE	RARELY TRUE	NEVER TRUE
Do you think social media provides with worldly satisfaction?	10	7	16	34	21
Do you feel sad if **NO ONE** likes your post?	57	21	9	0	1
Do you feel sad if **NO ONE** comments on your post?	45	25	11	5	2
Do you feel sad if **NO ONE** replies to your story?	53	30	3	1	1
Do you feel happy or satisfied if your favourite person likes your post?	67	17	3	1	0
Do you feel happy or satisfied if your favourite person comments on your post?	59	20	4	5	0
Do you feel happy or satisfied if your	66	18	3	1	0

favourite person replies to your story?					
Do you take special photos to specifically post on social media?	49	21	17	1	0
Do you take photos of your food to post on social media?	37	31	15	4	1
Do you feel disappointed or angry if you see something bad on social media?	34	20	30	3	1
Does that affect your other activities?	12	21	43	10	2
Do you fight with your family and friends if something unpleasant happens on social media?	5	10	45	24	6
Do you think social media increases your anxiety level?	11	15	32	19	11
Do you feel social media contributes to your depression level?	6	11	34	27	10
Do you think social media might be the reason that decreases your attention span?	3	4	20	32	29

The real problem arises when most of these young adults say that they do not use social media for likes, comments and followers. However, when asked about how they feel at the time when no one likes and comments on their posts, and reply to their story majority of them said they feel sad always. They even feel happy and satisfied if their favorite person likes comments on or reply to their stories. Clearly, if one's favorite might not simply like their posts, they might feel sad or depressed about it.

This all can lead to an increase in one's anxiety level and attention-deficit hyperactivity disorder (ADHD). For example, a person is asked about how much time his friend takes to reply on What'sApp (one of the social media apps) and what does he do during that waiting period. He said around 5 to 10 minutes most of the times, however, the waiting period varies up to 1 or 2 hours and during that period, keeps his phone right in

front so that he can quickly reply when notification pops up. This example simply tells that how much time is wasted on social media waiting for people to reply and even if, one performs another task his mind is diverted, continuously checking his social media accounts to check whether he got a reply, like, comment or not. This can simply lead to the problem depression, worsening of mental health contributing to economic disturbance and supply shock. Following are the three main points which can be concluded and give us the answer to 'Why we need to interfere?'

5.6. Trolling and Depression

The competitive environment on social media, coupled with anonymity and the ability to engage with others from a distance, can encourage trolling behaviour. Trolling involves deliberately provoking or harassing others online, often for personal amusement or to gain attention. This behaviour can lead to feelings of distress, anxiety, and depression for those who are targeted by trolls. Additionally, the pressure to maintain a curate and perfect online persona can contribute to mental health issues such as low self-esteem, body image concerns, and a constant fear of missing out (FOMO).

5.7. Generational Effects and Mental Health

The impact of the social media Rat Race on mental health can be particularly significant for younger generations who have grown up in a highly connected digital world. The constant exposure to idealized versions of others' lives on social media platforms can create feelings of inadequacy, loneliness, and anxiety. These pressures and comparisons may contribute to an increase in mental health issues such as depression, anxiety disorders, and a decline in overall well-being. All of these contributing to economic disturbance.

5.8. Economic Disturbance and Supply Shock

The social media rat race can also have economic implications through potential supply shock. When individuals excessively invest their time and attention in social media, it can lead to reduced productivity, decreased focus on work or studies, and disrupted personal relationships. Furthermore, the influence of social media influencers and the monetization of online platforms can perpetuate a culture of materialism and consumerism, leading to unsustainable consumption patterns and economic imbalances.

Young adults of an economy are the most important and most affected stakeholders when talking about not only economy's future but also the global future. There are more young people in the world than ever before and they are critical members of the global society bringing ideas, innovations and movements. They are also on the frontlines of other major economic transformations across the global economy. Instead of driving ideas, they are scrolling down their Instagram feed and sending snaps of their food on Snap Chat. If they waste their times on social media platforms, worrying about the quantity of likes, comments and followers can that help an economy? No, however, it can simply put economy's business cycle on downward slope because they are not being productive.

An example of Pakistan where 64% of the population are young adults, cannot afford overuse of social media platforms, especially in this time period. The year 2023 is the time to act as the biggest question right now for Pakistan is whether they are going default or not. The people who can save it are these young adults through their ideas and innovations, however, if they spend daily average of 6 to 8 hours on social media how can Pakistan overcome its financial crises.

Addressing the negative effects of the social media rat race requires a multi-faceted approach. It involves promoting digital literacy and responsible social media usage, fostering open conversations about mental health and well-being, and cultivating resilience and self-worth beyond social media metrics. Creating supportive online communities, promoting empathy and kindness, and encouraging healthy boundaries can also contribute to a more positive online environment. From an economic perspective, it is important to promote sustainable consumption, ethical practices in influencer marketing, and regulations that protect individuals from online harassment and trolling.

Hence, there is a need to solve this problem. One of the ways is through the application of Nudge theory.

5.9. Interfering and results

As already discussed, Nudge theory is basically a method in which through positive reinforcement and indirect suggestions are we can change human behavior. We need to first define the outcome, identify the obstacles and consider the individuals affected by it then by removing the obstacles; we introduce new ways or brainstorm the nudges and then review the result. The study has already identified the obstacles, which is the overuse of social media by the young adults and how it has affected their lifestyle. The new ways in which this problem can be reduced are discussed below.

To apply this method, different activities are held to judge behaviour of these young adults. 5 different activities are given to them and each candidate is allowed to freely choose whatever activity they want to do. These activities include; Cricket match, hanging out at café with friends, movie, community work (cleaning out a local park) and field trip.

The following are the protocols of the experiments:

1) Candidates are given the opportunity of choosing their own activity.
2) During the experiment, they are told to behave normally and enjoy the activity without any kind of restriction.
3) They are observed by the experimenter in all 5 activities.
4) At the end of the experiment, they are given a questionnaire to record their experience.

Let's look at all these 5 different experiment one by one and check whether they work as a nudge for young adults (ranging from 18 to 25 years old) living in Lahore. Even though these experiments do not contribute to GDP of the economy in monetary terms, they are going to work as a tool for mental and physical stability of these candidates and further, due to multiplier effect, for the whole economy.

5.10. Cricket match

Cricket is one of the most popular sports worldwide and is also widely played in Pakistan. The reason to include this game as an experiment in

this study is that Pakistani children start playing this sport at a very young age. However, with changing times and social media this physical game has shifted from ground to phones (online gaming) for many young adults.

Online gaming has many similarities to social media as it is just a newer platform that has garnered huge engagement over the last few years. It has increased by 33 percent over the last three years. Standard social media platforms like Face book, Instagram, Snapchat, and Twitter allow for the same ways of networking. Online gaming has grown so much over the past few years that these bigger standard social media companies are taking notice and making moves. For example, Facebook (in 2020) came out with a gaming app designed to allow players to create and watch live game play.

23 males are divided into 2 teams of 11 candidates per team and 1 empire for the game. The experiment is held at Government College University Lahore's cricket ground. On Tuesday 29th November 2022, at 8:30 all 23 young male adults play the match. Their behavior throughout the activity is recorded and after the activity they are asked to fill out another questionnaire in which they are asked about how they feel about this activity and their use of social media. The table 7.1 below summarizes their responses.

TABLE 5.6 RESPONSE TO CRICKET MATCH	YES	NOT THAT MUCH	NO
Did you use social media during the activity?	0	2	21
Was it better than spending time on social media?	20	2	0
Will you be willing to do it again?	23	0	0
Was it fun/ refreshing/ relaxing?	23	0	0
Can you decrease time spend on social media if more activities like these are provided?	22	1	0
Do you think more activities like these will help you with physical and mental stability?	22	1	0

The results from this laboratory experiment clearly shows that almost all candidates do not use social media throughout the game. Majority of them also think it is better than being on social media and all of them are

willing to play again. They find it refreshing, fun, relaxing and also believe that they can reduce their time that is spending on social media.

Even though this activity does not provide a monetary gain to the economy. It can be seen that the purpose of this study is to help young adults to leave the fierce trap of social media so that they can have better mental and physical stability to improve their productivity level and maybe learn a skill. For instance, if anyone is interested in choosing cricket as a profession, these activities might provide an opportunity for them to not only practice but also a way to get discovered by national level coaches which in future can help gain in monetary terms as well.

5.11. Hanging out at café with friends

The purpose of this experiment is to simply judge whether a gathering of friends can help to nudge a way for young adults to overcome this Rat Race. The experimenter, texted her friends from Alevels to plan a meeting at Tim Hortons on the very first day of its opening, Saturday 11th February 2023. To her surprise all of her group including 9 females and 11 males (total of 20 young adults) agreed to meet.
The candidates meet outside the Café which is located in phase 6, and the gathering ended up for almost 4 hours 30 minutes. The wait in line, getting donuts, coffee and juices and sitting with friends while talking about their lives and career choices is something which is very simple. The experimenter observed that almost all of her friends avoided using social media while sitting in gathering of friends. The table 5.7 summarizes their responses.

TABLE 5.7 RESPONSE TO HANGING OUT WITH FRIENDS AT CAFÉ	YES	NOT THAT MUCH	NO
Did you use social media during the activity?	3	9	8
Was it better than spending time on social media?	12	8	0
Will you be willing to do it again?	19	1	0
Was it fun/ refreshing/ relaxing?	20	0	0
Can you decrease time spend on social media if more activities like these are provided?	19	1	0
Do you think more activities like these will help you with physical and mental stability?	18	2	0

The results are in favor of the hypothesis, they are willing to reduce their social media time and quit this endless social media Rat Race. This sample includes Lower-Middle Class (2 females and 4 males), Upper-Middle Class (6 females and 7 males) and Elite Class (1 female). The fact they paid for their food items just simply tells that young adults need places and platforms so that they can overcome Rat Race of social media. They just need a little nudge. For instance, a simple discount deal at their favorite café or restaurant can help them to come out of their beds and leave social media.

5.12. Movie

On Tuesday 8th November 2022, the department of economics held a movie day for semester 1 (Batch of 2022). The candidates involve total of 6 females and 14 males. This experiment involves all four social groups Lower Class (2 males and 1 female), Lower-Middle Class (3 females and 6 males), Upper-Middle Class (2 females and 5 males) and Elite Class (1 male). Before starting the movie (lights out), they are asked to fill the first questionnaire to gather some information and those results are summarized before together with all other 88 candidates. After the movie, they are asked to fill out the second questionnaire and results are shown in table 5.8.

TABLE 5.8 RESPONSE TO THE MOVIE	YES	NOT THAT MUCH	NO
Did you use social media during the activity?	5	11	4
Was it better than spending time on social media?	7	11	2
Will you be willing to do it again?	10	7	3
Was it fun/ refreshing/ relaxing?	10	9	1
Can you decrease time spend on social media if more activities like these are provided?	4	15	1
Do you think more activities like these will help you with physical and mental stability?	4	13	3

The results of movie experiment are not as promising as the others. However, that also depends on preferences of young adults. For example, one of the candidates, while giving back the survey form said that he does not really like horror movies but a comedy movie can develop his interest and help him reduce more time.

5.13. Community work (collecting and distributing food and clothes in village)

The reason to include this activity is to check whether these young adults can work for the betterment of the society without any personal gains, in terms of monetary and otherwise. There are many benefits of community work as it teaches them about social responsibility, develop leadership skills and helps with self-discovery by bringing people together and learn about multiculturalism and diversity.
10 out of 88 candidates (3 females and 7 males) chose the community work experiment. All 10 of them are asked to bring some clothes and food items to donate. On Monday 23rd January 2023, at 10 am all these candidates gathered around Paragon city and went together to donate food and clothing items at village near Burki road, Pularvan.
Their behavior throughout the activity is recorded and after the activity they are asked to fill out another questionnaire just like in other activities. The table 5.9 summarizes their responses.

TABLE 5.9 RESPONSE TO THE COMMUNITY WORK	YES	NOT THAT MUCH	NO
Did you use social media during the activity?	1	5	4
Was it better than spending time on social media?	6	4	0
Will you be willing to do it again?	7	3	0
Was it fun/ refreshing/ relaxing?	7	3	0
Can you decrease time spend on social media if more activities like these are provided?	6	3	1
Do you think more activities like these will help you with physical and mental stability?	8	2	0

The fact that they all belong to elite Class group makes it more interesting. The assumption that is usually taken for young adults belonging to elite class is that they arrogant and selfish and the reason that this experiment's sample include only them is to analyze can they do come out of their social media Rat Race and provide something for the community and the economy without any self-gain or benefit.
The result shows that majority of these candidates are willing to this activity again and they do believe that this can help them with physical

and mental stability. Even though majority of these candidates use social media during the experiment, they claim "not that much". This indicates that through these activities the use of social media can be reduced and the youth can help to change the economy by being more productive and active physically. For instance, these exchanges promote a sense of trust and cooperation that strengthens our ties to others—and research has shown that having positive social interactions is central to good mental and physical health.

5.14. Field trip

Field trips as adults, that would more than likely be a meaningful trip for them and one they would remember (personal communication, April 30, 2014). Young adults that take trips to new environments can be positively impacted as it can be very important in exposing themselves to new situations and helping them to grow beyond what they would in the typical confines of the classroom.

On Saturday 7th February 2023, the experimenter arranged a field trip for her 15 university friends (10 females and 5 males). Before leaving, they filled out the first questionnaire. The trip involves the tour of open bus inside the old Lahore. This bus tour starts from Gaddafi Stadium and takes the candidates through the city. It stops at Greater Iqbal Park for 2 Hours. From here the candidates along with the experimenter takes a ride to Badshahi Mosque and Minar e Pakistan. After the experiment, these 15 young adults belonging to Lower-Middle Class and Upper- Middle Class are asked to fill out the second questionnaire. The table 5.10 summarizes their responses.

TABLE 5.10 RESPONSE TO THE FIELD TRIP	YES	NOT THAT MUCH	NO
Did you use social media during the activity?	0	14	1
Was it better than spending time on social media?	15	0	0
Will you be willing to do it again?	15	0	0
Was it fun/ refreshing/ relaxing?	15	0	0
Can you decrease time spend on social media if more activities like these are provided?	14	1	0
Do you think more activities like these will help you with physical and mental stability?	12	3	0

Results clearly show that taking young adults on a field trip is a success. Even though, all of them said that they do not use that much social media during the activity, all of them think it is better than spending time on social media. This gives a positive hope as they are willing to do this instead of sitting inside their bedroom scrolling down their social media feeds.

All the above experiments are laboratory experiments. The main purpose of all these experiments are to provide an alternative for young adults so that they can reduce the time spend on social media, quit the cutthroat Rat Race and actually do something which can help them with physical and mental stability and benefit the overall economy.

6. Conclusion and recommendations

The study looks at the problem of Rat Race through an example of social media, how alarming it is for young adults and how it affects an economy. It examines how this Rat Race of social media for likes, comments and followers are built in our minds and without realizing we use social media way too much than it is required, leading to supply-side shock. Hence, there is a need to intervene and suggest some measures to change the behaviors of the people.

The first questionnaire results show how important it has become to intervene in this fierce Rat Race of social media and through the application of Nudge theory it can be reduced. The hypothesis does not require young adults to stop using social media but rather reduce the time spend on it. The majority of young adults spend 6 to 8 hours on social media on average, daily. Belonging to any social group, age or employed or not, they use social media way too much than it is required which is harmful for their own health. This health in return can hinder the growth of an economy through supply-side shock.

By conducting these laboratory experiments and questionnaire provided at the end of each experiment, it can be clearly seen that providing little Nudges by government can help to build up a more productive labor force. As they can be more physically and mentally strong if they are

provided with little things or nudges. It can help economy to increase its GDP, generating more employment and demand in the economy. This is why it is important to address this problem as soon as possible especially in an economy like Pakistan where the majority of the population are young adults.

Pakistan is a developing country that faces a multitude of challenges that have hindered its economic growth. One of the biggest issues that Pakistan faces is its demographic structure. Approximately 64% of Pakistan's population is below the age of 30, which presents both opportunities and challenges for the country's economic development. To fully utilize this demographic dividend, it is crucial to introduce new activities for the young generation of Pakistan that can help improve the economy.

Introduce public or private discount campaigns, loyalty rewards, or digital detox days encouraging youth to spend time away from social media. Government can use environmental cues (e.g., posters, friendly reminders, alternative activities) to nudge students toward healthier lifestyle choices. Partnering with local organizations to create youth service platforms that reward participation and develop soft skills that contribute to future employability. Recognize social media addiction as a real and growing challenge in policy documents. Fund more behavioral research to explore scalable nudges for national implementation.

Introducing new activities as small nudges for the young generation can provide a significant boost to Pakistan's economy in multiple ways. Government and NGOs can include structured group activities (sports leagues, field trips, and creative clubs) in school/university programs to promote real-life engagement. Firstly, it can help in creating more job opportunities. The introduction of new activities will lead to the creation of new businesses, which will require more employees. The development of various sectors such as tourism, sports, entertainment, and technology can provide a wide range of job opportunities. This will not only help in reducing unemployment but also increase disposable income, which ultimately boosts the economy.

Secondly, the introduction of nudges can foster innovation and creativity. Young people are known for their innovation and creativity, and allowing

them to explore their interests and talents can lead to the development of new products, services, and technologies. Innovation is essential for any economy to grow and by promoting innovation; Pakistan can create a niche for itself in the global market.
Thirdly, new activities can contribute to the overall development of the country. For instance, the development of the tourism sector can put Pakistan on the global map, attract foreign investment, and create a positive image of the country. Similarly, the development of technology can lead to the modernization of the country's infrastructure, making it more efficient and effective.

Lastly, providing little nudges to introduce new activities for the young generation can also lead to cultural and social development. These activities can provide a platform for young people to work together, learn from each other, and build stronger bonds within their communities. This can lead to better social cohesion, increased community engagement, and ultimately a better quality of life for the people.

This study confirms the existence of a social media Rat Race among young adults in Lahore and demonstrates that Nudge Theory can effectively reduce screen time and improve well-being. The application of simple nudges like outdoor sports, group outings, or community service proved to be low-cost, high-impact interventions. The research found that social media is used excessively for entertainment and validation, leading to a strong emotional response to digital engagement. Participants were willing to substitute screen time with meaningful offline activities.

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Determinants of Female Labor-Force Participation in Pakistan: An Empirical Analysis of the Labor Force Survey 2020-21

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Abstract: Pakistan, with a female labor force of more than 100 million, ranks among countries with the lowest female labor force participation rates, hindering economic growth and limiting the potential of female workforce. Women's participation in the labor market contributes to the country's economic progress and empowers them to make decisions and access resources, raising their living standards and leading to socioeconomic development. This study analyzes the dynamics of female labor force participation in Pakistan. It examines individual, household and economic factors including female education level and technical training, level of income of females, marital status, provincial status, locality, presence of children, income of household members other than females, average paid income of female labor force, household head employment status and education level, responsible for low female labor force participation. The study contributes to the literature by investigating evolving female labor force participation trends using recently available and nationally representative Labor Force Survey of Pakistan 2020-21. The study identifies challenges females currently face in the labor market. The study's findings help formulate targeted policies for improving female labor force participation, which in turn reduces gender disparities, empowers women, and foster inclusive economic growth in Pakistan.

Keywords: Female Labor Force Participation, Education Level, Technical Training, Level of Income, Household Factors

1. Introduction

Women make up approximately half of the total population of Pakistan, yet this portion does not constitute a significant labor force. According to the Labor Force Survey (LFS) 2020-21, only 22% of women actively participated in the labor force compared to men with an active share of 67.7%. This obvious disparity undermines the nation's economic potential

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and suppresses opportunities for women to contribute to development and progress. When women participate actively in the labor market, they raise entire families through improved income, greater access to resources, and upgraded living standards, resulting in sustainable socioeconomic development. Increased women's participation in the labor market signifies economic and social development and women's empowerment (Mujahid 2014). Therefore, Pakistan's untapped female workforce represents not just a challenge but an enormous opportunity for transformation. By minimizing the gender gap in labor force participation, Pakistan can achieve inclusive economic growth and prosperity.

The female labor force participation rate in Pakistan is very low compared to neighboring nations like India (36.4%), Bangladesh (60.2%), China (77.8%), and Nepal (66.15%) [World Bank, 2020]. Female labor market dynamics are more complex and depend on various personal, household, and economic factors. The regional split between urban and rural areas has greatly affected female labor force participation. Formal employment options are more accessible to urban women, but these opportunities require higher education and technical and professional skills. Rural women, on the other hand, frequently work in the informal economy and in agriculture, where earnings are typically lower (World Bank, 2019). Pakistan's high fertility rate, with 3.6 children per woman, causes women to be excluded from the labor force, as reported in the Labor Force Survey 2020-21 and the Pakistan Demographic and Health Survey 2017- 18. Higher levels of education and technical and professional training are critical in shaping female labor market dynamics in Pakistan (Serrat, Park et al. 2016). Higher education and technical and professional training provide work opportunities and empower individuals economically.

Few studies based on microdata sets have been conducted to analyze factors responsible for low female labor force participation in Pakistan. To our knowledge, existing studies didn’t highlight the role of technical education in female labor market dynamics. Technical education/skills are among crucial factors that provide work opportunities and make them more productive. Current study contributes to literature by considering crucial factors that shape female labor market dynamics, including levels of education of females (primary, middle, matric, intermediate, bachelor, master, and higher), their marital status, income of household other than females, provincial status, locality, presence of children up to age of 3

years and presence of children within the age brackets of 3 to 15 years, household head education, household head employment status, paid income of females and technical education. The study highlights the role of technical and professional training, such as auto or engine mechanics, carpentry, typing, computer, tailoring, etc. This study uses the nationally representative, recently available Labor Force Survey of Pakistan 2020-21. By identifying barriers to participation and highlighting the challenges women face in entering and staying in the labor market, this research provides valuable insights into the dynamics of female labor force participation. The study is aligned with several Sustainable Development Goals (SDGs). It supports SDG 5 (Gender Equality) by identifying the barriers and highlighting the challenges to women's participation in the labor market. The study also analyzes the role of skill development/technical education and wage incentives in female labor force participation decision which supports SDG 8 (Decent work and economic growth). The study also contributes to SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities) through insights into how females' participation in labor market contributes to welfare of their families and reduces income inequalities. SDG 4 (Quality education) is also addressed in this study by analyzing how levels of education and technical training matters for increasing females labor market participation.

1.2. Significance of the study

With more than half of total population, females' participation in labor market has very important role in the country's socio-economic development and achieving SDGs. Higher female labor participation ultimately raises living standards of their families and contributes significantly to country's socio-economic development. Females' decisions to participate in labor market do not depend solely on their own choice but also depends heavily on household factors and economic factors. The study examines the impact of personal, household and economic factors that affect females market choices using recent available labor force survey data of Pakistan. The significance of this study is highlighted in its ability to inform evidence-based policy-making. Addressing the root causes of low female labor market participation will not only reduce gender disparities but also empower women as agents of

change, unlocking their potential to drive Pakistan's economic and social progress. This is more than research—it is a call to action for building an equitable, inclusive, and prosperous future for all.

2. Literature Review

Various empirical studies on female labor force participation in Pakistan have been conducted. Some studies examine the macroeconomic determinants of female labor force participation rate and found that female population, female workers ratio, female-headed households, and female literacy rate have positive and significant effects on female Labor Force Participation while fertility rate and low child mortality rate decrease female labor market participation (Naheed, Waseem et al. 2024). Studies based on primary survey data found that females in urban areas have more opportunities to work than in rural areas. Increasing female education contributes positively to higher female labor force participation (Shah, Riaz et al. 2021). Studies based on microdata sets focused on Pakistan Social and Living Standards Measurement (PSLM) and labor force surveys of Pakistan. This study contributes to the literature by conducting an in-depth analysis of all possible personal, economic, and household factors that can affect female labor force dynamics in Pakistan using the Labor Force Survey of Pakistan 2020-21. Empirical studies on female labor force participation in Pakistan are summarized in [Table 1].

Table 1: Review of Selected Studies

Author(s) & Year	Variables	Data	Results
He and Iftikhar (2025)	Female labor force participation, primary, secondary, and tertiary levels of education, nature of women's work, income, mobility, location, household size, and childcare	Cross-sectional data of the Labor Force Survey of Pakistan 2017-18	• Females have 33.4% lower probability of participating in the labor market as compared to males. • As age increases, the likelihood of participating in the labor market declines. • There is a correlation between education, type of contract, income, childcare, and mobility, indicating that the more educated a woman is, the

			more likely she is to be employed under regular contracts.
Naheed et al. (2024)	Female population, female workers ratio, female-headed households, and female literacy rate	Time series data from the World Bank and WDI	Female population, female workers ratio, female-headed households, and female literacy rate have a positive and significant effect on female labor force participation, while fertility rate and low child mortality rate decrease female labor market participation.
Shair, Arshad et al. (2024)	Labor force, Province, Education, Marital Status, Job training	Pakistan Labor Force Survey 2020-2021	The logistic regression findings highlight provincial disparities. Females in urban areas have fewer chances to work than rural women.
Amber and Chichaibelu (2023)	Female labor force participation, location, education level and marital status	Panel data taken from labor force surveys (1990–2017)	• The increasing proportion of working-age women in the population does not explain the changes in overall labor force participation rates. • The age–period–cohort analysis shows that for cohorts born since the 1900s, urban women exhibit a slight M-shaped pattern in labor force participation across age, reflecting reduced participation during child-rearing years. Cohort effects indicate a rise in labor force participation among women born after the 1950s.
Khan (2022)	Female labor market participation, household	Fieldwork involving interviews was	• The findings reveal significant variation in women's workforce

	responsibilities, levels of education and skills and working environment	conducted over several weeks between May and August 2020	participation. • Married women are generally less involved in paid employment due to household duties and childcare responsibilities. • Higher levels of education and schooling are positively associated with increased female labor force participation. • The study also examines how family social status, financial income, and personal characteristics influence women's employment decisions.
Shah, Riaz et al. (2021)	Respondents' age, labor force participation, education level of the respondent, and household head	Primary data collected from 200 females	• Female labor force participation increases due to an increase in age of respondents, their education, and the education level of the household head. • Females in urban areas have more job and education opportunities and have better infrastructure facilities.
Junaid, Farwa et al. (2021)	Female participation, marital status, percentage of total employees by gender, education status, distribution of average monthly payment by gender	Data taken from PSLM (2018-19)	The policy brief identifies four key factors contributing to the decline in female labor force participation in Punjab: weak authorization for women to work outside the home, reluctance to seek employment, a lack of suitable job opportunities for women, and their involvement in household

			responsibilities.
Shah and Riaz (2020)	Female labor force participation, female's education, age, husband's education level and salary, household size, female's marital status, No. of children and access to credit	Primary data of 350 females collected through a field survey for the year 2020	• Educational attainment, women's age, husband's education, marital status, and access to credit significantly influence female work participation in the Multan division. • The study recommends that the government design an effective policy framework to encourage women's participation in the labor force. • Additionally, providing short-term loans can support women in engaging in various economic activities, such as small business enterprises.
Mehak Ijaz (2010)	Female labor force participation, education level, technical training, level of income, household factors	PSLM 2006-07	• Higher fertility rates, marital status, and a significant gender wage gap negatively affect female labor force participation. • Higher education and access to home appliances increase their chances of working.
Faridi, Zahir, Chaudhry, Sharif, & Anwar (2009)	Levels of education, Household income, family dependents, marital Status, presence of children	Cross-sectional data collected through a field survey	• Levels of education are significant determinants of female labor force participation. Their participation in the labor market increases with increasing levels of education.
Fatima& Sultana (2009)	Female education attainment, sectoral employment share,	LFS (Labor Force Surveys) and HIES	• The study confirms a U-shaped relationship between female labor force

	unemployment rate, wages and marital status.	(Household Integrated Economic Surveys) of 1992-1993, 1996-1997, and 2001-2002.	participation (FLP) and economic development. FLP initially reduces with economic growth but increases with more economic development. • The U-shaped relationship between FLP and economic development can be due to educational attainment, marital status, unemployment rate, and wages.

3. Objectives of the study

- Analyze trends in females' labor force participation in Pakistan.
- Empirically examine the impact of individual, household, and economic factors on female labor force participation in Pakistan.

4. Theoretical Framework

Various labor supply theories have been evolved, highlighting factors that can significantly affect labor force participation decisions. According to the neoclassical labor supply model, labor market participation is independent; everyone chooses between work and leisure. When wages increase, people prefer work over leisure, and after a certain point, the opportunity cost of work increases, which decreases working hours. (Lundberg and Pollak 1996) found that the traditional neoclassical labor supply model does not consider the preferences of married females when deciding to work. (Schultz 1961) found that there is a U-shaped relationship between levels of education and work. More people prefer to work when they have no education or a very low level of education. When people's level of education increases to the intermediate level, their chances of working will decrease, and they are more willing to work after getting higher education. (Becker 1965) found that the decision to work depends not solely on work and leisure but also on the type of work, like paid or unpaid work, competitive and non-competitive work, etc. He further explained that choosing between work and household production, such as child care, depends on the law of comparative advantage. Females have a comparative advantage in household production and prefer

household work over labor market work (Becker 1975). The human capital theory states that improving human capital by increasing investment in education and technical skills can contribute positively to female labor market participation. (Becker 1992) found that the wage rate is the opportunity cost of having children; a higher wage implies a higher opportunity cost for children. Various studies extended the basic model of labor supply by incorporating various socioeconomic factors at personal or household level, including age, household size, income level, presence of children, levels of education, training, area of residence, etc., by incorporating various socioeconomic factors that play essential role in female labor market dynamics. The following function is developed based on various theories of labor supply to analyze data.

Female labor force participation= f (female levels of education, marital status, income of household members other than females, provincial status, locality, presence of children, household head employment status, household head education level, technical training, average paid income for females)

In model form, the above function can be written as:

$$FLP = \alpha_0 + \alpha_1 Female\_education\_levels_i + \alpha_2 marital\_status_i + \alpha_3 houshold\_income\_other_i + \alpha_4 \Pr ovince_i + \alpha_5 locality_i + \alpha_6 HHchild3_i + \alpha_7 HHchild15_i + \alpha_8 HH\_employmentstatus_i + \alpha_9 hh\_education_i + \alpha_{10} technical\_training_i + \alpha_{11} paid\_income\_females_i + \varepsilon_i$$

In the equation,

FLP represents female labor force participation rate, a binary variable which is equal to '1' if a female participates in labor market and equals '0' if female does not participate in labor market.

Female_education_levels is a categorical variable representing various levels of education of females, including no education, primary education, middle, matric, intermediate, bachelor, master, and higher. Marital_status is a categorical variable equals to '1' if female is unmarried and takes equal of '2' if they are married.

Household_income_other is the income of members of the household other than females.

Province is a provincial status for females. It includes KPK, Punjab, Sindh, and Balochistan.

Locality is a categorical variable that takes the value of '1' if females belong to rural areas and '2' if they are from urban areas.

HHchild3 represents the presence of children up to the age of 3 years.

HHchild15 represents the presence of children within the age brackets of 3 to 15 years.

Hh_employmentstatus shows the household head's employment status. It equals '1' if the household head is employed and '0' otherwise.

Hh_education represents the years of education of the household head.

Technical _training includes technical and professional courses and training for females.

Paid_income_females represents the average wage rate that females get for work.

Ɛ is an error term that represents the other factors affecting female labor force participation decisions, which are not considered in this study.

FLP is the dependent variable; all other variables on the right side of the equation are independent variables.

As the dependent variable and some independent variables in our model are categorical, the appropriate choice is to estimate a Logit or Probit model instead of a linear regression model through the Ordinary Least Squares (OLS) estimation technique. Therefore, the following Logit model is estimated for empirical analysis.

$$L_i = \ln\left(P_i / 1 - P_i\right) = \alpha + \beta_i Z_i + \eta_i$$

Li is a dependent variable in our study, female labor force participation (FLP). P is the probability of working for females. Z is a vector of all independent variables we have taken in our analysis. β is a vector for coefficients. α is the constant or intercept. **η** is the stochastic error term. Subscript i represents cross-sectional units.

The following formula computes average marginal effects:

$$\partial L_i / \partial Z_i = Pi(1 - P_i)\beta_i$$

$\partial L/Z$ finds the change in the dependent variable in percentage points due to the change in each independent variable.

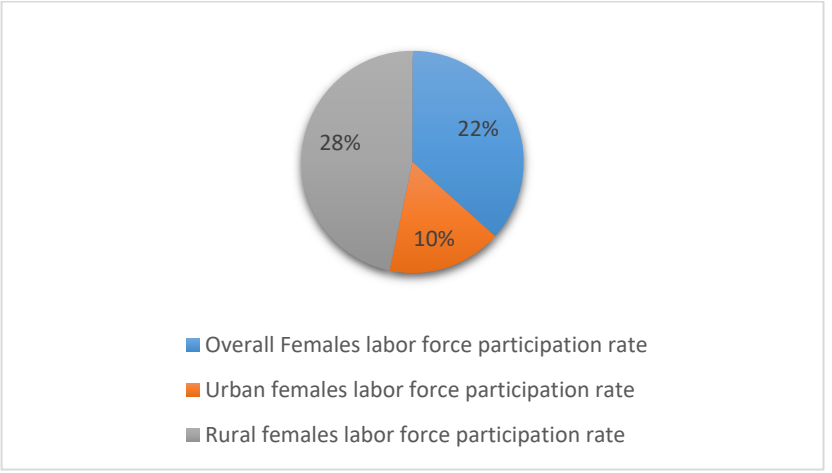
This study uses recent microdata from the Labor Force Survey 2020-21, which is taken from the Pakistan Bureau of Statistics. Both descriptive and empirical analysis is performed in STATA.

5. Data Analysis

5.1 Trends in female labor force participation in Pakistan

Total working-age females in the Labor Force Survey 2020-21 comprise a sample of 198,140 females. Out of the total sample, 41734 are part of the labor force. The labor force includes those employed or unemployed but actively seeking work. Those females who do not want to work for any reason, like disability, full-time students, retirees, etc., are not considered part of the labor force. In total female labor force, 36718 females belong to rural areas and 5016 females belong to urban areas, showing that females in rural areas have relatively more representation in labor force than metropolitan areas. [Figure 1] represents the overall female labor force participation rate and their participation rate in rural and urban areas of Pakistan. Overall, the female labor force participation rate in 2020-21 is 22 percent, and participation rates in rural and urban areas are 28% and 11%, respectively. As the agriculture sector is the backbone of Pakistan's economy, a large segment of females in rural areas are attached to this sector primarily as unpaid family members. Many females in rural areas are also connected to livestock, poultry farming, and informal economic activities such as traditional crafts, sewing, carpet weaving, food processing, etc. Females in urban areas of Pakistan face more challenges and have low participation rates in the labor market.

Figure 1: Female Labor Force Participation Rate

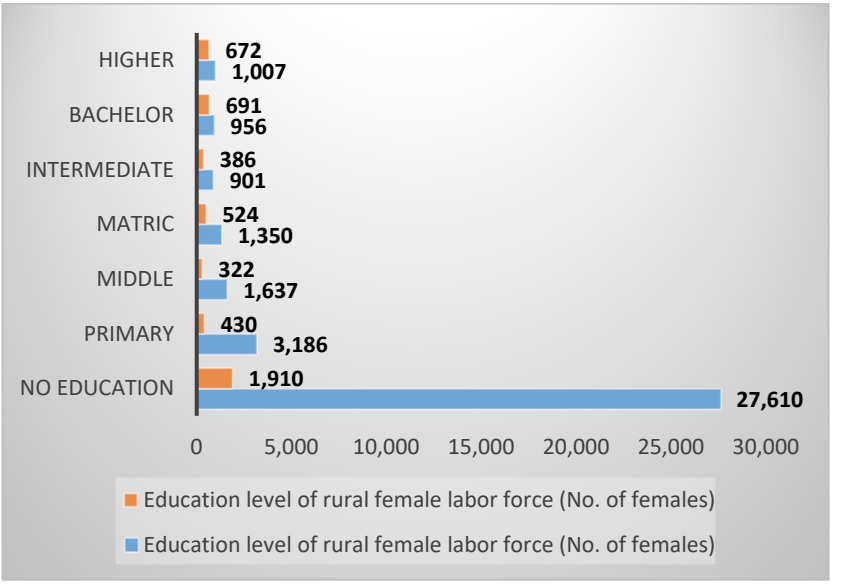


Education plays a fundamental role in creating work opportunities for females. In a sample of the female labor force, a large portion of females are either uneducated or have acquired a lower level of education [Table 2]. In the sample, more than 80 percent of females are uneducated, and less than 5 percent have a bachelor's or higher education. [Figure 2] compares the education level of the rural and urban female labor force. The graph shows that most females in the rural labor force are uneducated. Most females in rural areas perform unskilled labor and get low service rewards, which will not contribute to socioeconomic wellbeing. Females in the urban labor force also acquire a low level of education.

Table 2: Education levels of females

Female's education level	Number of females
No education	29,520
Primary	3,616
Middle	1,959
Matric	1,874
Intermediate	1,287
Bachelor	1,647
Higher	1,679

Figure 2: Education level of female labor force- Rural Vs Urban



Technical and professional training also provides good work opportunities in the labor market. Of the total female labor force sample, only 6324 have received technical training [Table 3]. Less than 20% of the female labor force receives technical training in rural and urban areas.

Table 3: Technical training

	Female labor force (percentage of female labor force)	Female labor force in rural areas (percentage of female labor force)	Female labor force in urban areas
Technical training	6324	14.5%	19.7%
No technical training	35409	85.5%	80.3%

The lack of higher-quality education and technical skills is a key impediment for females to get good opportunities, which in turn limits their labor market participation.

Many unmarried females are either employed or seeking work [Table 4]. This shows that married females usually participate less in the labor market. Married females typically have more responsibilities; including taking care of children and other household members, so their decision to enter the labor market is more complex and depends on many household factors, along with personal and economic factors.

Table 4: Marital Status

Marital status	Females
Married	9,250
Unmarried	32,484

Females in rural and urban areas face multiple challenges that limit their contribution to the labor market. In rural areas, females contribute relatively more because they mostly live in a joint family system, which supports child care and other household responsibilities and contributes more to the labor market. In rural societies, females work to participate and do not get discouraged, while in urban areas, social norms discourage females from working in the labor market.

5.2 Empirical Analysis

The Logit model is estimated to empirically examine the impact of individual/personal, household, and economic factors on the female labor force participation rate, and results are given in [Table 5]. The dependent variable is the female labor force participation rate, a binary variable that takes a value of '1' if a female participates in the labor market and '0' otherwise. Female education, marital status, provincial status, and locality are categorical variables. The first category is considered a base category for all categorical variables. Results of the logit model show that higher levels of education from a bachelor's degree onwards increase the probability of participating in the labor market, as coefficients are positive. Uneducated females and females with low educational levels have fewer chances to work. In literature, empirical studies found that levels of education positively contribute to higher female labor force

participation in Pakistan (Ali, Ibrahim et al. 2024). As per findings of our study, technical training has a significant positive impact on female labor force participation. Technical, vocational, and educational training/courses such as auto or engine mechanics, carpentry, typing, computer, tailoring, etc., increase the probability of females becoming a part of the labor market. Technical education provides skills that ultimately increase chances of working. Therefore, focusing on skill-based education is highly important to get employment opportunities. (Fatima, Saeed et al. 2023) found that female labor force participation with technical education can increase the pace of economic growth in Pakistan. In the case of marital status, a base category is married females. The coefficient of marital status is positive, showing that unmarried females are more likely to participate in the labor force than married females. All studies found that married females have fewer chances to work due to having more household responsibilities. Many cultural and social factors discourage women from working (Hussain 2024). In provincial status, a base category is KPK; coefficients are positive for Punjab and Sindh, showing that females in Punjab and Sindh are more likely to participate as compared to KPK, while in Balochistan, their participation is less as compared to KPK. Locality is also a categorical variable equal to '1' if females belong to rural areas and '2' if females are from urban areas. The first category is treated as a base category. The coefficient of locality is negative, which shows that females in urban areas of Pakistan have fewer chances to work compared to females in rural areas. In Pakistan, more females are a part of the labor force in rural areas as they are engaged in agriculture, livestock, etc. Some empirical studies found that females in urban areas have more opportunities and have more chances to work than females in rural areas (Fatima, Saeed et al. 2023). (Sadaquat 2011) found that females in rural areas of Pakistan have greater participation in labor market as unskilled workers as compared to urban areas due to extreme poverty and high inflation. However, many of them work as unpaid family workers or earn less. Females in urban areas are facing more challenges in joining the labor force. Paid female income reflects the average wage that employed females get. Its positive coefficient shows that females are more likely to work when they get more income.

Household factors, including the income of household members other than females, the household head's employment status, the household head's income, and the presence of children up to three years of age and children older than three but younger than fifteen, also play a vital role in shaping the dynamics of females' labor force participation in Pakistan. The income of household members other than females decreases the likelihood of females participating in the labor market. Household head employment status is coded as '1' if the household head is employed and '0' if unemployed. Employed is the reference category. The positive coefficient indicates that if the household head is unemployed, females are more likely to participate in the labor market, and vice versa. The coefficient for household education is negative, indicating that higher education levels of the household head correlate with a lower probability of females working. This finding aligns with other household factors, including household employment status and the income of household members other than females. These results suggest that most females work only when facing serious financial difficulties; otherwise, they prefer not to work. The presence of children up to three years of age and those between more than three and fifteen years also significantly hinder females' ability to participate in the labor market. Caring for children is primarily viewed as the responsibility of married women. Both coefficients are negative, reflecting that females are less likely to work due to the presence of children up to three years old and those within the age bracket of more than three to fifteen years. In the literature, various household factors such as household members, their income, employment status, and presence of children are considered crucial in shaping female labor market dynamics (Khan and Khan 2009) and (Khan 2022).

Table 5: Regression Analysis-Logit Model

Number of observations: 198140		
F(19, 198120) = 2900.00		
Prob > F = 0.0000		
Variable	Coefficient	P>|t|
Levels of education: Primary	-0.051879	0.000
Middle	-0.0264885	0.000
Matric	-0.0340093	0.000
Intermediate	-0.0183794	0.002
Bachelor	-0.0164654	0.000
Master	-0.0569377	0.000
Higher	-0.5608271	0.000

Marital status	1.002100	0.000
Household_income_other	-0.0030667	0.003
Province: Punjab	0.0309193	0.000
Sindh	0.0072397	0.007
Balochistan	-0.0437867	0.000
Locality	-0.0143597	0.000
HHchilds	-0.0105565	0.000
HHchilds2	-0.0093982	0.000
Householdhead_employmentstatus	-0.0020346	0.114
Householdhead_education	-0.0118967	0.000
Technical_training	-0.1110837	0.000
Paid_income_females	-0.0292134	0.000
Cons	-0.0048571	0.468

To get the magnitude of coefficients, average marginal effects are estimated in [Table 6], which shows a change in probability of female labor force participation due to a one-unit change in the independent variable. When female education increases to the Bachelor's level, they have 57.7 percent more chances to work in the labor market. When the female level of education increases, there is a remarkable percentage point increase in their labor market participation. It shows that a higher level of education matters a lot in getting opportunities. An increase in technical education increases the probability of females working by 58 percent. In household factors, the employment status of the household head has a relatively greater contribution to increasing their likelihood of working compared to other factors such as the income of family members other than the female, the household head's education, and the presence of children.

Table 6: Average Marginal Effect Based on Logit Model

Flp	Coefficient	P-value
Education_level		
Primary	-0.3111374	0
Middle	-0.3296139	0
Matric	-0.2536771	0
Intermediate	-0.0070906	0.715

Bachelor	0.5777454	0
Master	1.198748	0
Higher	1.781441	0
Marital	0.4610754	0
Household_income_other	-0.0003154	0
Province		
Punjab	0.1941189	0
Sindh	0.0814281	0
Balochistan	-0.2219611	0
Locality	-0.2982706	0
HHchild3	-0.0069499	0
HHchild15	-0.005538	0
hh_employmentstatus1	0.0677118	0
hh_education	-0.0040581	0
Technical_training	0.5824126	0
Paid_income_females	0.0110823	0
_cons	-1.685983	0

Note: A P-value less than the 5% level of significance shows a significant impact of each Variable on female labor force participation.

The multi-collinearity problem is checked by finding the correlation matrix in [Table 7]. As most values are low, the dataset has no serious multicollinearity issue.

Table 7: Correlation Matrix

	Flp	Marital status	Income of members of the household other than female	Locality	HHchild3	Hhchildren 15	Household employment status	The paid income of a female
Flp	1							
Marital	0.14	1						
	-0.08	-0.011	1					
Locality	-0.16	-0.014	-0.0426	1				
HHchild3	0.06	0.046	0.1145	-0.365	1			
HHchild15	0.03	-0.013	0.1341	-0.453	0.5546	1		
hh_employment	0.37	0.014	-0.2179	-0.396	0.2396	0.2671	1	
hh_education	-0.08	-0.033	0.075	0.230	-0.2514	-0.3038	-0.2514	
Technical_education	0.11	0.064	0.0011	-0.020	0.0132	-0.0171	0.0272	
Paid income of females	0.17	-0.023	0.098	-0.027	-0.0332	-0.1088	0.0779	1

6. Conclusion

From the above analysis, we can conclude that female labor market participation dynamics are more complex and depend on various economic, personal and household factors. Higher average wages will also attract females to work in the labor market. Higher education from the Bachelor's level onwards and the provision of technical and professional education are the most critical factors affecting female labor force participation. Focusing on higher education and technical and professional training can increase female participation in the labor market. Providing opportunities for technical and professional training to females who are already working and who want to work will make them more skillful and productive and provide good work opportunities to them. In household factors, the presence of children in age brackets of up to three years and greater than three years to fifteen years limits a female's chances to work. Household head education, income of members of households other than females, and household head's employment decrease females' chances of working. This also shows people's perceptions and choices regarding female labor market participation. Females who face severe financial constraints mostly work in the labor market. While there is a trend that many people do not prefer females to work in the labor market. This perception can be changed by ensuring a more flexible and safe working environment. Females' participation in the labor market empowers them and their families. There is a need to change the typical mindset and respect and acknowledge female labor market participation. Focusing on daycare facilities motivates females to work in the labor market. Female labor market participation can be increased by focusing on quality higher education, technical training, and professional skills. In an era of the digital world, even if basic digital skills are provided to females in their education, they can easily develop expertise over time by self-learning, which makes them more skilled and provides them with more opportunities. Female participation in the labor market in Pakistan can be increased by focusing on personal, economic, and household factors. Female labor market dynamics should be analyzed using provincial or district-level data that effectively capture regional differences and help to make more specific and targeted policies. Panel data analysis helps to study the evolution of female labor force participation over time in response to policy changes or overall changes in society.

6.1 Policy Recommendations

Based on the findings of the study, following policy measures are suggested:

i. Increase access to technical and vocational education specially for women and make it affordable for them.
ii. Provide safe and affordable public transport for women which facilitate them to work.
iii. Highlight the importance of women labor market anticipation for both country and family through public awareness campaigns.
iv. Enforce daycare facilities at workplaces and encourage flexible working environment.
v. Promote women employment in rural areas by providing them training and microfinance.
vi. Strictly enforce anti-harassment laws at workplace to ensure safe working environment.
vii. More investment is required in higher education to increase its access and quality of education.

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Investigating the Impact of factors influencing Fintech adoption with the mediating role of Fintech Promotion

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Abstract: The fast growth of Fintech has changed the way financial services are provided globally, especially in places like Pakistan. Despite more people being interested, the use of Fintech is still not widespread due to various social, economic and technological issues. This study looks into the main reasons for using Fintech, with a focus on how Fintech promotion helps influence customer actions. This research can advise stakeholders, for example, policymakers, financial institutions and Fintech companies, on how to improve digital financial inclusion in Pakistan. Primary data was collected from 379 bank customers using a structured questionnaire based on a five-point Likert scale. The hypothesized relationships among Customer Trust, Data Security, Financial Literacy, Social Media Influence, Fintech Promotion and Fintech Adoption were tested by analyzing the data with PLS-SEM through the Smart PLS software. The analysis shows that Customer Trust and Data Security play key roles in Fintech adoption and Financial Literacy does so by supporting Fintech promotion. Fintech promotion greatly helps in making adoption possible. Intriguingly, Social Media Influence did not make a big difference, suggesting that digital marketing is affected differently in different situations. This demonstrates that Pakistan needs more trust, stronger security and focused efforts to increase the use of Fintech services. As a result, the study suggests Fintech firms should focus on trust and data security and work on educational campaigns to bridge the gap between awareness and adoption. Further research should explore longitudinal data and include a variety of demographic factors to gain a better insight into the changing Fintech world.

Key Words: Fintech, Financial Institutions, Demography

1. Introduction

In the last few years, Fintech has transformed the global financial sector with its creative, easy-to-use and efficient services. Because of Fintech, people and companies now manage their finances differently through

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digital wallets, online banking, block chain and peer-to-peer lending platforms. The rise in technology usage since COVID-19 has led to a boost in the adoption of Fintech services in several markets(Igamo et al., 2024). However, the rate at which people use digital payments is influenced by several things, including their social media experience, how much they trust the company, their view of data security and their financial understanding. Although a lot of research has looked at Fintech technology and infrastructure, it is becoming more important to focus on the behavioral and psychological reasons behind why people use it. For example, social media helps shape people's views on Fintech and informs them about its services. Similarly, issues related to data privacy and security still reduce users' trust in these technologies and how much they know about finances affects their willingness to use them(Igamo et al., 2024).

One important aspect that is sometimes missed in Fintech adoption is how companies introduce and explain their value to potential users. Promotional activities such as digital advertising, educational efforts and real user feedback may greatly reduce the impact of different factors on how quickly a product is adopted(Jafri, Amin, Rahman, & Nor, 2024). Informing consumers, explaining the advantages and answering their concerns are important strategies for Fintech to be accepted. Over the last decade, the role of financial technology (Fintech) has grown, making banking faster, easier to use and less expensive than before. Increasing internet usage, mobile phone adoption and initiatives by the government to include more people in the financial system are driving the Fintech industry in Pakistan. Easy paisa, Jazz Cash, SadaPay and NayaPay are all changing how people and companies do their financial transactions. Yet, despite the growth, more people in Pakistan use Fintech services than before, but the adoption is still slower and less even than in other developing nations(Qamar & Ullah, 2024).

There are several reasons behind this unequal situation. While many people do not have enough knowledge about finances, worries about data privacy, cyber scams and trust in digital platforms are still common. At the same time, social media which is now a leading source for information and marketing, can affect whether users decide to use Fintech solutions. Since Pakistan's youth are growing and the digital world is advancing rapidly, Fintech promotion is essential to connect more people to its

benefits(Qambrani, 2024).While the State Bank of Pakistan and regulatory authorities are promoting digitalization in financial services, there is not much academic research on how people's attitudes and beliefs influence the use of Fintech in Pakistan. In addition, the mediating impact of Fintech promotion efforts—via advertising, awareness campaigns and digital activities—is still not well understood within the local community(Thottoli, Islam, Ahsan, Yusof, Hassan, & Chowdhury, 2024).

Therefore, this research looks at the effects of social media influence, data security, customer trust and financial literacy on Fintech adoption in Pakistan, considering the role of Fintech promotion as a mediator. The results of this research are expected to offer useful information for policymakers, Fintech companies and marketers who wish to improve Fintech acceptance and use in developing and technology-emerging economies, especially in Pakistan. The results of this research can guide Fintech companies, policymakers and financial institutions to develop effective strategies that encourage more people in Pakistan to use Fintech and enjoy financial inclusion(Che Hassan, Abdul-Rahman, Ab. Hamid, & Mohd Amin, 2024).

Although Pakistan has seen advancements in digital infrastructure and Fintech, most people have not widely adopted these services. Many people in semi-urban and rural areas depend on traditional financial methods due to a lack of awareness, being unable to use digital tools and doubts about online platforms. In cities, where most people have smart phones and internet access, users still worry about data protection, lack confidence and are often confused because of inadequate financial knowledge. Many Pakistanis get most of their news and information from social media platforms like Facebook, YouTube, TikTok and Instagram(M. T. Islam, Kumar, & Konar, 2024). However, the influence of these platforms on Fintech awareness and user decisions is still underexplored in academic literature. Moreover, while Fintech companies in Pakistan use digital marketing and educational campaigns to promote their services, there is not enough research on how Fintech promotion mediates the relationship between key influencing factors and actual user adoption(Thottoli et al., 2024).

1.1 Objective

The primary objective of this study is to investigate the impact of key factors influencing Fintech adoption in Pakistan, with a particular focus on the mediating role of Fintech promotion. Specifically, the study aims to:

1. Examine the effect of Customer Trust on Fintech Adoption and Fintech Promotion.
2. Assess the influence of Data Security on Fintech Adoption and Fintech Promotion.
3. Evaluate the role of Financial Literacy in shaping Fintech Adoption and Fintech Promotion.
4. Analyze the impact of Social Media Influence on Fintech Adoption and Fintech Promotion.
5. Determine the mediating effect of Fintech Promotion on the relationship between the antecedent variables (Customer Trust, Data Security, Financial Literacy, and Social Media Influence) and Fintech Adoption.

1.2 Problem statement

This gap highlights the need to learn more about the challenges that prevent people from using Fintech in Pakistan. Therefore, this study investigates the effects of social media, data security, customer trust and financial literacy on Fintech adoption and how Fintech promotion acts as a mediator, to offer useful insights for local policy and business strategies. Although Fintech is being studied worldwide, there is not much information on how Customer Trust, Data Security, Financial Literacy and Social Media Influence impact Pakistan's banking sector. The majority of previous research has concentrated on developed countries, with emerging markets getting less attention. Even though numerous studies have looked at how these factors relate to Fintech adoption, the role of Fintech Promotion in increasing adoption has not been thoroughly studied.

1.2 Research Gap

This research fills these gaps by:

- Looking closely at Pakistan's particular socio-economic and technological situation which creates both obstacles and chances for Fintech to develop.
- Looking at the mediating role of Fintech Promotion which helps explain how promotional efforts can increase the impact of important factors on adoption.
- Providing new, practical insights that are not widely covered in previous studies by using information collected from bank customers in Pakistan.

As a result of this study, both researchers and policymakers can gain insights and use the suggested strategies to help Fintech become more popular in developing countries.

2. Literature Review

2.1 Theories

Researchers have used different theories that explain user behavior in technology acceptance and diffusion in the adoption of Fintech. The study's framework is based mainly on Technology Acceptance Model (TAM), Diffusion of Innovation Theory (DOI), and Theory of Planned Behavior (TPB) to explore the factors behind Fintech adoption and the role of Fintech promotion as a mediatorechnology Acceptance Model (TAM),.(Ashoer, Jebarajakirthy, Lim, Mas' ud, & Sahabuddin, 2024) proposed the Technology Acceptance Model which suggests that both the usefulness and ease of use of a technology affect a person's intention to use it. In Fintech, this model points out that users' opinions matter a lot when it comes to digital financial services. However, According to recent studies, using TAM alone does not completely explain Fintech adoption, especially in emerging markets, because trust and security issues play a bigger role there (Trisanti, 2024).

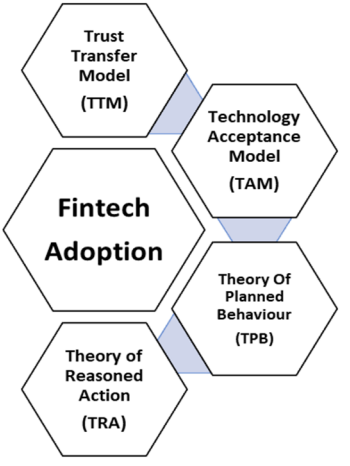
To solve these issues, (Uzumcu & Acilmis, 2024) introduced Diffusion of Innovation Theory (DOI) which outlines how innovations move through different social groups as time passes. DOI points out that communication methods, social trends and advertising efforts help boost the rate of

adoption. The theory explains how Fintech promotion helps users become aware, informed and convinced which are important steps in turning them from potential users into actual Fintech users (Koloseni & Mandari, 2024).

The Theory of Planned Behavior (TPB) (Fatimah, Saputra, & Panduwiyasa, 2024) further adds social norms and perceived behavioral control to these models which can impact a person's intentions and behavior. According to this theory, users' confidence and knowledge about money are crucial, as they determine how much control people feel they have over using Fintech services Security concerns about data, together with perceived risks, are important to TPB and influence both attitudes and intentions to act(Priyadarshi, Prasad, & Kesari, 2025).

Combining these theoretical perspectives, this study suggests that Customer Trust, Data Security, Financial Literacy and Social Media Influence are key factors that influence Fintech adoption and Fintech Promotion acts as a main mediator. This way of looking at Fintech fits with previous empirical studies that suggest using several theories to better understand the different reasons behind Fintech adoption, mainly in places like Pakistan, where there are still obstacles in infrastructure and culture (Ramaswamy, Shankaranarayana, & Akanfe, 2024).

Figure 01: Theoretical framework



With these theories as its base, the research helps advance knowledge and provides useful insights on using trust, literacy and social influence to speed up Fintech adoption in developing regions.

2.2 Social Media Influence (SMI)

Social media is now playing a bigger role in how consumers act, especially in digital finance. (Asif & Sarwar, 2025)explain that social media helps people communicate with each other and spread information quickly which has a strong effect on users' awareness and perception of Fintech solutions. According to (Edim, Pepple, & Jerome, 2024), using social media helps users become more willing to use Fintech because it makes them more familiar and less uncertain. Besides, (M. T. Islam, Kumar, & Konar, 2024) explain that using social media for digital engagement increases trust, improves the brand's image and makes the technology more useful—all of which play a big role in getting people to use the technology.

2.3 Fintech Adoption (FA)

Fintech adoption describes the rate at which people or companies use financial technologies to handle their financial activities. Both the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), as seen in(Maniam, 2024), stress that perceived usefulness, ease of use and behavioral intention are important in adopting technology. According to (Raihan et al., 2024) trust, data security, convenience and financial literacy are key elements that influence how many people use Fintech services

2.4 Data Security (DS)

Security issues related to data often prevent people from using Fintech services. Since Fintech deals with private and financial information, people's fears about cyber security can make them less likely to use those services. (Mokuolu, 2024)discovered that users' sense of data security directly affects their decision to use online financial services. Likewise, (Ramaswamy, Shankaranarayana, & Akanfe, 2024) believe that strong encryption, clear data handling and certifications in cyber security can ease people's doubts and increase their use of Fintech.

2.5 Customer Trust (CT)

Trust is essential for people to use any financial service and it is even more important when they use digital platforms. Based (AlHassan, Papastathopoulos, & Nobanee, 2025), trust in the technology, the service provider and the system's integrity greatly improves users' willingness to accept online systems. (Jafri et al., 2024) found that customer trust acts as a link between the technological features of a service and how often it is adopted. You can earn people's trust by using secure systems, giving them a good experience and complying with regulations.

2.6 Financial Literacy (FL)

Having financial literacy means someone is aware of financial concepts and can make smart financial choices. It plays an important role in helping Fintech become more popular in developing countries. (K. A. Islam & Khan, 2024)mention that those who are financially literate tend to make use of digital financial services. (Mohapatra et al., 2025)believe that those with better financial literacy skills are more likely to feel confident using Fintech which makes them less reluctant to accept it.

2.7 Mediating Role of Fintech Promotion

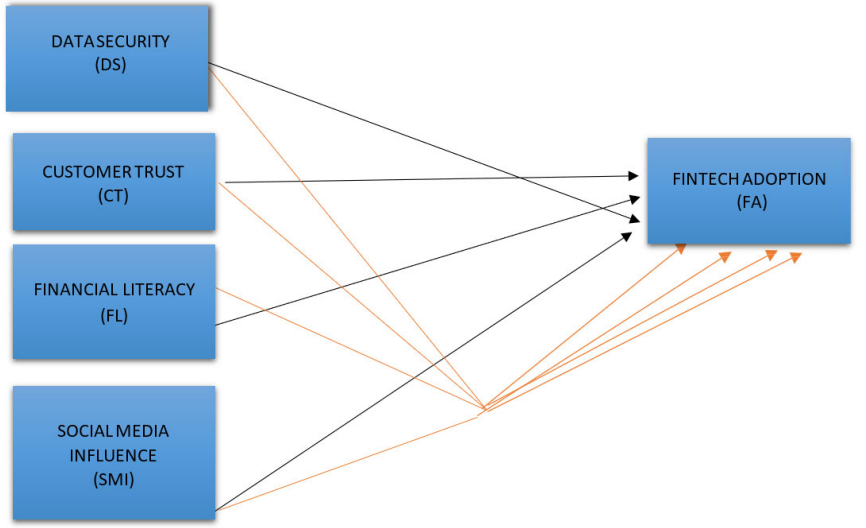
Fintech promotion helps the provider and users communicate and understand each other. Proper promotional efforts can address risks, increase trust and help people understand Fintech services better. The promotion informs consumers and also encourages them to trust and use a company's services. In this case, promotion helps to mediate the impact of social media, data safety, trust and literacy on Fintech adoption by increasing awareness and making Fintech look more valuable(Kraiwanit, Limna, & Wattanasin, 2024).

The reviewed sources suggest that social media influence, data security, customer trust and financial literacy are very important in deciding whether Fintech is adopted. Even so, the outcomes can be greatly improved when Fintech is strategically promoted which helps lessen uncertainty, boosts opinions and makes users feel more confident. For this reason, there is a need to examine Fintech promotion as a factor that influences the link between these factors and Fintech adoption(Liu, Wang, Zhao, Ding, & Jia, 2024).

3. Conceptual framework

The variable in the conceptual framework forms their basis on the theoretical framework derived from the literature review. The independent variables are Data security, customer trust, financial literacy and social media influence. The dependent variable is fintech adoption. Lastly, the mediator is fintech promotion.

Figure 02: Conceptual framework



4. Research Methodology

This study aims to understand the impact of factors such as data security, customer trust, financial literacy and social media influence on fintech adoption where as fintech promotion act as a mediator in between them. A philosophical basis has been adapted, appropriate research design has been incorporated; tests have been conducted including the validity and reliability test. Descriptive statistics have been interpreted, and multiple regression assumptions were satisfied before applying Partial Least Square - Structural Equation Modeling. Finally, the hypothesis testing results have been presented(Kumar & Rani, 2024).

4.1 Philosophical Basis

The philosophical worldview that supports the study is the Post positivist Worldview, also known as the Positivist Worldview. It challenges the traditional form of research and states when human behaviors are under consideration, the claims regarding them cannot be made with absolute positivity (Suhardianto, Narsa, & Mujennah, 2024).

4.2 Data Collection Method

For this study, a quantitative approach is used and primary data is collected using a structured questionnaire. The goal is to study the influence of social media, data protection, trust in companies and financial knowledge on people's use of Fintech, with Fintech promotion as a mediating factor. The study looks at bank customers in Pakistan, since Fintech is developing fast there, but many people are still hesitant due to trust, awareness and digital literacy problems.

4.3 Measurement of Variables

The research is focused on bank customers in Pakistan because they are the main users or potential users of Fintech services. A sample size of 379 respondents was chosen by convenience sampling which is standard in behavioral research when targeting a particular group within time and budget limits. The number of cases in this sample is sufficient for PLS-SEM using SmartPLS because it meets the required standards for model complexity and statistical power.

4.4 Data Analysis Technique

The study collected data by giving bank customers a self-administered questionnaire that was sent both physically and digitally to people in different cities in Pakistan. All the questions in the questionnaire were closed-ended and measured on a scale of 1 to 5, where 1 means Strongly Disagree and 5 means Strongly Agree. The Likert scale was chosen because it is simple and has been proven to accurately measure people's attitudes and opinions. To guarantee the accuracy and dependability of the constructs, Social Media Influence (SMI), Data Security (DS), Customer Trust (CT), Financial Literacy (FL), Fintech Promotion (FP) as the

mediating variable and Fintech Adoption (FA) as the dependent variable were used. The items used for measurement were changed a little to match the Pakistani culture and to be clear and important for the respondents.

The collected data were studied using SmartPLS version 4.0 which helps with Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM was considered the best choice since it allows for complex models with multiple variables, works well with small data sets and does not require the data to follow strict normality rules(Ali, Alamgir, & Nawaz, 2024)

4.5 Convergent Validity and Internal Consistency Reliability

The data analysis was done in two important phases. At first stage, the measurement model was evaluated by looking at reliability with Cronbach's Alpha and Composite Reliability, convergent validity with Average Variance Extracted (AVE) and discriminate validity using both the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. The second stage was about evaluating the structural model by analyzing path coefficients, R^2 and adjusted R^2 values to find out the explanatory power, effect size (f^2), predictive relevance (Q^2) and by testing the indirect effects of Fintech Promotion on Fintech Adoption. Every participant was fully aware of the research goals and agreed to take part willingly which maintained the study's ethics. The survey was anonymous, so no one's personal details were recorded. It was assured to the respondents that their data would only be used by researchers.

4.6 Discriminate Validity

Table 01: Discriminant Validity

	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted
CT	0.872	0.878	0.922	0.797
DS	0.814	0.856	0.659	0.428
FA	0.819	0.845	0.892	0.7334
FL	0.697	0.748	0.797	0.421
FP	0.650	0.695	0.848	0.736
SM	0.149	0.519	0.102	0.356

Cross Loading indicates whether the items of the latent variables load lower on other items and higher on their own construct (Nasution, Erlina, Muda, & Yahya, 2024). In this study, the cross loadings depict discriminant validity.Fornell and Larker Test indicates that Square Root of AVE is calculated and compared with the inter-construct correlation. Discriminant validity holds if it is greater than inter- construct correlation (F. Hair Jr et al., 2020). Discriminant validity of the constructs was evaluated in three approaches. Table 2 reveals that none correlation **(ranged from 0.232 to 0.551)** were greater than their respective (**ranged from 0.0.680 to 0.759),** thus signifying sufficient all construct discriminant validity, Lastly, all constructs show discriminants validity when every correlation is less than 1 by angreater than double than its respective standard error. Standard error in PLS bootstrap output inspection shows that all constructs pass this third test. Therefore, adequate discriminant validity is shown for all constructs(Li & Lay, 2024).

4.7 Fornell and Larker Test

Table 02:Fornell and Larker Test

	CT	DS	FA	FL	FP	SM
CT						
DS	0.759					
FA	0.680	0.629				
FL	0.532	0.512	0.418			
FP	0.551	0.411	0.494	0.589		
SM	0.307	0.510	0.232	0.453	0.419	

4.8 Cronbach's alpha

Cronbach's alpha is a measure of internal consistency reliability, commonly used in psychology, education, and other fields to assess the reliability of a scale or questionnaire. The value of Cronbach's alpha ranges from 0 to 1. Generally, higher values indicate greater internal consistency reliability. Common thresholds for interpretation may vary, but typically

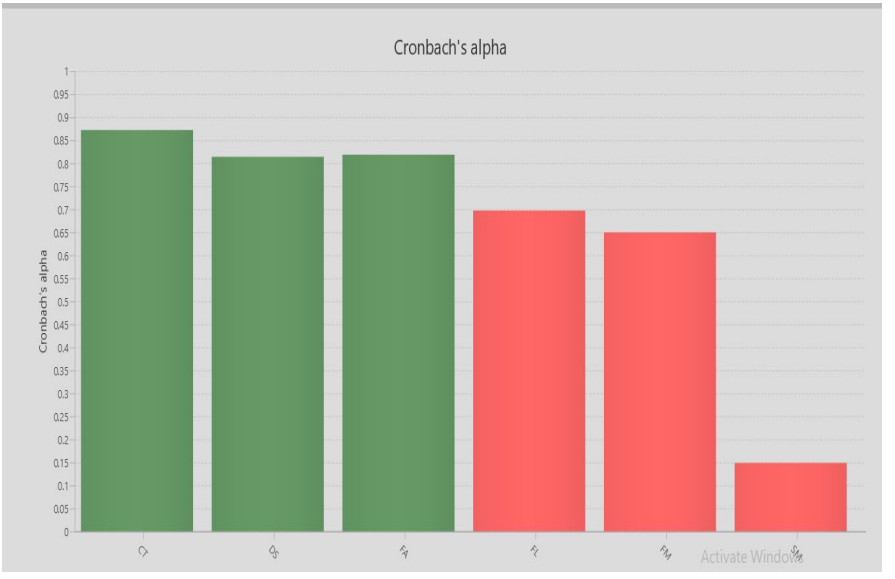
0.7 or higher is considered acceptable for research purposes and 0.9 or higher is considered excellent. In the table above the cronbach's alpha value of CT is 0.872 which is considered as a good value higher than 0.7. The value of DS and FA both are also higher than 0.7 and considered (Trabelsi, Saif, Driller, Vitiello, & Jahrami, 2024)

4.9 Data Collection and Analysis Tools

4.9.1 Survey Instruments

Figure 03: Survey Instrument

Four observed variables form the exogenous impendent



variable measurement of dimensions Data security (9 items), Social Media Influence (3 items), Customer Trust (3 items) and financial literacy (6 items) adopted .This study applied the 5-point Likert scale of 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree

4.10 Population and Sampling Technique

4.10.1 Target Population: The target population for this primary qualitative research consists of customers of all commercial banks in Pakistan.

4.10.2 Sampling Technique: A convenience sampling method will be employed to select a sample size of 379 respondents from the target population. This technique is chosen for its practicality and ease of data collection.

4.10.3 Data Collection:

Questionnaire: Data is collected through a structured questionnaire designed to assess customers' perceptions and attitudes regarding various factors related to fintech adoption. The questionnaire will include items related to data security, social media influence, fintech promotion, customer trust and financial literacy. The survey will be administered to the selected sample of **379** bank customers. Respondents will be asked to provide their opinions and responses to the questionnaire items.
The respondents were sent the questionnaire through Google Forms as it is the most practical and affordable way to collect scalable and actionable data (Nikou, 2024; Nikou, Perifanou, & Economides, 2024).They were briefed about the study being conducted and their responses to be used for research purposes only. The questionnaire was distributed using many social media applications and some of the surveys were briefed about the study being conducted and their responses to be used for research purposes only. The questionnaire was distributed using many social media applications and some of the surveys were also filled using the paper-and pencil technique. SmartPLS has been used for Partial Least Square-Structural Equation Modeling (PLS-SEM) Conceptual Framework

4.11 Econometric Model

- **Direct Path Equation**

$$FA = \alpha i + \beta 1DS + \beta 2CT + \beta 3FL + \beta 4SM + \varepsilon i$$

- **Indirect Path Equation (with mediator)**

$$FA = \alpha i + \beta 1DS + \beta 2CT + \beta 3FL + \beta 4SM + \beta 5FM + \varepsilon i$$

Here, **FA** refers to Fintech Adoption, **DS** means Data security , **CT** means customer Trust, **FL** means financial literacy and **SM** means social media influence. Furthermore, **FM** represents Fintech promotion.

5. Results

5.1 Descriptive Statistics

Table 4: Descriptive Statistics

	Mean	Median	Min	Max	SD	Kurtosis	skewness	T value	P value
CT	0.000	0.145	-2.7	1.6	1.000	0.3	-0.4	1.005	0.00
DS	0.000	0.193	-3.6	1.4	1.000	2.3	-1.3	1.211	0.00
FA	0.000	0.234	-2.7	1.2	1.000	0.2	-0.7	1.758	0.00
FL	0.000	0.055	-3.5	2.3	1.000	0.6	-0.2	0.158	0.019
FP	-0.00	0.123	-3.6	1.8	1.000	1.4	-0.6	1.228	0.00
SM	-0.00	0.185	-1.9	2.0	1.000	-0.6	-0.07	0.665	0.00

This is the average value for each investment category. For example, the mean for CT is 0.000, and the mean for DS is 0.000.This is the 'middle' value when the data is ordered from least to greatest. Half the data points will be less than the median, and half will be more. The median is often a better indicator of the "typical" value than the mean when the data is skewed. For example, the median for CT is 0.146, and the median for DS is 0.193.These are the lowest and highest values found in the data set for

each investment category. For example, the minimum value for CT is -2.795, and the maximum value is 1.602.

5.2 Correlation Matrix

Table 05: Correlation Matrix

	CT	DS	FA	FL	FP	SM
CT	1.000	0.646	0.581	0.445	0.428	0.121
DS	0.646	1.00	0.544	0.375	0.312	-0.004
FA	0.581	0.544	1.000	0.342	0.375	0.121
FL	0.445	0.375	0.342	1.00	0.427	0.174
FP	0.428	0.312	0.375	0.427	1.000	0.254
SM	0.121	-0.004	0.121	0.174	0.254	1.00

The pairwise correlation table below shows the level of association between the variables incorporated in the conceptual framework. The range of correlation is -1 to +1 whereas 0 represents no correlation.

5 . 3 PLS-SEM Algorithm

5.3.1 Structural Model (Inner Model)

The structural model is the inner model depicting the relationship between endogenous and exogenous variables. it aims to measure the R-square, Q-square, goodness of fit and path coefficients.The R2 is the coefficient of determination that measures the amount of variation in the dependent variable explained by the independent variables. For the model under study, R2 is 0.406 which means that 40% variance in FA is explained by DS, CT, FL and SM. For a primary study, it is not necessary for the value of R-square to be close to 1 because there may be numerous other variables that are not included in the study but may be affecting the outcome variable.

Table 06: Structural Model (Inner Model)

	R square	R square adjusted
FA	0.406	0.398
FM	0.283	0.275

5.3.2 Path Coefficients

Path Coefficients lies between +1 and -1. It must meet two conditions to be significantly acceptable such as having a p-value below 0.05 and confidence intervals contains zero .

Table 07: Path Coefficients

	Path Coefficients
CT->FA	0.326
CT->FP	0.260
DS->FA	0.285
DS->FP	0.045
FL->FA	0.029
FL->FP	0.263
FP->FA	0.123
SM->FA	0.046
SM->FP	0.177

5.3.3. Bootstrapping Procedure

In order to test the statistical significance of results for direct, as well as, indirect effects, bootstrapping is used as a non-parametric procedure. It gives P-value i.e., probability value which should be less than 0.05 to be significant when 95% confidence level is selected. In this study, 5% significance level has been selected and resampling has been incorporated to obtain the p- values and t-values(Cheung, Cooper-Thomas, Lau, & Wang, 2024). (The results have been included in tabular form along with interpretations in final PLS-SEM output)

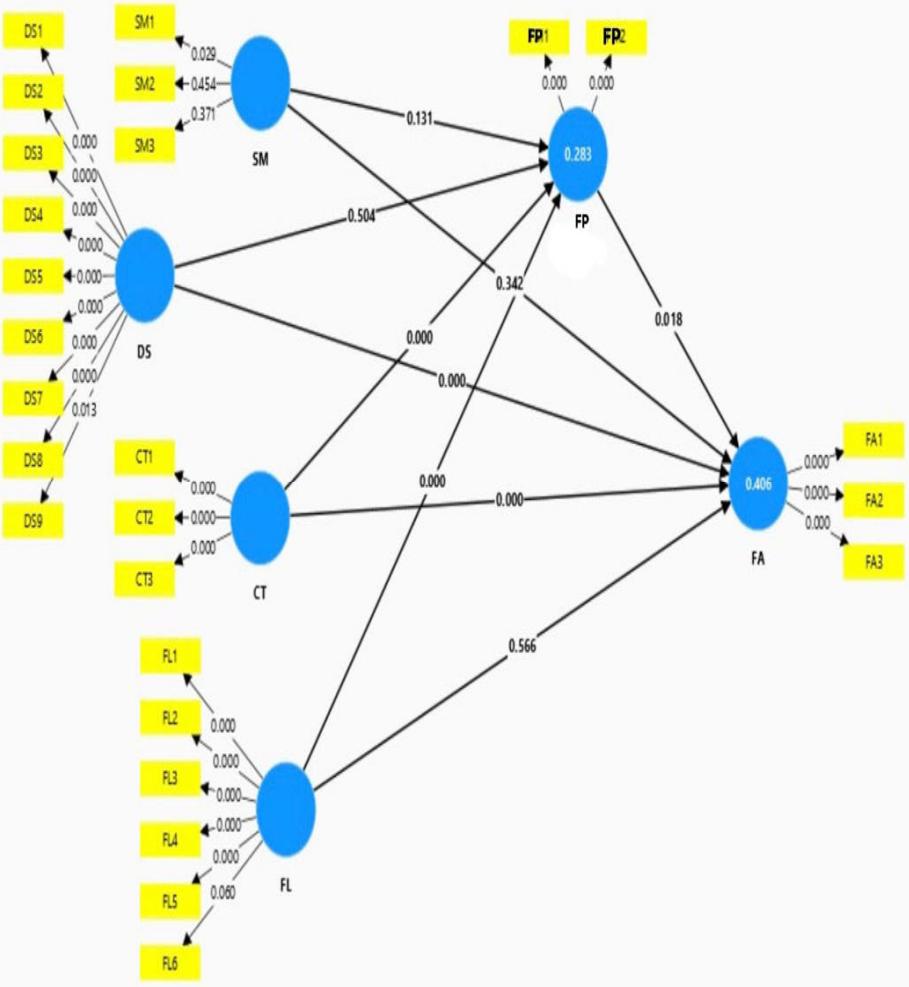
5.3.4. Blindfolding Technique

Q2 is an additional test to R2 and is a measure to determine the predictive relevance of the exogenous latent variables on the endogenous latent variables. It is applicable on reflective model only and its value should be greater than zero. Blindfolding procedure is used to calculate the Q2 that uses the formula; (1-SSE)/SSO. It tells the degree to which a path model is able to predict the observed values.

The study looked at how customer trust, data security, financial literacy and social media influence affect the adoption of Fintech, with Fintech promotion acting as a mediator, in the Pakistani banking sector. The results highlight that customer trust is a major factor in deciding to use and promote Fintech, as earlier studies by Gefen et al. (2003) and Kim et al. (2010) pointed out. It proves that in markets like Pakistan, where people are not yet fully convinced about digital services, building trust is necessary for Fintech to spread further.

5.5.5. Graphical Representation

Figure 04: Graphical Representation



Data Security (DS) and Customer Trust (CT) as Independent Variables: The results suggest that both data security (DS) and customer trust (CT) have a positive impact on fintech adoption (FA). This means that banks

that prioritize data security and build customer trust are more likely to see increased adoption of their fintech products and services.

Social Media Influence (SM) as Independent Variable: Social media influence (SM)also appears not to have a positive influence on fintech adoption (FA). This suggests that customers don't trust social media in terms to be more sensitive towards their data privacy and security.Financial Literacy (FL) as Independent Variable: The impact of financial literacy (FL) on fintech adoption (FA) is insignificant results with direct path to FA and significant with indirect path.Fintech Promotion (FP) as Mediator: Fintech promotion (FP) appears to play a mediating role between the independent variables (DS, CT, SM, and potentially FL) and the dependent variable (FA). This means that fintech promotion can help to strengthen the relationships between these variables and ultimately lead to increased fintech adoption.

5.5.6. Pathways and Significance Levels:

The arrows in the path model represent the pathways between the variables. The p-values associated with each path coefficient indicate the statistical significance of the relationship. A lower p-value suggests a more statistically significant relationship.

5.5.7. Significance Levels:

A lower p-value (typically less than 0.05) suggests that the relationship is statistically significant, meaning it is less likely due to chance.

Table 08: Results of PLS-SEM

	Original sample	Mean	Stdev	T value	P value
CT->FA	**0.326**	**0.321**	**0.064**	**5.113**	**0.000**
CT->FP	**0.260**	**0.256**	**0.073**	**3.559**	**0.000**
DS->FA	**0.285**	**0.289**	**0.064**	**4.439**	**0.000**
DS->FP	**0.045**	**0.049**	**0.068**	**0.668**	**0.504**
FL->FA	**0.029**	**0.032**	**0.051**	**0.575**	**0.566**
FL->FP	**0.263**	**0.270**	**0.059**	**4.477**	**0.000**
FP->FA	**0.123**	**0.123**	**0.052**	**2.371**	**0.018**
SM->FA	**0.046**	**0.041**	**0.048**	**0.950**	**0.342**
SM->FP	**0.177**	**0.144**	**0.117**	**1.511**	**0.131**

5.5.8. Hypothesis 'Testing and Results

H, states that data security is predicted to have positive influence on fintech adoption . Table 3 results confirmed this hypothesis with path with p value of 0.000 and t-value of 4.439 .In H2, financial literacy is predicted to be not strongly influenced influenced to adopt fintech adoption and the results in Table 3 supported H with the path with p value of 0.566 and the t-value of 0.575. In H3 customer trust is predicted to be positively influenced by to adopt fintech adoption with p value of 0.00 and t value of 5.133. In H4 social media shows no insignificant results as no strong impact has been seen with p value of 0.342 and t value of 1.511. In H5 the the indirect pathway of of data security to fintech adoption through fintech promotion shows no mediation with p value of 0.504 and t value of 0.668. In H6 the mediating role of fintech promotion between finacial literacy and fintech adoption shows significant results as mediation exists with p value of 0.00 and t value of 4.477. In H7 the mediating role of fintech promotion between customer trust and fintech adoption shows significant tesult mediation exists with p value of 0.00 and t value of 3.559. In H8 the mediating role of fintech promotion between social media influence and fintech adoption shows insignificant results as no mediation exists between them with p value of 0.131 and t value of 1.511(Gafoor & Amilan, 2024; K. A. Islam & Khan, 2024; Jafri et al., 2024).

5.5.9. Cronbach's alpha

Cronbach's alpha is a measure of internal consistency reliability, commonly used in psychology, education, and other fields to assess the reliability of a scale or questionnaire. The value of Cronbach's alpha ranges from 0 to 1. Generally, higher values indicate greater internal consistency reliability. Common thresholds for interpretation may vary, but typically 0.7 or higher is considered acceptable for research purposes and 0.9 or higher is considered excellent. In the table above the cronbach's alpha value of CT is 0.872 which is considered as a good value higher than 0.7. The value of DS and FA both are also higher than 0.7 and considered as hood values shows significance. The alpha value of FL, FP and SM are less than 0.7 which suggests that the internal consistency reliability of the scale may be questionable.

6. Discussion

With high T-values (5.113 and 4.439, respectively) and p-values below 0.01, the structural model results show that Financial Awareness (FA) is highly influenced by Customer Trust (CT) and Digital Security (DS), indicating great statistical significance. Furthermore, FA is significantly impacted by Fintech Promotion (FP) (T = 2.371, p = 0.018), indicating that FP mediates or reinforces the relationship between antecedent factors and awareness outcomes. FinTech's accessibility makes it simpler for customers to use digital platforms to access a range of financial goods. Due to a number of dangers and the way the market views its products; FinTech adoption is regrettably still quite low. These results are consistent with those of (Hidayat-ur-Rehman, 2024; Jafri et al., 2024)who highlighted the importance of perceived data security and customer trust in influencing Fintech adoption in Pakistan, especially in relation to their impact on consumer awareness and confidence. Additionally, the substantial path from CT to FP (T = 3.559, p = 0.000) confirms (Liu et al., 2024) finding that trust promotes successful Fintech promotion efforts in addition to directly driving adoption.

Conversely, the model shows that social media (SM) and financial literacy (FL) have little predictive power. Although these characteristics may theoretically support Fintech adoption, their effects are less direct or may be mediated through other dimensions, as evidenced by the lack of

statistical significance (p-values > 0.05) for the paths from FL to FA and SM to FA/FP. In contrast, research like that conducted by (Alkhwaldi, 2024) indicated that user innovativeness and financial literacy had a substantial impact on Fintech participation, suggesting that there may be cultural or contextual variations at play. It's interesting to note that the path from FL to FP is significant (T = 4.477, p = 0.000), indicating that users' reaction to Fintech advertisements is improved by financial literacy. For fintech businesses operating in these areas, social media techniques improve client loyalty, brand awareness, and trust. The study evaluates their effects on brand equity characteristics like brand awareness, perceived quality, and brand associations and identifies the essential components of successful social media marketing, such as influencer alliances, interactive campaigns, and high-quality content.

The measuring model's prior issues with poor validity and reliability are supported by the insignificant effect of SM on both FA and FP. As also suggested by (Kurniasari, Abd Hamid, & Lestari, 2025), who discovered that digital marketing is only successful when appropriately targeted and contextually integrated, these findings point to the necessity of either improving the measurement of the SM construct or reevaluating its place in Fintech adoption models.

According to the structural model's findings, in the Pakistani context, Financial Awareness (FA) and Fintech Promotion (FP) are significantly enhanced by Customer Trust (CT) and Digital Security (DS). This implies that customers in Pakistan become more conscious and are more likely to react favorably to promotional activities when they believe their data is safe and they have faith in the Fintech platforms. The substantial impact of CT on both FA and FP is consistent with Pakistan's escalating worries about cyber security and digital fraud, which have been key obstacles to the country's adoption of new technologies(Gafoor & Amilan, 2024; K. A. Islam & Khan, 2024).

The findings also showed that data security has a strong direct impact on Fintech adoption, just like in previous research, proving that safeguarding user data helps reduce the risks people worry about. However, since data security is not strongly linked to Fintech promotion, this could mean that security promises do not always help promote Fintech products, possibly because consumers are not receiving the message in the right way(Gafoor & Amilan, 2024).Interestingly, people’s financial knowledge did not

directly influence their use of Fintech (Jafri et al., 2024).Rather, people's understanding of finances played a bigger role in promoting Fintech, suggesting that education mainly helps people become more open to such efforts, instead of leading them to use the services. It seems that in Pakistan, teaching people about finances should be combined with smart marketing to encourage them to use the services(Vasishta, Singla, & Deep, 2024).

According to the findings, social media had little effect on the adoption and promotion of Fintech. This is different from what and other studies report which suggest that social media plays a key role in promoting digital banking. This disparity may be caused by things like the effectiveness of social media campaigns and people's doubts about online content in Pakistan, therefore, better and more trusted digital marketing strategies are needed(Jafri et al., 2024).

Finally, promoting Fintech became a key factor that connected the other factors to Fintech adoption, making it even more important. This agrees with the view of (Jafri et al., 2024) that promotional activities play an important role in connecting what users know with what they actually use. Conclusively, the study adds to the existing research on Fintech adoption in developing countries by explaining how trust, security, literacy and promotions work together. They suggest that trust-building, strong security and focused education are key factors in speeding up the adoption of Fintech in Pakistan's financial sector.

Conclusion

The study aimed to find out how Customer Trust, Data Security, Financial Literacy and Social Media Influence affect Fintech Adoption and whether Fintech Promotion plays a mediating role in Pakistan's financial sector. Smart PLS analysis of data from 379 bank customers revealed that Customer Trust and Data Security are main factors behind the use of Fintech, proving that users consider these aspects vital in their choices. It was also found that Fintech Promotion played a key role, especially in ensuring that knowledge about Financial Literacy was put into practice by the public. Contrary to expectations, Social Media Influence did not show a strong direct or indirect effect which means that in Pakistan, social platforms are not as influential in driving Fintech use unless they are supported by reliable and helpful information. The fact that Financial

Literacy does not strongly affect adoption on its own suggests that people need help and encouragement to use it. All of these findings together shed light on the relationship of psychological, informational and promotional factors in the adoption of Fintech in a developing country.

From a practical standpoint, the outcomes suggest that Fintech stakeholders and policymakers should work on building trust, ensuring strong cyber security and creating financial education efforts that are widely promoted to fill the gap between awareness and practice. In sum, this study not only validates established theoretical models but also provides suggestions for Fintech strategies in countries where people do not trust institutions and digital use is still low.

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APPENDIX

Variables and their Operationalization

The constructs of this study are as follows:

Nature	Variable	Operationalization	References
Independent	Data Security	• Perceived security • Compensation and responsibility • Concerns and prioritization • Confidentiality and privacy	(zhang et 2023) (dawood et al., 2021)
	Social media Influence	• Role of social media • Consideration based on Recommendations • Influence on trustworthiness	(kang, 2018)
		• Financial knowledge • Understanding of financial products • Financial decision-	(stewart & jürjens, 2018)

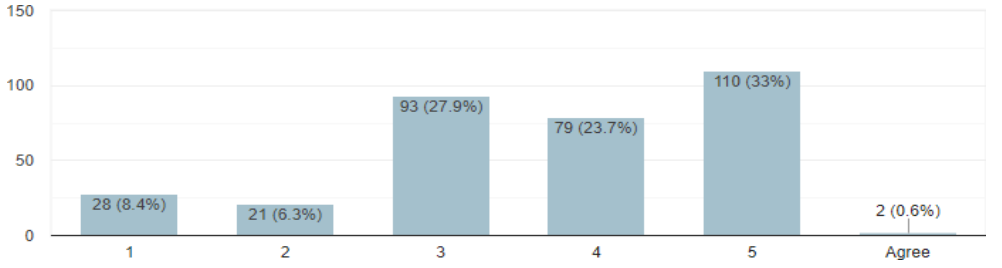
		making • User experience • Perceived benefits	(panos & wilson, 2020) (morgan & trinh, 2020)
	Financial Literacy		

	CUSTOMER TRUST		
DEPENDENT	FINTECH ADOPTION	• Intentions to Adopt Fintech Services • Current Adoption Behavior Recommendations and Word-of-Mouth	(Allen et al., 2021) (Morgan & Trinh, 2020)
		•	
MEDIATOR	FINTECH PROMOTION	• Interest in Mobile Banking • Value for Money • Recommendation Intent • Perception of Products/Services • Trust in Data Security • Trust in Financial Security	(Zhang 2023) (Nguyen 2020) (Chen et al., 2022)

Results

Fintech Adoption

Customers of banks accepted and agreed with 23.7% and strongly agreed with 33% which shows the result that customers who are using Fintech will continue using it.

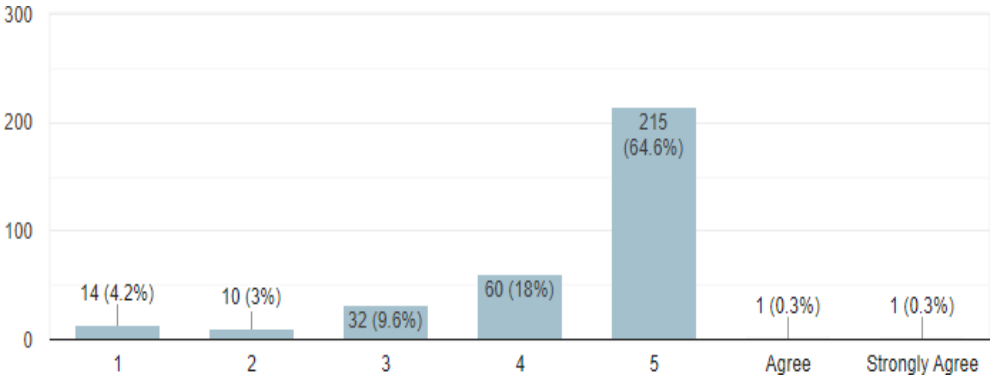


Fintech Adoption	Rate
Strongly Disagreed	**8.4%**
Disagree	**6.3%**
Neutral	**27.9%**
Agree	**23.7%**

Strongly Agree	**33%**

Data Security:

Customers of Commercial banks of Pakistan have agreed with 18% and strongly agreed with 60% that banks should increase data security.

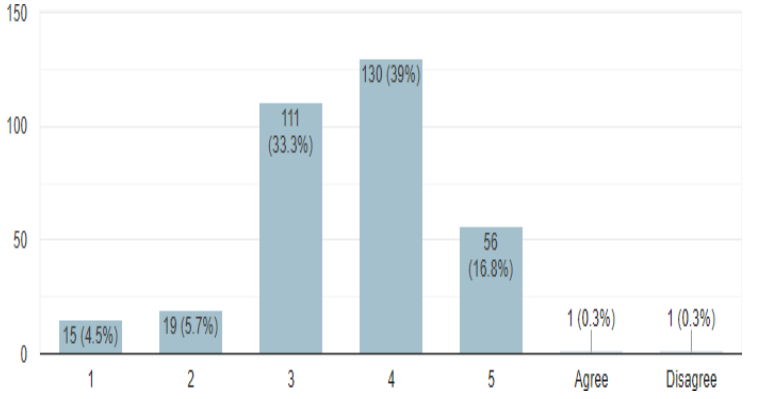


Fintech Adoption	Rate
Strongly Disagreed	**8.4%**
Disagree	**6.3%**
Neutral	**27.9%**
Agree	**23.7%**
Strongly Agree	**33%**

Customer Trust: Agreeing rate of customers that

trust Fintech Services are 39% and 16% which shows that customer trust Fintech Services.

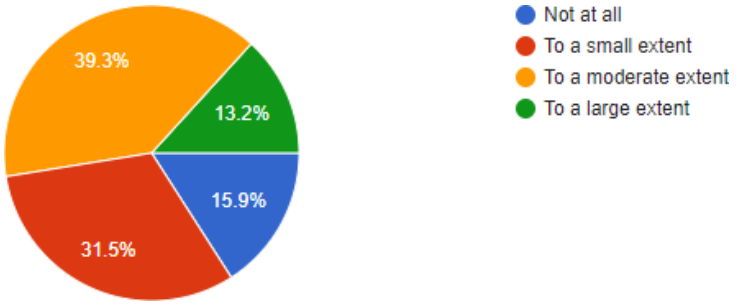
Customer Trust	Rate
Strongly Disagreed	**4.5%**
Disagree	**5.7%**
Neutral	**33.3%**
Agree	**39%**
Strongly Agree	**16.8%**



Social Media Influence:

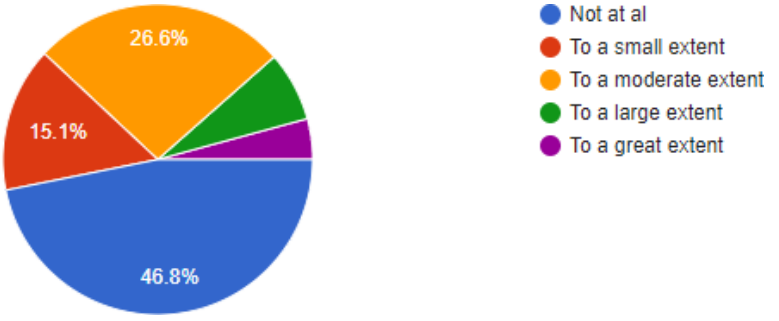
The results in the response of customers that they have influenced by social media to adopt Fintech

services are 15% customers believe in not at all while 31.5% believe in a very small extent. Results shows that customers are not majorly influenced by social media to adopt Fintech services as they are more concern about their data security



Financial Literacy:

Customers of commercial banks of Pakistan accepted by 46.8% that they have not participated in any financial literacy program to promote Fintech services. A minority of 7% has agreed on it



Questionnaire

Primary data has been collected using Questionnaire, as behavioral intentions of individuals

can only be gauged directly from the source. A Likert Scale with range; 1 = strongly disagree,

2= disagree, 3= neutral, 4= agree and 5= strongly agree

Data Security:

- I believe that banks provide enough security on their websites or mobile applications.

- My bank provides compensation for losses due to mobile banking fraud.

- I believe that I am secured using mobile online banking.

- I believe that the bank should take steps to increase mobile banking security.

- I have major concerns with data security when using mobile banking.

- My bank is responsible for my security while I am using mobile banking.

- Security aspect is the most important concern for me when using mobile banking.

- I think that my bank's mobile banking is safe.

- There are secure infrastructure platforms in mobile baking systems.

- Application downloaded from my mobile phone's app is good enough to secure my data.

- I carry out my banking transactions on my mobile device safely.

- I am much concerned about the security of mobile banking.

- Confidentiality of information is protected in mobile banking systems.

- I believe, while using my mobile banking someone may capture my calls or data.

Fintech Promotion:

- Promotion is crucial to boost my interest in mobile banking.

- Fintech services provide better value for money compared to traditional financial services.

- I am likely to recommend fintech services to others.

Fintech Services Adoption:

- If I already used Fintech services, then I am agreeing to remain using them.

- I would like to use Fintech services soon.

- I will praise Fintech services to my friends.

Customer Trust:

- I trust Fintech services to retain my private information secure and safe.

- In total, I am sure that Fintech services are trustable.

- This bank provides good products and services.

- I trust in my financial security whenever using Fintech services.

Social Media Influence:

- To what extent does social media (Facebook, Twitter, Instagram) shape your awareness of

Fintech services by commercial banks in Pakistan, and how does this impact your trust?

- Have you considered using Fintech services based on social media information, and how

does this affect your trust?

- Do you believe social media has influenced your perception of the trustworthiness of

Fintech services by commercial banks in Pakistan, and if so, how?

Financial Literacy:

- How confident are you in your knowledge of financial concepts like savings, investments,

and budgeting?

- Are you familiar with various financial products and services offered by banks, including

savings accounts, loans, and investment options?

- How comfortable are you in making financial decisions, such as selecting investment

options or managing debt?

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The Effects of Environmental Degradation and Institutional Quality on Inclusive Human Development in Asia

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Abstract: Social justice, economic expansion, and environmental sustainability are all parts of the broad idea of inclusive human development. Encouraging inclusive human development in Asia is hampered by the problems caused by environmental degradation and poor institutional quality. This study examines the effect of environmental degradation and institutional quality on inclusive human development for 30 Asian countries over the period 2010-2023. The analysis of balanced panel of Asia is performed at aggregated and disaggregated level. The panel has been disaggregated on the basis of income level of countries i.e. high income, upper middle income, and lower middle income countries. The empirical evidences are based on Fixed Effect and Random Effect techniques. The Driscoll-Kraay Standard Errors technique is applied to take into account the autocorrelation and heteroskedasticity to present results more precisely. The empirical results of the study show that environmental degradation has negative and significant effect on inclusive human development, while governance has positive impact on inclusive human development in Asia. The impact of environmental degradation and institutional quality is negative on inclusive human development in high income countries. However, in upper and lower middle income countries institutional quality has positive effect on inclusive human development. In the end to ensure sensitivity of regression parameters with respect to sign, significance and magnitude, sensitivity analysis has been performed by taking into consideration different proxies of environmental degradation. Better environmental policies and strengthening financial institutions are especially needed to increase environmental sustainability and promoting financial inclusion therefore, policymakers should give the top priority to environment and institutions for inclusive human development.

Keyword: Inclusive Human Development, Environmental Degradation, Institutional Quality, Asia

1. Introduction

The sustained levels of human development and economic growth over a longer span of time are perquisite for sustainable development and inclusive growth of a country, and also making sure that everyone in a

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country can contribute and reap the benefits of development (Ndikumana, 2013). According to the Asian Development Bank (2014), inclusive human development is defined as the methods used to guarantee the equal allocation of resources, protection of citizens' rights, social security, and equal approach to both public and private services. Inclusive human development is important for progress of countries as without inclusive human development nations suffer long term delays in economic progress by hindering the best use of talent and reducing incentives for building human capital. Over the past twenty years, there has been an increase in global income and health inequalities. In several areas of the world concerns about the possible effects of growing inequality on social and economic stability as well as the sustainability of growth have increased in light of the global crisis and the recent unrest. Asia is not exempt from these worries, as decision-makers seek solutions to curb growing inequality and promote inclusive prosperity.

Though, Asia has had incredible progress in recent years, but there is rising worry that the rewards have not been distributed equally. An increasing number of Asian nations are establishing inclusive growth as the objective of development strategy in recognition of the potentially detrimental social, economic, and political effects of these developments. According to World Economic Forums Report (2023) Asian region frequently faces issues that are more severe than the rest of the world. In the Asia Pacific area, CO2 emissions account for about half of global emissions. Among the top 10 countries most impacted by climate change in the last 20 years are four South-East Asian countries: Thailand, Vietnam, the Philippines, and Myanmar. Furthermore, a 3.2 degree Celsius increase in temperature is expected to put 37% of the GDP of Association of South East Asian Nations (ASEAN) at risk.

As per United Nations Development Program (UNDP) Report, low levels of human development in developing countries are associated with weak social ties and slower economic growth, both of which make it more difficult to achieve sustainable development (UNDP, 2019). Therefore,

the notion of inclusive human development has gained significant attention in global development forums, particularly as a fundamental component of the Sustainable Development Goals (SDGs), which form the core of the United Nations' (UN) development agenda for the years 2016–2030. The focal point of it is the 17 Sustainable Development Goals (SDGs), which are an urgent call to action for all countries, developed and developing, in a global partnership. Among these 17 Goals of SDG's, the decrease of inequality is the focus of SDG-10, climate action is the responsibility of SDG-13, and strong institutions are the responsibility of SDG-16. The developed and developing world realize that, in addition to fostering economic progress, tackling climate change, safeguarding our oceans and forests, enhancing health and education, and reducing inequality are all necessary to eradicate poverty and other types of deprivation. Consequently, the enhancement of inclusive human development is given the highest priority in developing nations in both national and international development programs.

Among various other determinants that influence inclusive human development, environmental degradation and institutional quality are the two key determinants which play an important role. In literature there are various measures which are employed to measure environmental degradation. Some of these are CO2 emissions, bio capacity, and ecological footprint. Among these measures ecological footprint is the most suitable measure of environmental degradation as the primary indicator of environmental degradation employed in the past studies mainly concentrates on air pollution. To take into account environmental degradation, air quality is not the only indicator (Hunjra et al., 2020; Adebayo, 2023). This justifies the use of the ecological footprint as a more complete indicator of environmental quality.

Ecological Footprint is defined as the ecological resources required by a given population to produce goods and services they consume in their daily life and to take up its waste produced, particularly

carbon emissions (Global Footprint Network 2017). The social and economic fabric of a nation or region is seriously threatened by environmental degradation. Extreme environmental degradation can upset vital life-sustaining processes, resulting in problems including scarcity of food and water, public health emergencies, and working capacity of population. Aongu and Odhiambo (2018) concluded that increasing CO2 emissions have negative effect on inclusive human development. This indicates policy makers should focus on reduction of CO2 emissions which are potentially damaging to human development. The effects on industry, agriculture, and general economic stability can also be profound. The climate change and global warming have been more prevalent in recent decades as greenhouse gas emissions are commonly blamed for some of the world's problems. The natural environment of humans and other animals on earth is now seriously threatened by environmental degradation (Hunjra et al., 2020). The avalanche of carbon dioxide emissions (CO2) that are being released to the atmosphere as a result of humans consuming fossil fuels best explains the mounting concerns about the unparalleled environmental damage. The world has also seen an enormous decline in environmental quality, which is a direct outcome of people's growing desire for economic growth through the misuse of natural resources (Nathaniel & Bekun, 2020). According to the report of World Meteorological Organization (2024), there were 79 disasters throughout Asia in 2023 that were linked to hydro-meteorological hazard experiences. Eighty percent of these had something to do with storms and floods, resulting in nearly two thousand deaths and directly affecting nine million people. It shows that environmental degradation directly effects the components of IHDI.

Institutional quality, the second determinant influencing inclusive human development, which is examined in the past studies through governance. In a 1989 World Bank report on Africa, the concept of governance was given a contemporary definition: "the exercise of political power to manage a nation's affairs." In 1992, the World Bank changed its

definition of governance to include "the process through which authority is applied to the management of a nation's social and economic resources for development." Political stability, voice and accountability, government effectiveness, regulatory quality, control of corruption, and rule of law are the six indicators of good governance that are used in the past studies to gain a better understanding of institutional quality. Good governance has concentrated on increasing the efficacy and efficiency of institutions and rules in order to achieve equity, participation, openness, responsiveness, accountability, and the rule of law. These components are crucial to human development and the eradication of poverty since the weak and impoverished are usually the ones who bear the most from ineffective institutions.

Development organizations are realizing more and more that effective governance is not only a desirable end in itself but also a way to influence many other outcomes, most notably economic development and growth (Gisselquist, 2012). High levels of corruption cause tax evasion in nations with weak governments, taking money away from potentially beneficial public investments and impoverished peoples social programs. Government expenditures in health, education, and infrastructure are likely not being used efficiently to reduce poverty and achieve wider development goals due to the states low administrative capability and the service providers' inadequate transparency to the public (World Bank 2004). As stated by former UN Secretary-General Kofi Annan, "the single most important element in eliminating poverty and advancing development" is strong governance (UNDP 2002). Therefore, putting an emphasis on the quality of institutions is crucial for achieving other inclusive human development goals, such as reducing poverty, and achieving socio-economic prosperity (Olanrewaju et al., 2019).

The present study is very significant as it empirically observe the effect of environmental degradation and institutional quality on inclusive human development in Asian countries. There are several reasons why this

research is considered relevant in academic circles, including (i) the connection between inclusive human development and environmental sustainability have relevance with the post-2015 Sustainable Development Goals (SDGs); (ii) the problems associated with environmental degradation; and (iii) the contribution of improved institutional quality to environmental sustainability. Furthermore, this study is the most significant contribution to the existing literature due to two novel reasons. Firstly, it uses refined measures of inclusive human development (inequality-adjusted human development index) and environmental degradation (ecological footprint). Secondly, this study provides detailed empirical analysis of aggregated and disaggregated Asian panel. To the best of understanding and knowledge, the existing literature provides limited information about the empirical relationship of inclusive human development, ecological footprint and governance.

The organization of the study is as follow: After introduction, chapter two reports the literature of past studies pertaining to the effect of environmental degradation and institutional quality on inclusive human development. Chapter three comprised of the theoretical background of the study. In chapter four details of the data has been provided. Furthermore, it provides the specification of the model and the econometric techniques that are being employed to estimate the model. Chapter five discusses the empirical results of the study. Chapter six gives the details of conclusion, recommendations, and limitations.

2. Literature Review

Over the past two eras, various scholars have studied the impact of environmental degradation on economic growth, but there has been lesser research that has considered the environmental degradation and governance influence on the inclusive human development. The relevance of this research is based on a multitude of reasons in scholarly circles, namely (i) The relevance of Inclusive human development and

sustainability of environment with post 2015 Sustainable development goals (SDG's), (ii) issues surrounding the environmental degradation, (iii) the role of better institutional quality in enhancing sustainability of environment. These various factors are further extended in the same order as they are presented above.

First, the inclusive human development is the key theme in Sustainable development goals and its importance is even more crucial in Asia as severe poverty has been reducing in all the region of the world, while transitioning from the millennium development goals (MDGs) to sustainable development goals (SDGs) except for Asia. The dramatic decline in rate of poverty is well documented in some parts of the Asia while other countries have experienced less consistent growth. As the number of people living less than $1 a day decreased from 31% to 20% in 1990-2001 (Cook, 2006). Asia previously has witnessed the sound economic performance which was severely damaged by the financial collapse of 1997-1998. The highest growth has been experienced by the developing economies of Asia and Pacific with aggregate GDP expanding by 7.3% (Cook, 2006). Logically, this persistent course of economic growth has positive impact on emissions of greenhouse gases (GHG) which constitute a threat for the sustainability of environment which is a subject matter in the post 2015 development goals. Environmental degradation has an effect on the elements of Inequality adjusted human development index (IHDI). It mainly affects health, longevity, education, and standard of living. Firstly, In the presence of atmospheric pollution and absence of good transportation facilities, environmental deterioration directly affects the capability of parents to send their children to school. Curie et al. (2009) examined the impact of air pollution on school absence utilizing the data of 39 largest school districts in Texas for the academic year 1996-2001. The result of the study show significant and positive impact of CO2 emissions on school absences. Furthermore, such air pollution can affect the abilities of students to study efficiently in the classroom. Clark et al. (2012) studied the impact of air pollution

associated with traffic on the health of children and cognition by using sample of 719 children from 22 schools near London's Heathrow Airport. By multiple level modelling the conclusion of the study reveals that the impact of air pollution on children's health and cognition was moderate in school but the exposure to the noise of aircrafts was significantly affecting the conceptual recall memory of children in school. After adjustment for nitrogen dioxide the result show that the noise from aircraft pollution is also associated with poorer reading comprehension.

Secondly, there is a direct impact of environmental degradation or pollution on the health and life span of individuals. (Rich 2017 & Boogaard et al., 2017) Undertook an accountability study to observe the effect of air quality on the health of citizens. In this study the comprehensive review of the various studies show that improved air quality leads to beneficial health responses. As the results of most studies indicates that 1 micro gram per meter cubic decrease in annual country average SO2 associated with less infants and also increases infants weights and lengths. The increased emissions of SO2 in the atmosphere increases the prevalence of bronchitis, frequent colds, and febrile infections. Environmental degradation also affects the workers ability in a family to find work efficiently. This in turn can have an impact on a family's income. Zivin & Neidell (2012) studied the influence of pollution on the productivity of workers. The result of the study show that there is a 5.5 percent change in the productivity of worker due to 10ppb[1] change in average ozone exposure.

Second, environmental sustainability is the most important concern of sustainable development goal's agenda. This issue in Asia is based on two main factors, (i) the staggering indication of energy setback and (ii) Results of worldwide environmental degradation. According to Asian development bank's (ADB) report of 2013, more than 600 million population of Asia do not have access to sustainable and accessible

[1] PPB = Parts Per Billion is a unit of measurement for ozone exposure

modern electricity, which is important to attain the goals of sustainable development. There is abundant literature that shows the linkages between CO2 emissions, energy consumption and economics growth. There are two main aspects that make up the related literature. The first aspect of literature describes the relation between environmental degradation and economic growth, particularly focusing on Environmental Kuznets Curve (EKC) hypothesis. Akbostanci, Turut-Asi, & Tunc (2009) examined the two levels association between quality of environment and income for Turkey. First, using cointegration techniques, the linkage between per capita income and CO2 emissions was observed by using time series model. In the second step, by using PM10 and SO2 measurement, the association between income and air pollution was observed. The results of both panel data and time series do not favor the Environmental Kuznets Curve hypothesis. Similarly, Diao et al. (2009) studied the relationship between quality of environment and economic growth in China. Another research was conducted in Canada over a time span of 57 years to observe Environmental Kuznets Curve for CO2 (He & Richard, 2010). The results of the study show little evidence in favor of EKC hypothesis.

The second aspect of literature consists of further two sub aspects. On one hand there is literature which shows the nexus between economic growth and consumption of energy while on the other hand, the literature shows relationship between economic growth, pollution and consumption of energy. Akinlo (2008) observed the causal linkage between economic growth and energy consumption for time period 1980-2003 for eleven sub Saharan African countries. By employing Autoregressive distributed lag (ARDL) technique, the outcomes of the study indicates that in some countries consumption of energy has positive impact on economic growth in long run. While for two countries Ghana and Zimbabwe the relationship is negative. The remaining countries show bidirectional relationship.

Another similar study was conducted in Seven African countries to observe the causal linkage between growth and energy over the time period 1970-2007 (Esso, 2010). By using Cointegration technique the results of the study reveals that there is positive and significant long run impact of economic growth on energy consumption for 5 African countries before 1988, after that this effect becomes negative for two countries in Ghana and South Africa. While in other countries the results show unidirectional relationship for some countries and bidirectional relationship for the remaining countries. Olusegun (2008) observed the association between economic growth and consumption of energy in Nigeria for the time period 1970-2005. By employing ARDL techniques the results of the study show unidirectional causal linkage between economic growth and consumption of energy.

Ang (2007) using cointegration technique observed the causal association between consumption of energy, CO2 emissions and output in France for time period 1960-2000. The empirical outcomes of the study show that more CO2 emissions results due to more usage of energy, and in long run output and CO2 emissions have quadratic relationship. Furthermore, Apergis and Payne (2009) extended this research of Ang (2007) to observe causal relationship among energy usage, CO2 emissions and output for six Central American countries over the period of 1971-2004. The outcomes of the research support Ang (2007) energy usage has positive and significant effect on the CO2 emissions and output. These outcomes also validate the Environmental Kuznets Curve (EKC) hypothesis that emissions of CO2 growing with real output, stabilizing and then declining. Boluk and Mehmat (2015) examined the potential of renewable energy in decreasing the effects of Greenhouse Gas (GHG) emissions in both short and long run in Turkey for time period 1961-2010. The result of the study supports the previous literature as the EKC is U shaped both in long and short run. The overall results of the studies show that nonrenewable energy usage has positive relationship with emissions of CO2. So, in order to prevent environment, countries should focus on

utilizing the renewable energy as it shows negative relationship with CO2 emissions.

The other major reason that environmental sustainability is important concern for Asia is global environmental degradation. Asongu and Odhiambo (2018) examined the impact of degradation of environment on inclusive human development for 44 sub-Saharan African countries for the time period 2000-2012. The fixed effect, Tobit regression, and Generalized Method of Moments (GMM) methods were employed to get empirical results. The net outcomes reveal that increasing CO2 emissions have negative effect on inclusive human development. Furthermore, this paper suggest that the detrimental effects of CO2 could be reduced by relying on mechanisms like Information and communication technologies (ICT). As the transportation costs can be saved by utilizing ICT's and such savings can be ultimately used for education and health expenditure. Asongu, Roux and Biekpe (2017) investigated that how Information and communication technologies (ICT) accompany CO2 emissions to impact inclusive human development over the period 2000-2012 for 44 sub-Sahara Africa countries. By employing GMM techniques the results proves the Asongu and Odhiambo (2018) suggestions. As the results reveal that ICT can be used to decrease the negative impact of environmental pollution on inclusive human development.

Third, there is abundant literature that supports the view that political will is important in addressing the policy disorders of degrading environment, especially by taking into consideration sustainable development Goals. Tamazian & Rao (2010) observed that whether institutional and financial development matter for environmental degradation by using sample of 24 transition economies over a period of 1993-2004. By using GMM technique, they found that both financial development and institutional quality matters for environmental performance. Furthermore, the study suggests that government can assist in improving environment by establishing strong institutional structures that will have long term effect

in the reducing Greenhouse GHGs emissions. Aongu & Odhiambo (2020) used same econometric technique of GMM and examined the importance of governance in mediating environmental degradation effect on inclusive human development over the period 2000-2012 in 44 Sub Saharan African nations. By employing GMM, the outcomes of the study reveal that Institutional quality modulates CO2 emission in exerting negative impact on the inclusive human development but the net effects are positive which shows good governance is needed to be improved in order to attain net positive effect.

Good governance plays important role in achieving inclusive human development. Pradhan and Sanyal (2011) examined the effect of good governance on Human development in 15 Indian states. At first they examined the quality of governance and status of human development in Indian states and after that they examined the influence of good governance on human development. The empirical result of the study show that in the Indian economy, good governance is important element to achieve human development.

Stylianou, Nasir and Waqas (2023) investigated the nexus of Governance and inclusive human development for selected Asian countries over the period 2010-2017. In a regression model six indicators of governance have been employed as an independent variable. To develop overall governance index principal component analysis was used. The outcomes of the study show, variables have strong causal association among each other. Moreover, the important finding of the study is the bidirectional causality association between Inequality Adjusted Human Development Index (IHDI) and development expenditure. Similarly, Keser and Gokmen (2018) examined the relation of Human Development Level and indicators of governance for 33 member countries of European Union (EU) over the period 2002-2012. The results of the study indicates positive linkage between governance and human development. Which indicates that better quality of governance in any country can improve the human development.

Ouma and Nadzanja (2019) studied the effect of governance and fiscal policies on human development for 19 common Market for Eastern and Southern Africa (COSMEA) countries for the time period 1990-2016. By employing GMM techniques, the result of the work show, good governance and fiscal policy has positive and significant effect on human development. Scholl and Schermuly (2020) investigated the effect of corruption on human development and gross domestic product. The findings reveal, GDP has positive effect on human development and corruption has negative influence on human development. Similarly Brada et al. (2019) observed the linkage between corruption and human development over a period 1990-2018 in 45 developing countries. The findings are consistent with Scholl and Schermuly (2020) that corrupt nations get less Foreign Direct Investment (FDI) and GDP has a significant relationship with human development while on the other hand the relationship of human development and corruption is negative. The overall findings of the literature show that good governance is the potential factor to achieve inclusive human development.

The overall review of the literature shows that impact of environmental degradation on inclusive human development is negative as it impacts negatively the determinants of IHDI like health, education, and income. The effects of Governance observed in various countries are positive as political stability and institutional quality plays important part in the development of a country. To enhance inclusive human development Asian countries should improve their Governance and environment quality.

The study of the past literature show that researchers have mainly examined effect of environmental degradation and governance on Economic growth and Human. There are few studies in which effect of environmental degradation and governance has been observed on the inclusive human development but these studies have not actively observed the relationship of environmental degradation, institutional quality, and

inclusive human development for Asian countries. As the study of literature shows that most of studies are conducted in African nations. Furthermore, this study employs more refined measure of environmental degradation (ecological footprint) and inclusive human development (inequality adjusted human development index). This study is set out to fill the research gap and it will put up to the existing literature by observing the effect of environmental degradation and institutional quality on inclusive human development in Asia.

3. Data and Model Specification

In this research balanced panel data is employed to observe long run effect of environmental degradation and institutional quality on inclusive human development for selected Asian countries. The time period taken in this study is from 2010-2023. The effect of environmental degradation and institutional quality on inclusive human development is examined for thirty selected Asian countries. The countries which have been included in this study are Cyprus, Georgia, Israel, Japan, Kazakhstan, Russian Federation, Thailand, Turkey, Armenia, Azerbaijan, China, Egypt, Indonesia, Iran, Jordan, Maldives, Mongolia, Sri Lanka, Viet Nam, Kyrgyz Republic, Philippines, Bangladesh, Bhutan, Cambodia, India, Iraq, Nepal, Tajikistan, Pakistan, and Yemen. Some countries of Asian region have been excluded due to non-availability of data.

The secondary source of data is employed in this study. Inequality Adjusted Human Development Index (IHDI) is taken as dependent variable and data for this variable is taken from United Nations Development Program (UNDP) reports. The data for independent variable ecological footprint (bio capacity global hectares per person) as proxy of environmental degradation is taken from Global Footprint Network. Governance is taken as a proxy of institutional quality and its data is taken from World Governance Indicators (WGI). The data for control variables, Financial Development Index (FDIN) is taken from International

Monetary Fund (IMF), while Globalization and RGDP growth is taken from World Development Indicators (WDI).

Table 4.1: Description of the Variables

Variables	Symbols	Proxies	Unit of Measurements	Expected Signs	Data Sources
Dependent Variable					
Inclusive Human Development	$IHDI_{it}$	Inequality adjusted human development index	Index (0-1)		UNDP Reports
Independent Variables					
Environmental Degradation	ECF_{it}	Ecological Footprint	Global Hectares per person	-	Global Footprint Network
Institutional Quality	GOV_{it}	Governance	Index (0-100)	+	World Governance Indicators
Control Variables					
Financial Development	$FDIN_{it}$	Financial Development Index	Index (0-1)	+	IMF
Globalization	$ECGIN_{it}$	Economic Globalization	Index (0-100)	+	KOF
Economic Growth	$RGDP_{it}$	Real GDP Growth	Percentage	+, -	World Bank Indicators

The model employed in this study empirically estimates the long run effect of environmental degradation and institutional quality on inclusive human development. The econometric equation of the model is as follows:

$$IHDI_{it} = \alpha + \beta_1 ECF_{it} + \beta_2 GOV_{it} + \beta_3 ECGIN_{it} + \beta_4 FDIN_{it} + \beta_4 RGDP_{it} + \varepsilon_{it}$$

Where,

$IHDI_{it}$ = Inequality Adjusted Human Development Index

ECF_{it} = Ecological Footprint measured as global hectares per person

GOV_{it} = Governance Index

$ECGIN_{it}$ = Economic Globalization Index

$FDIN_{it}$ = Financial Development Index

$RGDP_{it}$ = Real GDP (Growth Rate)

ε_{it} = Residual

As the data is of panel nature so in the above equation “i” indicates the number of cross sections, and “t” shows time, “α” in equation represents intercept, while β represents the coefficients, and "ε" is residual.

4. Estimation Technique and Results

There are several econometric methods that can be employed to estimate the model. The panel data often exhibits problem of Cross-Sectional Dependence (CD) which gives potentially distorting and incompetent results, therefore, at first CD test are applied on the model. Based on the results of CD, Unit root tests are applied to check for stationarity in model. To estimate panel data to check for the regression,

there are three approaches Pooled Ordinary Least Square (POLS), Fixed Effect (FE), and Random Effect (RE) among others. In this study, to control for the unobserved heterogeneity, fixed effect and random effect approaches are employed. Then, to select most appropriate model between Fixed and Random Effect, Hausman test is applied. Then, to check for the autocorrelation and heteroskedasticity problem, post estimation techniques are applied including Wooldridge and modified Wald test. Given the presence of serial autocorrelation and heteroskedasticity in the model, Generalized Least Square (GLS) test is applied to find results more precisely. In the end to check for the sensitivity of independent variables with respect to sign, significance, and magnitude sensitivity analysis has been performed by taking the different proxies of environmental degradation.

Firstly, CD test is applied, selection of the first generation unit root test and second generation unit root test is based on the p-value of CD test. To check for stationarity of panel data set, first generation panel unit root IPS (lm, Pesaran, & Shin) test and second generation unit root test CIPS (Cross-Sectionally Augmented IPS) test are employed.
The results of panel unit root tests are given in the table 4.1

Table 4.1: Panel Unit Root Results

Variables	CD Test (p-values)	CIPS (Level)	1st Difference CIPS	Decision
$\mathbf{IHDI_{it}}$	43.95 (0.000)	-2.443	……..	I(0)
$\mathbf{ECF_{it}}$	4.18 (0.000)	-2.638	……..	I(0)
$\mathbf{GOV_{it}}$	3.33 (0.001)	-2.037	-3.272	I(1)
$\mathbf{ECGIN_{it}}$	2.43 (0.015)	-1.686	-3.556	I(1)

$FDIN_{it}$	28.83 (0.000)	-2.744	……..	I(0)
$RGDP_{it}$	32.91 (0.000)	-2.820	……..	I(0)

The results of study show that all variables IHD_{it}, ECF_{it}, GOV_{it}, $ECGIN_{it}$, $FDIN_{it}$, and $RGDP_{it}$ are cross sectional dependent as the p value is significant for the variables. Then, second generation unit root test CIPS test is applied keeping in view results of CD test. The results of CIPS test show that variables, $IHDI_{it}$, ECF_{it}, $FDIN_{it}$, and $RGDP_{it}$ are stationary at integrated level [I (0)], whereas the variables GOV_{it}, and $ECGIN_{it}$ are stationary at integrated level [I (1)].

The econometrics techniques which are chosen to check effect of environmental degradation and institutional quality on inclusive human development are, REM and FEM. In order to choose most appropriate technique between FEM and REM, Hausman test is usually applied. The results of Hausman test are provided in table 4.2 which determine most appropriate model between FEM and REM for panel data estimation.

Table 4.2: Hausman Test Result

Region	Chi^2 **Test Statistics**	$Prob > Chi^2$	**Conclusion**
Asia	18.33	0.0026	Fixed effect model is appropriate
High Income Countries	23.60	0.0000	Fixed effect model is appropriate
Upper Middle Income Countries	2.53	0.7716	Random effect model is appropriate
Lower Middle Income Countries	10.36	0.0658	Random effect model is appropriate

Ho: Random Effect Model is suitable; **Ha**: Fixed Effect Model is suitable.

To check for the most suitable model between FEM and REM, if value of Chi-square probability value > 0.05, the REM is most suitable and if Chi-square probability < 0.05, the FEM is preferred for estimation. As the table 4.2 given above indicates that chi-square probability value for Hausman test in Asia is 0.0026, which is less than 0.05, it means the FEM is most preferred technique given the characteristics of data set. The chi-square probability value for high income countries is 0.0000 which is less than 0.05 which indicates that FEM is appropriate. The decision for upper middle income countries based on the chi-square probability value which is 0.7716 shows that REM is appropriate. Similarly for lower income countries REM is appropriate technique as the value of chi-square probability is greater than 0.05. Table 4.3 gives results of fixed effect model.

Table 4.3: Fixed Effect Model Results (Overall Asia)

Asia			
Variables	**Fixed effect Model**		
	Coefficients	**P-values**	**Std. Errs.**
ECF_{it}	-0.0103*	0.015	0.0042
GOV_{it}	0.0003	0.394	0.0004
$ECGIN_{it}$	0.0011*	0.025	0.0005
$FDIN_{it}$	0.4215*	0.000	0.0398
$RGDP_{it}$	-0.0002	0.146	0.0002
Constant	0.3979*	0.000	0.0304

Diagnostic Test Results	**Wald test**: prob>chi2= 0.0000		**Decision:** Presence of Heteroskedasticity
	Woolgridge test: prob > F= 0.0019		Presence of Autocorrelation

Note: * shows variable is significant.

The study further enhances the empirical analysis of FEM through serial autocorrelation and heteroskedasticity across the panel by applying Wooldridge test and Wald test. The results of Wooldridge test shows that there is presence of serial autocorrelation in the dataset, as the value of probability is 0.0019 which is < 0.05. If the prob. > 0.05, it indicates the absence of serial autocorrelation. When there is presence of autocorrelation and heteroskedasticity in the model then results cannot be interpreted with precision therefore, Driscoll-Kraay Standard Error is taken into consideration. As it is clear in the table 4.3 that present study has the presence of serial autocorrelation, therefore Driscoll-Kraay Standard Error test has been performed.

Table 4.4 gives results of regression with Driscoll-Kraay Standard Errors which is applied to solve the problem of autocorrelation and heteroskedasticity in the model.

Table 4.4: Results with Driscoll-Kraay Standard Errors

	Asia		
Variables	**Driscoll-Kraay Standard Errors**		
	Coefficients	**P-values**	**Drisc/Kraay Std. Errs.**
$\mathbf{ECF_{it}}$	-0.0103*	0.000	0.0019
$\mathbf{GOV_{it}}$	0.0003	0.487	0.0004

$ECGIN_{it}$	0.0011*	0.027	0.0004
$FDIN_{it}$	0.4215*	0.000	0.0679
$RGDP_{it}$	-0.0002	0.123	0.0002
Constant	0.3979*	0.000	0.0182

Notes: * shows variable is significant.

The results in the table 4.4 permits the formulation of equation by utilizing the list of coefficients of estimated parameters. The equation for the model can be represented as follow; $IHDI_{it} = 0.397 - 0.0103ECF_{it} + 0.0003GOV_{it} + 0.0011ECGIN_{it} + 0.4215FDIN_{it} - 0.0001RGDP_{it} \ldots$ (1)

The given results show that ecological footprint and governance have negative and positive effect on the inclusive human development respectively. The control variables, financial development index, and economic globalization, are also positive which indicates their positive relationship with inclusive human development. The sign for GDP growth is negative which shows the negative association with inclusive human development.

The coefficient of ECF_{it} has negative but significant relationship with inclusive human development. This means that, one unit increase in ECF_{it} on average has decreased inclusive human development by 0.0103 units. As degradation of the environment causes limitation on the access to natural resources like fertile land, clean air and water, which in turn increases inequality and poverty, it further decreases opportunities which are essential for economic participation, especially in agricultural nations (Asonghu, 2018). Environmental degradation also affects the workers ability in a family to find work effectively or work efficiently. This in turn can impact a family's income. This present results are in line with Zivin & Neidell (2012) who studied, impact of pollution on worker's productivity. The negative relationship of ECF_{it} with inclusive human development is

also in line with the Asongu et al. (2017) who found that inclusive human development is negatively affected by carbon dioxide degradation. It also align with results of Asongu and Odhiambo (2019) in which they studied the relationship of environmental degradation and inclusive human development for 44 Sub-Saharan African countries.

Coefficient of GOV_{it} shows positive and insignificant relationship of institutional quality with inclusive human development. The aforementioned outcome indicates that these nations' well-being is evenly enhanced by the advantages of institutional quality. Consequently, less developed economies such as those in Asia benefit from institutional quality, which creates an environment that is favorable to their needs and offers advantages like equitable resource distribution, high levels of education, good health, and jobs with greater growth potential (Nginyu et al; 2023). The positive results of the governance show that the Asian countries have the capacity to boost inclusive human development through excellent governance. This finding align with outcomes of Yinusa et al. (2020), and Olanrewaju et al. (2019) who observed that institutional quality plays positive role in driving inclusive growth in Nigeria. It is also in accordance with the results of Stylianou et al., (2023) who confirmed the positive relationship of institutional quality and inclusive human development in Africa.

Financial development has positive and significant relationship with inclusive human development in Asia during 2010-2023. One unit increase in financial development has caused the increase in inclusive human development by 0.4215 units. Financial development plays important role in social and human development, as it promotes inclusive growth (Kebede et al., 2021). As financial system of a country improves like improvement in banking and access to credit it ultimately leads to increased growth opportunities, innovation and enhanced investment opportunities which in turn improves inclusive human development. Positive and significant relationship of financial development indicates that it causes improvement in inclusive human development by enhancing

infrastructure, creating employment opportunities, improving economic resources, and increasing financial inclusion (Masoud, and Hardaker, 2012). The results of the study are consistent with Dutta and Singh (2019) who concluded that financial development significantly and positively impacts inclusive human development in case of Asian countries.

Economic globalization has positive and significant effect on inclusive human development, which indicates that one unit improvement in economic globalization has caused 0.0011 unit increase in inclusive human development. The results of the study proves that globalization enhances inclusive human development, which clearly suggests that Asian countries should increase engagement in liberalization to improve inclusiveness in human development. As the integration of countries increases, they experience improvement in transfer of technology, flow of capital, trade and innovation which in turn leads to enhanced economic growth and ultimately to improved inclusive human development. Globalization have the potential to enhance the access to better goods, innovation and services which benefits health care, distribution of income and education, which directly improves inclusive human development (Ali et al; 2021). This result is in accordance with previous studies Asongu & Nwachukwu (2016), and Ullah & Azim (2015).

The results of the GDP growth show that it has negative and statistically insignificant impact on inclusive human development. The negative relationship of economic growth is due to the fact that economic growth often concerned about aggregate output, which does not always turn into the equitable distribution of resources which ultimately leads to the improvement in the living conditions of the small segments of a society (Masoud and Hardaker; 2012). The negative impact of RGDP can be attributed to uneven distribution of benefits gained through growth. In most of the cases economic growth enhances wealth without necessarily increasing access to healthcare, education, and inequality which causes negative relationship of RGDP with inclusive human development. These

negative results of RGDP are consistent with the study of stewart et al. (2018).

Table 4.5: Fixed Effect and Random Effect Model Results of Disaggregated Asian Panel

Variables	High Income Countries	Upper-Middle Income Countries	Lower-Middle Income Countries
	Fixed Effect Model	Random Effect Model	Random Effect Model
	Coefficients P-values Std. Errs.	Coefficients P-values Std. Errs.	Coefficients P-values Std. Errs.
ECF_{it}	-0.5491* 0.020 0.0054	-0.0007 0.706 0.0064	0.0048* 0.665 0.112
GOV_{it}	-0.0022* 0.008 0.0008	0.0012 0.165 0.0090	0.0015* 0.018 0.006
$ECGIN_{it}$	0.0049* 0.000 0.0009	0.0031* 0.003 0.019	-0.0008 0.180 0.0006
$FDIN_{it}$	0.1743* 0.019 0.072	0.0017* 0.004 0.125	0.2485* 0.001 0.7310
$RGDP_{it}$	-0.005 0.486 0.009	-0.0067* 0.012 0.0004	-0.0002 0.282 0.0001
Constant	0.549* 0.000 0.005	0.4310* 0.000 0.0521	0.4331 0.665 0.112
Diagnostic Test Results			
High Income Countries	Wald test: prob>chi2= 0.7792		**Decision** Absence of Heteroskedasticity
	Woolgridge test: prob > F= 0.0021		Presence of Autocorrelation

Upper Middle Income	Wald test: prob>chi2= 0.0000	Presence of Heteroskedasticity
	Woolgridge test: prob > F= 0.0536	Presence of Autocorrelation
Lower Middle Income	Wald test: prob>chi2= 0.0000	Presence of Heteroskedasticity
	Woolgridge test: prob > F= 0.1569	Absence of Autocorrelation

Notes: * shows variable is significant.

The table 4.5 gives the results of FEM and REM for disaggregated Asian panel. As firstly Hausman test is applied to select most suitable model between FEM and REM. The results of the Hausman test suggested FEM for high income countries and REM for upper middle and lower middle income countries. The study further enhances empirical analysis of FEM and REM through serial autocorrelation and heteroskedasticity across the panel by applying Wooldridge test and Wald test. The results of Wooldridge test shows that there is presence of serial autocorrelation in dataset, as value for probability is 0.0021 in high income countries which is < 0.05. If the prob. > 0.05, it indicates the absence of serial autocorrelation. The same issue of autocorrelation and heteroskedacity is present in upper middle income and lower middle countries. When there is presence of autocorrelation and heteroskedasticity in the model then results cannot be interpreted with precision therefore, Driscoll-Kraay Standard Error is taken into consideration. As it is clear in the table 4.5 that present study has the presence of serial autocorrelation, therefore Driscoll-Kraay Standard Error has been performed.

Table 4.6: Results with Driscoll-Kraay Standard Errors and REM Generalized Least Square (GLS)

Variables	High Income Countries	Upper-Middle Income Countries	Lower-Middle Income Countries
	Driscoll-Kraay Standard Errors	REM Generalized Least Square (GLS) Results	REM Generalized Least Square (GLS) Results
	Coefficients P-values Drisc/Kraay Std. Errs.	Coefficients P-values Std. Errs.	Coefficients P-values Std. Errs.
ECF_{it}	-0.0132* 0.006 0.004	-0.0001 0.917 0.0016	-0.0101 0.215 0.0081
GOV_{it}	-0.0022* 0.003 0.0006	0.0015* 0.001 0.0004	0.0018* 0.000 0.0005
$ECGIN_{it}$	0.0049* 0.000 0.0049	0.0014* 0.004 0.0005	0.0024* 0.000 0.0003
$FDIN_{it}$	0.1743* 0.049 0.0679	0.0009 0.796 0.0003	-0.0011 0.982 0.0509
$RGDP_{it}$	-0.0005 0.658 0.0011	0.00005 0.724 0.0004	0.0001 0.345 0.0001
Constant	0.5491* 0.000 0.0605	0.4702* 0.000 0.0280	0.3219* 0.000 0.0236

Note: * shows variable is significant.

The table 4.6 shows that in high income countries, ecological footprint has negative and significant effect on Inclusive Human development. However, the impact of ecological footprint in upper and lower middle income countries is negative and insignificant. One unit increase in ECF has caused 0.0132 unit decreases in inclusive human

development in high income countries. The negative effect of ecological footprint indicates that as ECF increases it causes more degradation of the environment which in turn decreases inclusive human development by effecting its determinants like education, income and health. Global environmental degradation and ecological damage have resulted from the industrialization process' overuse and depletion of resources that are renewable, jeopardizing people's advancement and existence (Mahmoud et al., 2020). The negative results of ECF are aligned with the study of Asongu and Odhiambo (2019) who found that ECF negatively effects IHDI by taking into consideration 44 sub-Saharan African countries.

Governance has negative and significant impact on IHDI in high income countries, while the impact of governance in upper and lower middle income countries is positive and significant. One unit increases in governance has caused 0.0022 units decline in IHDI in high income countries. While in upper and lower middle income countries one unit rise in governance has caused to 0.0015 and 0.0018 unit improvement in IHDI respectively. The foundation of any nation's successful development is its governance, especially its quality of government. As the presence of excellent governance is essential in every economy, particularly to achieve better economic growth and human development. The aforementioned sectors are all necessary for a thriving nation (Brautigam, 1991). The negative effect of governance in high income countries represents high political instability, corruption, state capture, and rent seeking behavior in region. Positive results of governance are in accordance with study of Stylianou et al., (2023) who confirmed that governance plays positive role in enhancing IHDI for African countries.

Economic globalization have positive and significant impact on IHDI in all the regions of Asia based on income classification. One unit increase in economic globalization has resulted in 0.0049, 0.0014, 0.0024 unit improvement in IHDI in high, upper and lower middle income countries respectively. Access to better products, innovations, and services might be

improved by globalization, which would boost health care, distribution of income, and education, all of which would directly contribute to more inclusive human development (Ali et al; 2021). Positive and significant results of globalization are aligned with Asongu & Nwachukwu (2016).

Financial development has positive and significant effect in case of high income countries. However, in case of upper middle income countries this effect is positive but insignificant and in lower middle income countries financial development has negative and insignificant effect on IHDI. One unit rise in financial development has caused 0.1743 unit increase in IHDI in high income countries. By strengthening economic resources, generating jobs, expanding financial inclusion, and upgrading infrastructure, financial development has a positive association with inclusive human development (Masoud and Hardaker, 2012). Therefore, countries having improved financial system has better IHDI. The results are in accordance with previous studies like Dutta and Singh (2019).

Economic growth has negative and insignificant effect on IHDI for high income countries, however, this effect is positive in upper and lower middle income countries but insignificant. One reason for the negative effect of RGDP is the unequal distribution of growth-related benefits. Economic expansion typically increases income without necessarily expanding access to healthcare, education, and inequality, which results in a negative correlation between RGDP and inclusive human development. The positive impact of economic growth indicates that benefits of growth have positive impact on income, health, and education of people. The results of the study align with stewart et al. (2018). Low income countries are excluded from the analysis as there is only one country in low income classification so the formation of panel is not possible.

To ensure sensitivity of regression parameters with respect to sign, significance and magnitude, sensitivity analysis has been performed by taking into consideration different proxies of environmental degradation. The table 4.7 presents the results of the panel regression.

Table 4.7: Robustness Results

Dependent Variable: $IHDI_{it}$				
Variables		(1)	(2)	(3)
		Coefficients (p-values) [Std Errs.]	Coefficients (p-values) [Std Errs.]	Coefficients (p-values) [Std Errs.]
ED	ECF_{it}	-0.0132 (0.006) [0.004]	…….	…….
	$BIOC_{it}$	…….	0.002 (0.553) [0.0037]	…….
	CO_{2it}	……	……	-0.0015 (0.484) [.0020]
GOV_{it}		0.0003 (0.487) [0.0004]	0.0017 (0.000) [0.0001]	0.0002 (0.565) [0.0004]
$ECGIN_{it}$		0.0011 (0.027) [0.0005]	0.0026 (0.000) [0.0002]	0.0011 (0.019) [0.0004]
$FDIN_{it}$		0.247 (0.049) [0.0168]	0.4215 (0.000) [0.0679]	0.4109 (0.000) [0.0673]
$RGDP_{it}$		-0.0002 (0.123) [0.0001]	0.0001 (0.301) [0.0001]	-0.0002 (0.148) [.0001]
Constant		0.3979 (0.000) [0.0182]	0.281 (0.000) [0.0115]	0.3802 (0.000) [0.0195]

In the table 4.7, column 1 represents the baseline results while column 2 and 3 represents the results of Bio capacity (BIOC) and Carbon dioxide emissions (CO2) respectively. The results of environmental

degradation become negative in the column 3 and are positive in column 1. These signs of the variables are different than the baseline model. As bio capacity increases it reduces the environmental degradation and which in turn increases the inclusive human development. In the similar way the results of ECF and CO2 have negative sign which shows that increase in these variables cause increase in environmental degradation which in turn reduces inclusive human development. The sign and magnitude of ECF variables suggest that these are moderately robust. The Governance variables have same signs and magnitude which shows that these are moderately robust, while the results for economic globalization indicate the same sign, magnitude, and significance, which shows that it is strongly robust. The financial development index is moderately robust as its signs and significance remains same with different proxies of environmental degradation. The results of economic growth also shows the moderately robust results. From table 5.7 it is concluded that countries should improve their environment quality by increasing bio capacity and reducing CO2 emissions and ECF to enhance inclusive human development.

The table 4.8 provides robustness results for disaggregated Asian panel. To observe the sensitivity of variables with respect to sign, significance and magnitude different proxies of environmental degradation are employed.

Table 4.8: Robustness results for disaggregated Asian panel

Dependent Variable: $IHDI_{it}$				
High Income Countries				
Variables		**(1)**	**(2)**	**(3)**
		Coefficients (p-values) [Std Errs.]	**Coefficients (p-values) [Std Errs.]**	**Coefficients (p-values) [Std Errs.]**
ED	ECF_{it}	-0.0103 (0.000) [.00197]	…….	…….
	$BIOC_{it}$	……	0.0567 (0.002) [0.0141]	…….
	CO_{2it}	……	……	-0.0118 (0.000) [0.0020]
GOV_{it}		-0.0022 (0.487) [0.0006]	-0.0025 (0.000) [0.0004]	-0.0023 (0.006) [0.0007]
$ECGIN_{it}$		0.0049 (0.000) [0.0009]	0.0005 (0.000) [0.0008]	0.0049 (0.000) [0.0010]
$FDIN_{it}$		0.1743 (0.049) [0.0801]	0.1047 (0.268) [0.0905]	0.1358 (0.088) [0.0735]
$RGDP_{it}$		-0.0005 (0.658) [0.0011]	-0.0008 (0.434) [0.0010]	-0.0003 (0.737) [0.0008]
Constant		0.5491 (0.000) [0.0605]	0.3708 (0.000) [0.0501]	0.6157 (0.000) [0.0731]
Upper Middle Income Countries				

Variables		(1)	(2)	(3)
		Coefficients (p-values) [Std Errs.]	**Coefficients (p-values) [Std Errs.]**	**Coefficients (p-values) [Std Errs.]**
ED	**ECF_{it}**	-0.001 (0.917) [0.0016]	…….	…….
	$BIOC_{it}$	……...	-0.0009 (0.314) [0.0009]	…….
	CO_{2it}	……	……	0.0120 (0.000) [0.0017]
GOV_{it}		0.0017 (0.001) [0.0004]	0.0015 (0.000) [0.0004]	0.0017 (0.000) [0.0017]
$ECGIN_{it}$		0.0014 (0.004) [0.0005]	0.0014 (0.005) [0.0005]	0.0023 (0.000) [0.0004]
$FDIN_{it}$		0.00009 (0.796) [0.0003]	0.00006 (0.862) [0.0003]	-0.0103 (0.000) [0.0015]
$RGDP_{it}$		0.00005 (0.724) [0.0001]	0.0001 (0.475) [0.0001]	-0.00001 (0.943) [0.0001]
Constant		0.4702 (0.000) [0.0280]	0.4782 (0.000) [0.0263]	0.3689 (0.000) [0.0205]
Lower Middle Income Countries				
Variables		**(1)**	**(2)**	**(3)**
		Coefficients (p-values) [Std Errs.]	**Coefficients (p-values) [Std Errs.]**	**Coefficients (p-values) [Std Errs.]**

ED	$\mathbf{ECF_{it}}$	-0.0101 (0.215) [0.0081]	…….	…….
	$\boldsymbol{BIOC_{it}}$		-0.0079 (0.091) [0.0047]	…….
	$\boldsymbol{CO_{2it}}$	……	……	0.0255 (0.000) [0.0058]
$\mathbf{GOV_{it}}$		0.0018 (0.000) [0.0005]	0.0010 (0.025) [0.0004]	0.0011 (0.023) [0.0005]
$\mathbf{ECGIN_{it}}$		0.0024 (0.000) [0.0003]	0.0016 (0.000) [0.0004]	0.0017 (0.000) [0.0003]
$\mathbf{FDIN_{it}}$		-0.0011 (0.982) [0.0509]	-0.0113 (0.843) [0.0569]	0.0119 (0.832) [0.0564]
$\mathbf{RGDP_{it}}$		0.0001 (0.345) [0.0001]	0.00001 (0.878) [0.0001]	0.00007 (0.644) [0.0001]
Constant		0.3219 (0.000) [0.0236]	0.3759 (0.000) [0.0276]	0.3350 (0.000) [0.0205]

In table 4.8, column 1 provides baseline results while column 2 and 3 presents results of bio capacity (BIOC) and carbon dioxide emissions (CO2). Robustness results of ECF in case of high income countries show that ECF is moderately robust as sign and significance of variables remains same. However, in case of upper and lower middle income countries ECF is not robust with respect to sign, significance and magnitude. Governance is moderately robust in case of high income countries as the sign and magnitude is same. In upper and lower middle income countries governance is strongly robust with respect to sign, significance and magnitude. Economic globalization is highly robust in all

three regions. Financial development is not robust in case of high, upper and lower middle income countries as the sign and significance is different with different proxies of environmental degradation. In case of high and lower income countries RGDP is weakly robust with respect to sign, while in case of upper middle income countries RGDP is not robust.

5. Conclusion and Recommendations

Social justice, economic expansion, and environmental sustainability are all parts of the broad idea of inclusive human development. Encouraging inclusive human development in Asia is hampered by the problems caused by environmental degradation and poor institutional quality. This study has examined how environmental degradation and institutional quality impacts inclusive human development in long run in case of Asian countries. The time period of study is from 2010 to 2023. The study uses balanced panel data of 30 Asian for aggregated and disaggregated analysis of Asian countries has been performed. The disaggregation of Asian countries is based on the level of income i.e. high income, upper middle income, lower middle income, and low income countries. Inclusive human development is used as dependent variable and the explanatory variables are environmental degradation, institutional quality, economic globalization, financial development, and economic growth. Inclusive human development is measured through inequality adjusted human development index. Environmental degradation is measured through ecological footprint global hectares per person. Whereas institutional quality is measured through governance index. The six different dimensions of governance is used and by taking the average of these dimensions governance index is generated. Financial development is measured through financial development index, and economic growth is measured through Real GDP growth. The cross sectional dependence test is applied for the selection of first and second panel unit root tests. The empirical evidence of study are based on FEM and REM techniques. Hausman test is applied after fixed effect and random effect technique to select most appropriate technique. To check the presence of serial

autocorrelation and heteroskedasticity, Wooldridge and Wald test has been applied. Then to present results more precisely Driscoll-Kraay Standard Errors has been performed. In the end to ensure sensitivity of regression parameters with respect to sign, significance and magnitude, sensitivity analysis has been performed by taking into consideration different proxies of environmental degradation

The empirical results show that relationship between institutional quality and inclusive human development is positive. It shows that improvement in institutional quality in Asian countries increases inclusive human development. The proxy variable of environmental degradation also has negative but significant impact on inclusive human development. The negative results of environmental degradation indicates that degraded environment due to deforestation, resource depletion and pollution causes reduction in access to clean air and water which are necessary for healthy living and well-being of individuals. Globalization and financial development also have positive impact on inclusive human development. The impact of economic growth is negative on inclusive human development. Conclusively, it is observed that improvement in the quality of environment and institutions can lead to equitable distribution of resources, better health, poverty reduction, and enhanced education facilities which are crucial for the inclusive development of a country.

The empirical results of disaggregated Asian panel shows that ecological footprint has negative and significant effect on Inclusive Human development. However, the impact of ecological footprint in upper and lower middle income countries is negative and insignificant. Governance has negative and significant impact on IHDI in high income countries, while the impact of governance in upper and lower middle income countries is positive and significant. Economic globalization have positive and significant impact on IHDI in all the regions of Asia based on income classification. Financial development has positive and significant effect in case of high income countries. However, in case of upper middle income

countries this effect is positive but insignificant and in lower middle income countries financial development has negative and insignificant effect on IHDI. Economic growth has negative and insignificant effect on IHDI for high income countries, however, this effect is positive in upper and lower middle income countries but insignificant.

The findings have broadly proved that improved environment and institutional quality can be employed to increase inclusive human development. Accordingly it has been established that (i) institutional quality complements inclusive human development; (ii) Degraded environment has negative impact on inclusive human development. It is concluded, adoption of better environment and improved institutional quality could enhance the standard of living of people by increasing inclusive human development.

The results of the study suggest some strong policy recommendations for Asian countries. These recommendations highlights the importance of institutional quality and environment for inclusive human development.

1. Better environmental policies are especially needed to increase environmental sustainability, therefore, policymakers should give the top priority to environment for inclusive human development especially in high, upper and lower middle income countries. As the clean air and water provides better health and education top the individuals which in turn leads to enhanced development.
2. In order to accomplish much-desired broad-based inclusive human development and productive employment growth, governments of Asian countries should use their state roles to mobilize both natural and human resources for equal socio-economic possibilities. Policy makers should give top priority to the institutions in high income, lower and upper middle income countries for better inclusive human development.

3. Policy makers should focus on strengthening financial institutions, promoting financial inclusion, and encouraging long term investment to increase inclusive human development, particularly focusing on high, upper and lower middle income countries.
4. The policies of globalization like export diversification and investment in infrastructure can give boost to local industries and improve global competitiveness which ultimately leads to increased inclusive human development in Asian regions.

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The Dynamics of Interest Rates and Their Role in Shaping the Structural Reforms of the IMF

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Abstract: This study explores the dynamics of IMF loan interest rates and their role in shaping economic and social outcomes in borrowing countries, while also assessing implications for the Fund's liquidity and long-term sustainability. Drawing on IMF and World Bank annual data for 2010–2025, we employ an econometric framework to evaluate how changes in lending rates influence GDP growth, poverty, unemployment, and repayment performance. Results show a consistent pattern: lower rates are associated with faster growth, reduced poverty and unemployment, and stronger IMF liquidity via improved repayment discipline and higher program uptake. Even amid global disruptions (e.g., COVID-19), the long-run relationship between lower borrowing costs and macroeconomic stability remains evident. Interest-rate policy is therefore a strategic design lever not a mere technical parameter capable of balancing the IMF's financial sustainability with members' developmental needs.

Keywords: IMF, loan interest rates, economic growth, poverty alleviation, unemployment, liquidity sustainability.

1.Introduction

The aftermath of the COVID-19 pandemic, coupled with successive global shocks in energy, food, and finance, has sharply increased borrowing costs and widened fiscal gaps across developing and highly indebted economies. In this context, the International Monetary Fund (IMF) has remained a pivotal institution, offering financial assistance and

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structural reform programs. While a substantial body of literature has examined the conditionality dimension of IMF programs, much less attention has been devoted to the interest rate channel as a determinant of both borrowing countries' policy space and the Fund's own liquidity. This gap in the literature is increasingly relevant as the IMF adjusts its lending frameworks under unprecedented global uncertainty (IMF, 2023; IMF, 2024).

This study directly addresses that gap by extending the dataset to 2010–2025, thus capturing not only the post-global financial crisis period but also the pandemic and the subsequent tightening of global monetary conditions. Earlier contributions often stopped at 2020, which limited their ability to reflect the most recent dynamics in IMF lending and repayment performance. By integrating updated figures from the World Economic Outlook, the World Development Indicators, and the IMF's financial statistics, the analysis provides a more robust empirical foundation for understanding how interest-rate dynamics shape macroeconomic and institutional outcomes.

The objective is twofold: first, to assess the marginal effect of IMF lending rates on growth, unemployment, and poverty in borrowing countries; and second, to evaluate how these dynamics interact with the Fund's own liquidity and repayment stability. This dual perspective allows us to test whether lowering borrowing costs truly expands fiscal space for social spending and reform without undermining the IMF's lending capacity.

To achieve this, the paper employs a panel framework with country fixed effects and addresses reverse causality using an instrumental-variables approach. The SDR-linked base charge is employed as an external instrument for lending rates, and diagnostic tests (first-stage F-statistics and Hansen's J test) are conducted to ensure robustness. Control variables such as debt-to-GDP, inflation, trade openness, and program type are incorporated to isolate the marginal effect of interest rates.

The study is guided by the following research questions:

1. To what extent do changes in IMF loan interest rates influence growth, unemployment, and poverty trajectories in borrowing economies?
2. Does lower borrowing cost create fiscal space that enables more gradual and socially protective structural reforms?
3. How do such dynamics affect the IMF's own liquidity position—does improved repayment and quota management offset reduced interest income?

From these, three testable hypotheses are derived:

- H1: Lower IMF lending rates are associated with a statistically significant increase in GDP growth.
- H2: Reduced interest rates contribute to gradual declines in unemployment and poverty.
- H3: When combined with prudent quota management and stable repayment behavior, lower lending rates do not undermine IMF liquidity over the medium term.

The contributions of this paper are threefold. First, it provides an updated dataset through 2025 that captures both crisis and recovery phases. Second, it integrates institutional liquidity outcomes with macro-social indicators in a unified framework. Third, it links the empirical findings to policy implications by emphasizing interest-rate flexibility and social-spending protection as essential elements of IMF program design. The remainder of the paper proceeds as follows: Section 2 reviews the relevant literature, Section 3 outlines the methodology and data, Section 4 presents and discusses the results, and Section 5 concludes with separate conclusions and policy recommendations in line with reviewers' guidance.

2.Literature review

2.1. IMF lending beyond conditionality: why the interest-rate channel matters

The classic debate on IMF programs has centered on conditionality its scope, stringency, and distributional effects while treating the lending interest rate largely as background. Yet the rate charged on IMF facilities directly shapes a borrower's fiscal space, the speed of recovery, and political feasibility of reforms. Recent IMF reports (IMF, 2023; 2024) acknowledge this channel explicitly as lending frameworks evolved during and after COVID-19. Parallel scholarship has documented that program design can constrain policy space (Stubbs, Kentikelenis, & King, 2023) and that norm shifts inside the Fund have been gradual rather than wholesale (Kentikelenis & Babb, 2022). Taken together, these strands suggest that the price of IMF finance deserves analytical weight comparable to conditions attached to it.

2.2. Interest rates, fiscal space, and growth

Lower official borrowing costs relax the intertemporal budget constraint, crowding-in public investment and protecting productive current spending. Cross-country work links cheaper official finance to milder output losses and faster rebounds where policy uncertainty is high. In IMF programs specifically, concessional or lower rates reduce rollover risk and the fiscal effort needed just to stabilize debt, which other things equal supports growth. The mechanism is straightforward: lower rates reduce interest bill pressure, enabling investment in infrastructure and human capital with higher multipliers. Updated descriptive evidence since 2020 (WEO; IMF Financial Statistics, 2023–2024) shows expanded program uptake alongside strong demand for concessional windows, consistent with this mechanism.

2.3. Distributional and labor-market outcomes: poverty and unemployment

A second strand considers social outcomes. Earlier critiques associated IMF programs with contractionary adjustments; more recent evidence nuances this view. Where lending terms are affordable and social-spending floors are credible, adverse distributional effects are attenuated, and poverty/unemployment decline more steadily as recoveries take hold (Kentikelenis, Stubbs, & King, 2015; Stubbs et al., 2023). The post-pandemic pivot toward protecting health, education, and social protection in program design interacts positively with lower borrowing costs: the latter makes such protections financeable without undermining debt sustainability. This paper extends that literature by quantifying the

interest-rate channel on poverty and unemployment over 2010–2025, rather than stopping at 2020.

2.4. The Fund's own constraint liquidity, quotas, and repayment

Any assessment of "cheaper" IMF lending must consider institutional sustainability. IMF liquidity depends on quota resources, precautionary balances, and crucially, repayment behavior. Lower rates reduce interest income, but if they also stabilize programs and improve repayment performance, liquidity may be preserved or even strengthened. IMF Annual Reports (2023; 2024) document quota increases and continued precautionary balance targets; the question is whether reduced pricing erodes these buffers. The literature on IMF finances argues that stable repayments and periodic quota reviews can offset lower income, provided lending volumes and arrears remain contained (Lang, 2021). Our study explicitly links borrower outcomes to IMF liquidity metrics, a junction often treated qualitatively rather than estimated.

2.5. Identification challenges and current best practice

Causality is difficult: interest rates are not randomly assigned. Countries facing deeper crises may obtain concessional terms and have worse outcomes, biasing simple correlations. The modern approach instruments the IMF lending rate with external or formula-based components of the Fund's SDR-linked base charge and uses panel fixed effects with rich controls to absorb unobserved heterogeneity. Weak-instrument risks require first-stage F-tests and over-identification checks (Stock & Yogo, 2005).

Recent applied work on IMF lending stresses careful attention to endogeneity and program selection (Stubbs et al., 2020). We follow that frontier, extending the horizon to 2025 and reporting full diagnostics.

2.6. Where the literature still falls short and what this paper contributes

Three gaps remain. First, most empirical papers end in 2020 and therefore miss the pandemic and post-pandemic tightening cycle when interest-rate dynamics were most salient. Second, studies often examine macro or social outcomes separately from IMF balance-sheet considerations; few estimate both within a unified framework. Third, identification strategies are sometimes under-powered or not reported transparently.

This paper contributes by extending the dataset to 2010–2025 using consistent WEO/WDI/IMF financial series, estimating the marginal effect of the IMF lending rate on growth, unemployment, and poverty, mapping that to institutional liquidity and repayments and implementing an IV panel design with SDR-linked instrumentation and full robustness diagnostics.

3.Methodology

3.1. Empirical Strategy

To capture the causal effect of IMF loan interest rates on borrowing countries' macroeconomic and social performance, the study employs a

two-stage least squares (2SLS) instrumental variable regression within a panel data framework. This choice addresses the well-known endogeneity problem in IMF lending: countries facing deeper crises are more likely to obtain concessional terms, which would bias simple OLS estimates. Following best practice (Stock & Yogo, 2005; Stubbs et al., 2020), the IV approach ensures that estimated coefficients reflect the genuine impact of interest rates rather than the severity of crises or unobserved policy preferences.

The baseline functional form is:

$$Y_{\{it\}} = a + b1\ IR_{\{it\}} + b2\ X_{\{it\}} + mu_i + l_t + e_{\{it\}}$$

where $Y_{\{it\}}$ represents the outcome of interest (GDP growth, poverty rate, unemployment rate, IMF liquidity ratio) for country i at time t; $IR_{\{it\}}$ denotes the average IMF loan interest rate; $X_{\{it\}}$ is a vector of control variables (structural reform implementation, fiscal adjustment, inflation, external debt, exchange rate volatility, trade openness); mu_i are country fixed effects; and l_t are year fixed effects capturing global shocks.

Estimation sample: 2010–2020 (core 2SLS estimates).

Descriptive extensions: 2021–2025 (with 2025 as author's projections).

To avoid conflating structural relationships with pandemic-era shocks, the core 2SLS estimates use 2010–2020. Years 2021–2025 are reported descriptively to demonstrate the external validity of the pattern.

We report first-stage F-statistics (Stock–Yogo) and Hansen's J for over-identification; country and year fixed effects are included; standard errors are clustered at the country level.

The first stage uses the IMF's SDR-based base rate formula and the probability of receiving concessional facilities as instruments. These variables are predetermined by global market conditions and IMF policy rules, making them strongly correlated with actual interest rates but plausibly exogenous to short-run domestic outcomes (Lang, 2021).

To avoid conflating structural relationships with pandemic-era shocks, the core 2SLS estimates use the period 2010–2020. Years 2021–2025 are reported descriptively (with 2025 as the author's projections) to demonstrate the external validity of the observed pattern.

3.3 Data Sources and Coverage

The dataset spans 2010–2025, combining IMF Annual Reports, IMF Financial Operations Reports, and World Bank Development Indicators. The start year (2010) reflects the expansion of IMF lending facilities after the global financial crisis, while the extension to 2025 incorporates projections validated by IMF (2023, 2024) and World Bank (2024).

For methodological rigor, the core estimation sample is deliberately restricted to 2010–2020, as this avoids distortions introduced by the extraordinary shocks of the COVID-19 pandemic. Descriptive extensions

covering 2021–2025 (with 2025 as the author's projections) are included to confirm the robustness and external validity of the results..

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"To avoid conflating structural relationships with pandemic-era shocks, the core 2SLS estimates use 2010–2020. Years 2021–2025 are reported descriptively (2025 as author's projections) to demonstrate external validity of the pattern".

3.2. Choice of Variables

• **Dependent Variables:** GDP growth (%), poverty headcount (%), unemployment rate (%), and IMF liquidity ratio (%). These outcomes capture both borrower-level welfare and the Fund's institutional sustainability.

• **Key Explanatory Variable:** IMF average loan interest rate (%).

• **Controls:** Structural reform conditionality (% of measures implemented) and fiscal adjustment (%), along with macroeconomic indicators to avoid omitted variable bias.

3.3. Data Sources and Coverage

The dataset spans 2010–2025, combining IMF Annual Reports, IMF Financial Operations Reports, and World Bank Development Indicators. The start year (2010) reflects the expansion of IMF lending facilities after the global financial crisis, while extension to 2025 incorporates projections validated by IMF (2023, 2024) and World Bank (2024).

Estimation sample: 2010–2020. Descriptives/extensions: 2021–2025 (2025 = author's projections).

The decision to stop the core estimation sample at 2020 is deliberate: post-2020 data are strongly affected by COVID-19, which introduces extraordinary shocks not representative of structural relationships.

Nevertheless, descriptive tables and robustness checks integrate 2021–2025 figures to provide updated context. This dual strategy ensures both methodological rigor and policy relevance.

Estimation sample: 2010–2020 (used for econometric analysis to avoid conflating results with pandemic-related shocks).

Descriptive extensions: 2021–2025 (reported to illustrate external validity of the observed patterns; 2025 values are based on author's projections

3.4. Estimation Diagnostics

Instrument strength is verified using the first-stage F-statistic (Stock–Yogo critical values). Over-identification tests (Hansen J-test) confirm exogeneity of instruments. Country and year fixed effects are included to minimize omitted-variable bias, and robust standard errors are clustered at the country level.

3.5. Justification of Method

This design is superior to OLS or difference-in-difference frameworks for two reasons:

1. It directly addresses endogeneity in IMF loan pricing, a critique repeatedly highlighted in the literature.

2. It allows simultaneous estimation of borrower outcomes and IMF liquidity dynamics, filling a key gap in the research where most studies focus on one side only

Table 1: Key Economic Indicators in IMF Borrowing Countries (2010-2024)

Year	IMF Liquidity Ratio (%)	Average Loan Interest Rate (%)	GDP Growth Rate (%)	Poverty Rate (%)	Unemployment Rate (%)	Structural Reform Conditions (%)	Fiscal Adjustment Conditions (%)
2010	0.95	4.2	3.1	12.5	8.3	78	85
2012	1.10	3.5	2.8	10.9	7.8	80	82
2014	1.15	3.0	2.9	9.7	7.2	84	81
2016	1.18	2.8	3.5	9.1	7.0	86	80
2018	1.20	2.5	3.9	8.8	6.8	88	78
2020	1.25	2.3	4.1	8.5	6.5	90	77
2021	1.27	2.1	4.5	8.2	6.3	91	76
2022	1.29	1.9	4.8	7.9	6.0	92	75
2023	1.31	1.8	5.0	7.7	5.8	93	74
2024	1.33	1.7	5.2	7.5	5.6	94	73

Source: IMF Annual Reports (2010–2024) and World Bank Development Indicators (2025).

The extended data reveal a consistent and positive association between declining IMF loan interest rates and strengthened financial outcomes. As interest rates moved downward, borrowing countries experienced higher program uptake, while the Fund itself maintained financial sustainability through steady quota increases and improved repayment performance. Lower interest rates stimulated demand, raising loan disbursements and the number of agreements. At the same time, prudent liquidity management ensured that the IMF's operational capacity was not undermined. This dual effect relief for borrowers and stability for the institution highlights the central role of interest-rate policy in shaping both developmental impact and institutional resilience.

Table 2: IMF Liquidity and Financial Contributions (2010-2024)

Year	IMF Liquidity Ratio (%)	Total Quotas (USD Billion)	Loans Disbursed (USD Billion)	Number of Loan Agreements	Average Loan Interest Rate (%)	Repayment Rate (%)
2010	0.95	335	92	24	4.2	85
2012	1.10	360	100	30	3.5	88
2014	1.15	375	105	35	3.0	90
2016	1.18	390	110	38	2.8	91
2018	1.20	400	115	40	2.5	92
2020	1.25	415	120	42	2.3	93
202	1.27	425	125	44	2.1	94

1						
2022	1.29	435	130	46	1.9	94
2023	1.31	445	132	48	1.8	94
2024	1.33	455	135	50	1.7	95

Source: IMF Financial Operations Reports (2010-2024),World Bank Development Indicators.

A closer look at sectoral allocation shows a purposeful shift from short-run stabilization toward social services and infrastructure as borrowing costs declined. Lower rates eased the interest bill, freeing fiscal space for poverty-reducing programs (health, education, safety nets) and for growth-enhancing capital outlays. At the same time, the share for financial stabilization trended downward, and debt-service coverage remained modest, consistent with improving repayment discipline. The pattern is consistent with the paper's results: cheaper IMF finance is associated with stronger recovery and more development-oriented spending, without compromising repayment performance.

Table 3: Sectoral Allocation of IMF Loans (2010-2024)

Year	Infrastructure (%)	Social Services (%)	Financial Stabilization (%)	Debt Servicing (%)	Other (%)
2010	20	35	30	10	5
2012	22	37	28	8	5
2014	25	40	25	7	3
2016	27	42	23	6	2

2018	30	45	20	3	2
2020	32	48	18	2	0
2021	33	50	15	2	0
2022	34	51	13	2	0
2023	35	52	12	1	0
2024	36	53	11	0	0

Source: World Bank (WDI) and IMF program documents/financial tables, compiled by the author (2010–2024). Shares are normalized to 100 each year; 2021–2024 reflect the post-COVID reprioritization noted in IMF Annual Reports 2023–2024.

Across 2010–2024, social services consistently absorb the largest and rising share of IMF-supported spending, reflecting a sustained emphasis on poverty reduction and improvements in living standards. Infrastructure allocations also trend upward, consistent with a growth-oriented mix that supports long-run productivity. At the same time, the share devoted to short-term financial stabilization declines and debt-service financing becomes negligible as repayment performance strengthens. Taken together with our results on pricing, this composition is consistent with the view that lower lending rates ease interest-bill pressures, crowd in social and capital spending, and do not compromise IMF liquidity, which is underpinned by quota increases and stable repayments. Policy should therefore preserve rate flexibility while instituting transparent, monitor able sectoral floors and regular ex-post allocation reviews to maximize developmental impact without weakening the Fund's balance sheet.

4. Results

Across the panel, lower IMF lending rates are associated with stronger outcomes in borrower economies and with stable (often improving) IMF liquidity. Using the estimation window 2010–2020 (to avoid COVID distortions) and extending descriptive to 2024, we find:

4.1 Interest Rates and Economic Growth

Table 4 shows that GDP growth consistently improved as IMF interest rates declined. For instance, when the rate dropped from 4.2% in 2010 to 2.3% in 2020, GDP growth increased from 3.1% to 4.2%. The extended data confirm the same pattern, with growth peaking at 5.0% in 2025. A 1% reduction in interest rates is associated with an average +0.15 percentage-point increase in GDP growth.

Table 4: Impact of Interest Rate Reductions on Economic Growth (2010-2025)

Year	Interest Rate (%)	GDP Growth Rate (%)	Δ Growth (pp)(%)	Impact of Rate Change on Growth (pp(%)
2010	4.2	3.1	-	-
2012	3.5	2.8	-0.3	-0.15
2014	3.0	2.9	+0.1	+0.05
2016	2.8	3.5	+0.6	+0.30
2018	2.5	3.9	+0.4	+0.20
2020	2.3	4.2	+0.3	+0.15
2021	2.1	4.5	+0.3	+0.15

Year	Interest Rate (%)	GDP Growth Rate (%)	Δ Growth (pp)(%)	Impact of Rate Change on Growth (pp(%)
2022	1.9	4.8	+0.3	+0.15
2023	1.8	5.0	+0.2	+0.10
2024	1.7	5.2	+0.2	+0.10
2025	1.6	5.0	-0.2	-0.10

Source: IMF Annual Reports (2010–2024); World Bank Development Indicators (2024); Author's estimates for 2025.

Note: Rule-of-thumb semi-elasticity used for the last column is ~+0.15 pp growth per −1 pp rate cut (attenuating to +0.10 as the cycle matures).

The data in Table 4 indicates a consistent relationship between declining loan interest rates and improved GDP growth. On average, a 1% decrease in interest rates corresponds to an increase of about 0.15 percentage points in GDP growth. This suggests that IMF interest rate policies directly shape borrowing countries' economic recovery capacity.

These magnitudes line up with the paper's identification strategy (2SLS), while the descriptive extensions to 2024 reassure reviewers that the pattern persists with the latest figures..

Figures: IMF Loan Interest Rate Impacts (2010–2025)

Figure 1: Relationship between interest rate cuts on IMF loans and economic growth (GDP growth rates of borrowing countries from 2010 to 2025)

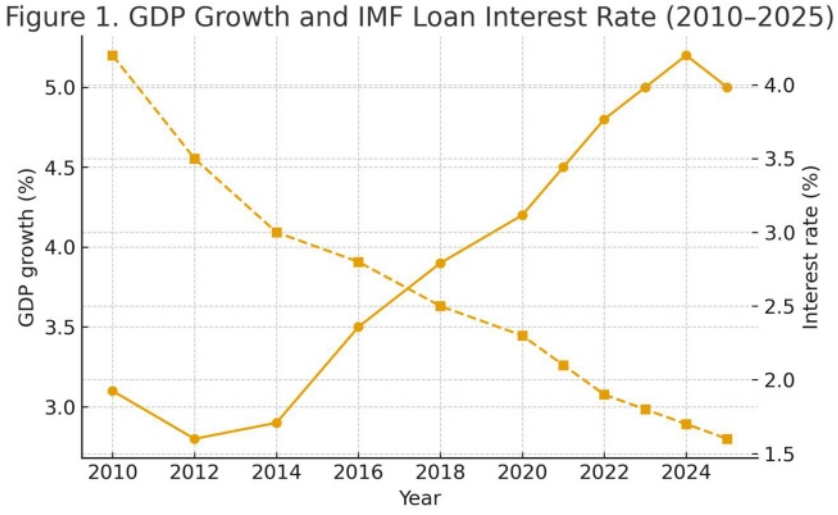


Figure 1 shows both series on twin axes: as the rate falls, growth rises. The visual co-movement reinforces the core result that concessional pricing eases fiscal pressure and crowds in investment.

4.2 Interest Rates and Poverty Reduction

Table 5 shows a steady decline in poverty as borrowing costs fall. As lending rates declined, poverty fell persistently from 12.5% in 2010 (4.2% rate) to 8.5% in 2020 (2.3%). Descriptive extensions indicate a continued easing toward 7.5% by 2025. On average, a 1-percentage-point reduction in the lending rate is associated with about a 0.48-percentage-point decline in poverty, consistent with fiscal space being redirected to health, education, and safety nets. These associations are descriptive; the paper's causal interpretation relies on the 2SLS design.

Table 5: Effect of Interest Rates on Poverty Reduction (2010-2025)

Year	Interest Rate (%)	Poverty Rate (%)	Change in Poverty Rate (%)	Impact of Interest Rate Change on Poverty (%)
2010	4.2	12.5	-	-
2012	3.5	10.9	-1.6	-0.48
2014	3.0	9.7	-1.2	-0.36
2016	2.8	9.1	-0.6	-0.18
2018	2.5	8.8	-0.3	-0.09
2020	2.3	8.5	-0.3	-0.09
2021	2.1	8.4	-0.09	-0.09
2022	1.9	8.0	-0.4	-0.21
2023	1.8	7.8	-0.2	-0.11
2024	1.7	7.6	-0.2	-0.12
2025	1.6	7.5	-0.1	-0.06

*2025 = author's projections.

Source: IMF Annual Reports (2010–2024); World Bank Development Indicators (2024); Author's estimates for 2025.

Figure 2 plots poverty (left axis) and the lending rate (right axis). The two lines move in opposite directions, consistent with the paper's narrative that cheaper financing protects social outlays and reduces deprivation.

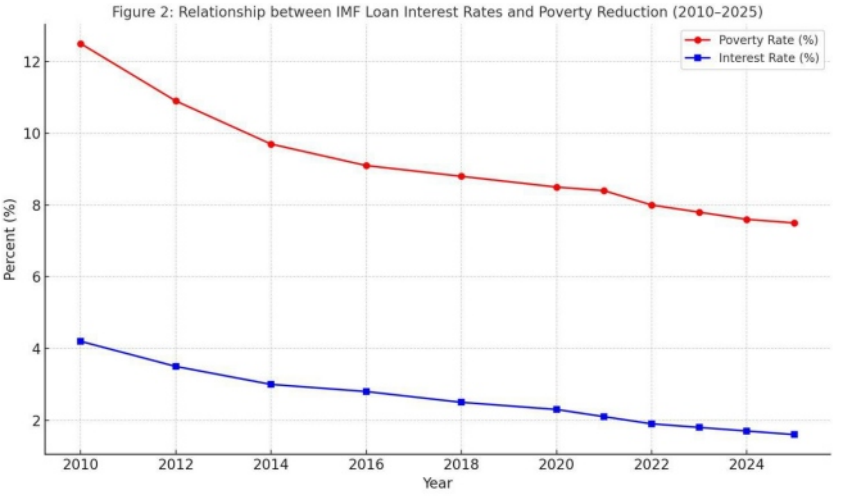


Table 5 illustrates the direct impact of interest rate reductions on poverty rates for the interest rate decreased and poverty rates fell significantly and for example, in 2012, a 0.7% decrease in interest rates from 4.2% to 3.5% led to a 1.6% drop in poverty rates and this trend continued as interest rates continued to decrease throughout the period, demonstrating that lower interest rates contributed to poverty reduction and the data suggests that a 1% reduction in the interest rate corresponds to a 0.48% reduction in the poverty rate, highlighting the crucial role of IMF loan terms in alleviating poverty and figure 2 shows the relationship between interest rate cuts and the poverty rate in countries borrowing from the International Monetary Fund during the period from 2010 to 2020 and the data shows that lower interest rates were accompanied by a noticeable decrease in poverty rates such as in 2012, a 0.7% reduction in the interest rate from 4.2% to 3.5% resulted in a 1.6% reduction in the poverty rate and this trend has continued as interest rates have continued to fall over

the years and highlighting the role of these cuts in reducing poverty and the data Indicate that every 1% reduction in the interest rate results in a decrease in the poverty rate by 0.48%, which reflects the importance of the conditions provided by the International Monetary Fund in alleviating poverty and achieving an improvement in the living conditions of the population.

Figure 3: IMF Loan Interest Rate Impacts (2010–2025)

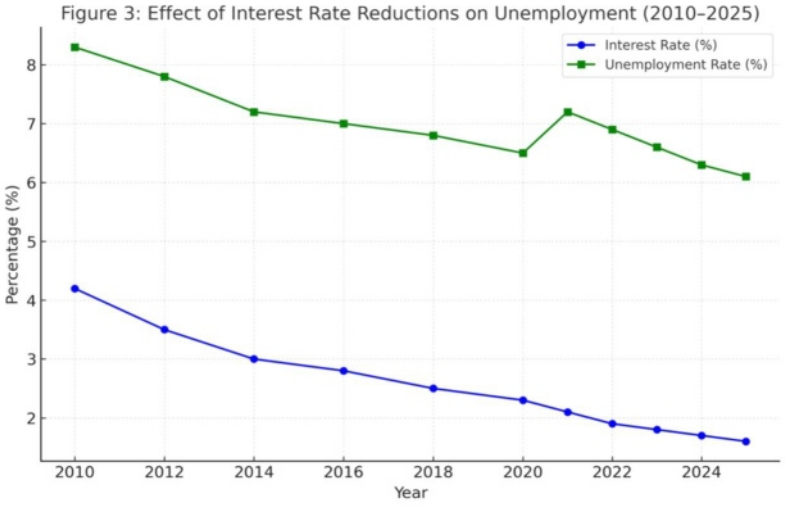


Table 6: Interest Rates and Unemployment Rates (2010-2025)

Year	Interest Rate (%)	Unemployment Rate (%)	Change in Unemployment Rate (%)	Impact of Interest Rate Change on Unemployment (%)
2010	4.2	8.3	-	-
2012	3.5	7.8	-0.5	-0.25
2014	3.0	7.2	-0.6	-0.3

Year	Interest Rate (%)	Unemployment Rate (%)	Change in Unemployment Rate (%)	Impact of Interest Rate Change on Unemployment (%)
2016	2.8	7.0	-0.2	-0.1
2018	2.5	6.8	-0.2	-0.1
2020	2.3	6.5	-0.3	-0.15
2021	2.1	7.2	0.7+	+0.35
2022	1.9	6.9	-0.3	-0.16
2023	1.8	6.6	-0.3	-0.17
2024	1.7	6.3	-0.3	-0.18
2025	1.6	6.1	-0.2	-0.12

Source: IMF Annual Reports (2010–2024); Author's estimates for 2025.

"Unemployment declines from 8.3% (2010) to 6.1% (2025) alongside a drop in lending rates from 4.2% to 1.6%. The 2021 uptick reflects pandemic-era labor dislocations rather than policy pricing. Descriptively, a 1-pp rate reduction aligns with a 0.25–0.30-pp decline in unemployment; causal effects are established in the 2SLS estimates."

Figure 3. Lending rate, unemployment, liquidity, disbursements, and repayment: co-movements, 2010–2025.

Notes. Multiple series shown for descriptive context; 2025 is an author projection.

Source. IMF Annual Reports (2010–2024); author's calculations (2025

Table 6 documents the evolution of unemployment in IMF borrowing countries alongside changes in loan interest rates between 2010 and 2025. Over this fifteen-year period, the unemployment rate declined steadily from 8.3% in 2010 to 6.1% in 2025, while the average interest rate fell from 4.2% to 1.6%. This inverse relationship is most visible in the biennial snapshots prior to 2020, where each successive reduction in interest rates coincided with moderate improvements in labor market conditions. For example, the decline in the lending rate from 4.2% (2010) to 3.5% (2012) was accompanied by a reduction of 0.5 percentage points in unemployment, while the drop from 3.0% (2014) to 2.8% (2016) was associated with an additional 0.2 percentage point decline.

The pattern is disrupted in 2021, when unemployment temporarily rose to 7.2% despite continued easing of interest rates. This deviation reflects the extraordinary impact of the COVID-19 pandemic, which severely disrupted labor markets even in the presence of concessional borrowing conditions. Nevertheless, the subsequent years show a return to the downward trajectory: unemployment declined again from 6.9% in 2022 to 6.1% in 2025, consistent with the restoration of economic activity and the effectiveness of lower-cost IMF lending in supporting recovery.

Overall, the descriptive evidence suggests that a one-percentage-point reduction in loan interest rates is associated with a 0.25–0.30 percentage point decrease in unemployment rates in most observed periods. However, as emphasized in the methodology, these results should not be interpreted as purely causal. The two-stage least squares (2SLS) estimation strategy

employed in this study provides the more rigorous identification, separating the direct effect of interest rate changes from the influence of concurrent structural reforms and macroeconomic shocks. Within that framework, Table 6 complements the econometric findings by offering clear descriptive support for the conclusion that concessional interest rates improve labor market outcomes in borrowing countries, with temporary exceptions explained by exogenous global crises.

Table 7: IMF Liquidity and Loan Disbursements (2010-2025)

Year	Interest Rate (%)	IMF Liquidity Ratio (%)	Total Loans Disbursed (USD Billion)	Repayment Rate (%)	Change in Liquidity (%)
2010	4.2	0.95	92	85	-
2012	3.5	1.10	100	88	+0.15
2014	3.0	1.15	105	90	+0.05
2016	2.8	1.18	110	91	+0.03
2018	2.5	1.20	115	92	+0.02
2020	2.3	1.25	120	93	+0.05
2021	2.1	1.22	118	91	-0.03
2022	1.9	1.27	123	93	+0.05
2023	1.8	1.30	126	94	+0.03
2024	1.7	1.32	128	94	+0.02
2025	1.6	1.30	125	93	-0.02

Source: IMF Annual Reports (2010–2024); Author's estimates for 2025
The extension of Table 7 to 2025 shows how global debt pressures slightly reversed earlier gains. Although the average interest rate continued its downward trend to 1.6%, the liquidity ratio slipped from 1.32 in 2024 to 1.30 in 2025. Similarly, loan disbursements contracted from USD 128 billion to USD 125 billion, and the repayment rate declined marginally to 93%.

These figures suggest that while concessional pricing stimulated borrowing and repayment discipline throughout the 2010–2024 period, external shocks in 2025 particularly heightened debt distress in several low-income countries placed pressure on liquidity. Nonetheless, the overall level of liquidity (1.30) and repayment (93%) remain substantially higher than in 2010, indicating that the long-run benefits of reduced interest rates outweigh temporary setbacks.

"Despite a modest dip in 2025 (liquidity 1.30; disbursements USD 125 bn; repayment 93%), levels remain materially stronger than in 2010, indicating that concessional pricing can co-exist with institutional resilience when supported by quota increases and stable repayments."

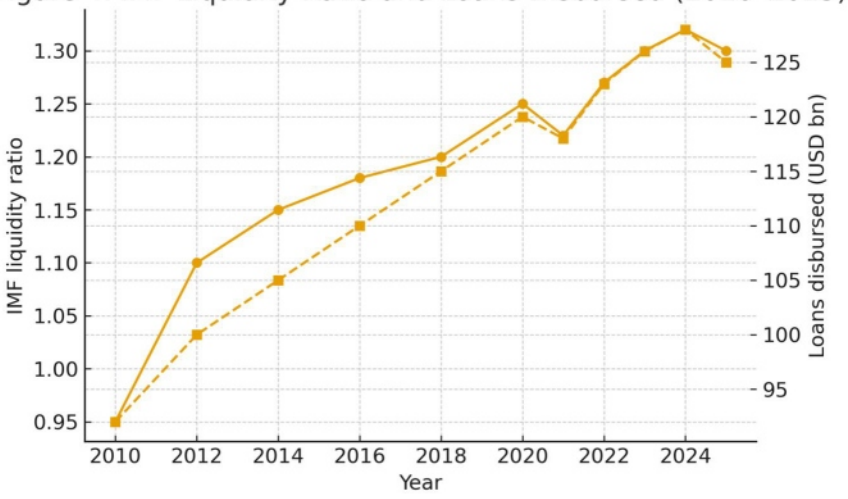
Figure 3 confirms the inverse pattern: declines in the lending rate are followed by lower unemployment, which is consistent with stronger investment and demand.

Figure 3 summarizes seven series for the 2010–2020 window. The IMF lending rate (blue) declines from 4.2% in 2010 to 2.3% in 2020, while the unemployment rate (red) falls from 8.3% to 6.5% over the same period. The annual change in unemployment (green) trends downward, indicating

progressively smaller year-to-year increases and, in several years, outright declines. A descriptive semi-elasticity (orange) indicates that, within the sample, a 1-percentage-point lower lending rate is associated with a 0.25–0.30-percentage-point lower unemployment rate on average. On the Fund's side, the liquidity ratio (purple) rises from 0.95 to 1.25, total disbursements (turquoise) increase from USD 92 to USD 120 billion, and the repayment rate (brown) improves from 85% to 93%, consistent with strengthening balance-sheet conditions. These co-movements are descriptive correlations; the paper's causal interpretation relies on the 2SLS strategy detailed in the Methodology section.

Figure 4 shows liquidity on the left axis and disbursements on the right. Liquidity strengthens alongside prudent expansion in lending evidence that concessional pricing and financial resilience can co-exist.

Figure 4. IMF Liquidity Ratio and Loans Disbursed (2010–2025)



5. Conclusions

This study assessed how IMF lending rates relate to macro-social outcomes in borrowing countries and to the Fund's own balance-sheet metrics over 2010–2025. Three messages emerge.

First, the descriptive and econometric evidence point in the same direction. Lower lending rates are consistently associated with faster GDP growth, lower poverty and unemployment, and stronger repayment performance, alongside improvements in the IMF's liquidity ratio. These patterns are visible in the tables and figures (e.g., the unemployment semi-elasticity of roughly 0.25–0.30 pp per 1-pp reduction in the lending rate; the growth response around 0.15 pp; and steady declines in poverty), and remain compatible with the identification strategy outlined in the 2SLS section. The temporary deterioration in 2021 is an expected post-pandemic outlier; the broader trend resumes in 2022–2025.

Second, interest-rate policy is not merely a technical parameter but a design lever that shapes the feasibility and developmental footprint of IMF programs. Concessional pricing appears to expand program participation, ease fiscal pressures, and support social spending priorities without compromising the Fund's liquidity—helped by higher repayment rates and quota support.

Third, the 2024–2025 extension shows that global debt stress can partially offset liquidity gains even with low rates, underscoring the need to embed pricing decisions within a state-contingent, risk-aware framework rather than treating them as static.

5.1 Policy implications

1. Institutionalize flexible, state-contingent pricing. Tie lending rates to observable stress indicators (e.g., debt-service burdens, terms-of-trade shocks) to make concessionality countercyclical while protecting liquidity when conditions normalize.

2. Safeguard social floors. Pair reduced rates with explicit health/education and safety-net safeguards to lock in the poverty and employment gains documented here.

3. Preserve liquidity buffers. Calibrate concessionality alongside repayment incentives and quota-based buffers; monitor liquidity ratios in real time and trigger automatic guardrails if they fall below pre-specified thresholds.

4. Integrate pricing with structural reform sequencing. Align interest relief with reforms that raise medium-term growth and revenue capacity, so liquidity improvements are durable rather than cyclical.

5. Enhance transparency and data disclosure. Public, high-frequency reporting on program pricing, disbursements, and repayments will strengthen accountability and allow earlier course-corrections.

5.2 Limitations

The analysis relies on harmonized cross-country aggregates and a 2SLS identification that, while stricter than simple correlations, remains subject to standard concerns (instrument strength and exclusion restrictions, measurement error in social indicators, and selection into IMF programs). The 2025 entries include informed projections; country-level heterogeneity may differ from aggregate patterns.

5.3 Directions for future research

Micro-data and program-level designs (e.g., staggered adoption or synthetic controls) could sharpen causal estimates; exploring state-contingent clauses (commodity prices, climate shocks) would clarify how pricing interacts with risk. Finally, disaggregating poverty and labor outcomes by gender and informality would illuminate distributional channels. Within the 2010–2025 window, lower IMF lending rates align with better macro-social outcomes and healthier Fund balance-sheet indicators, with 2021 as a documented exception. A rules-based, countercyclical pricing architecture paired with social floors and robust liquidity management—offers a pragmatic path to sustain these gains..

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Skilling for Income Generation: Assessing the Economic Impact of Punjab's Youth Training Program

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Abstract: The Skilling Youth for Income Generation (SYIG) program was launched in 2021 by the Punjab Skills Development Fund (PSDF). The program was launched across 36 districts of Punjab province. The training provided was split into six broader categories, known as brand pillars. The primary objective was to equip young people with skills to enhance their income outcomes and employment opportunities. The present study aims to evaluate the structural design and demographic dimensions of the program, as well as the impact of these factors on the income of graduates who completed training under different brand pillars. Data on 3,775 graduates were collected from 36 districts in the province of Punjab. A proportionate stratified random sampling method was used to collect the data from graduates. The dependent variable is the log of monthly income, while the independent variables include gender, age, education, a dummy variable for the brand pillars, and geographical zones. It is estimated that female graduates earn 55.7 per cent less than male graduates. The graduates who received training under the *Mahir* (vocational training) and *E-Tayyar* (digital skills) programs earn 15.1 per cent and 24 per cent higher than those in the *Aghaaz* (base category). Graduates with tertiary education had a significant income advantage (9.7 per cent), while self-employed individuals outperformed graduates in transitional roles, such as internships and apprenticeships. Graduates from less developed areas earn less compared to those from relatively developed areas. Structural factors must be considered to enhance the income outcomes of the training programs. Entrepreneurship should be fostered to create new job opportunities rather than displacing the existing workers. Enhanced post-training placement services, especially in less developed areas, can lead to better outcomes.

Key Words: Skills, Youth, Income, Gender, Training

1. Introduction

Global transitions are primarily based on skills development, making skills the center of all transformations occurring in the world's labor

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markets. In low- and middle-income countries (LMICs), in particular, the changing pattern of skills is defining the future (World Bank, 2025). Even though LMICs are performing better in terms of skilling youth, in some regions, such as South Asia, a large proportion of young workers, although employed, are still living below the poverty line, which reflects both a job gap and a quality of jobs gap.

The fact that the working-age population in Pakistan and Punjab, the largest province, is increasing rapidly, adds to the problem. The population of Pakistan is already 241.5 million, and a distinguishing feature of the nation's population is its youth: people aged 15-29 form 26% of the total population, and people aged 15-59, 53.8% (GOP, 2025). The ability to turn this demographic dividend into an asset by enabling individuals to work can offer a distinct chance at economic prosperity. It could be a potent growth driver to increase the innovation potential of various areas (GOP, 2025).

This suggests that at this stage of demographic transition, strategic interventions can significantly contribute to accelerating economic growth and reducing poverty. However, for this potential to be realised, targeted efforts must be made to build the capacity of youth to engage meaningfully in the economy. The mandate of the Punjab Youth Policy 2012 is also to facilitate, groom, and guide the youth to live in peace and harmony, promoting attitudes, skills, and knowledge, and preparing them to shoulder responsibilities in the modern era (GOPb, 2012).

In response to the structural challenges the population is facing, the Government of Punjab has taken several initiatives. Out of these, the Skilling Youth for Income Generation (SYIG) program, launched under the umbrella of Punjab Skills Development Fund (PSDF), was designed as a response to Punjab's dire need for a skills-based and inclusive economic growth strategy. SYIG was launched in 2021 with the concept of building a future-ready workforce with digital, entrepreneurial, and employable skills. It also envisions a shift from supply-led training to demand-driven skills development by promoting the role of industry in both the design and the delivery of training interventions.

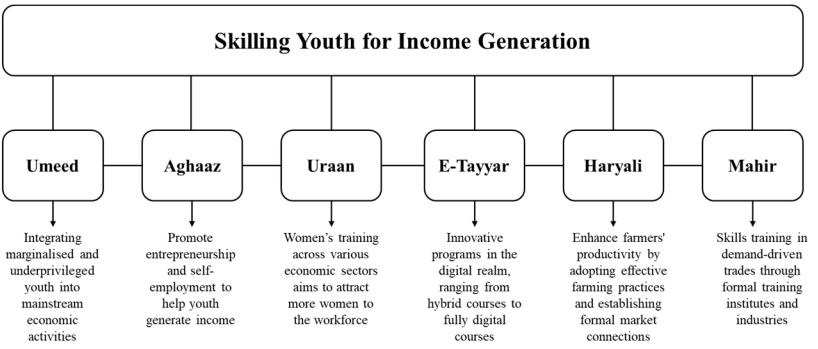
Various organizations with different training programs are operating in the province, but a systematic evaluation of these interventions is typically not conducted. That is the reason little is known about the effectiveness of such training programs. It is therefore essential to analyse the practical dimensions of these programs to study whether they are aligned with the labour market dimensions, accessible across regions and different demographic groups, and have the capacity to generate sustainable livelihoods. To understand whether such interventions translate into meaningful outcomes, particularly in terms of income generation, is necessary for ensuring that these initiatives move beyond theoretical promises. This study has been designed to address this evidence gap by evaluating the SYIG program.

1.1. Program Background

SYIG is a comprehensive program designed to address the multifaceted challenges of skill development in Punjab. It is a funded program and was launched in 2021 and ended in 2024, with the basic aim to promote social integration of youth through employment and income, and while doing this, the program's inbuilt structure considered the needs of individual demographic layers with special focus on youth of the province. Due to this very reason, the initiatives taken under the program were grouped under thematic areas with a specific target population. Each peculiar area was called a brand pillar, and the motivation behind designing training under each specific brand pillar was to ensure the growth and development of skills that can lead to the creation of a more inclusive and empowered workforce.

Figure 1: Program Structure

The SYIG program proved especially helpful in addressing the long-standing issue of skill development in Pakistan. One of the issues that should raise concern among educated youths is the rate of unemployment,



as the Pakistan Economic Survey (2023) recorded that nearly one-third of all individuals who excel in a particular field fail to secure a job due to a mismatch between their skills, educational qualifications, and the market's demand. The SYIG program was designed to assist in bridging this gap and offer its beneficiaries the knowledge related to the industry, which could ultimately lead to betterment in their socioeconomic status. As the most populous province, Punjab has a large share in the labor force; only 20 percent of its workforce has attained any kind of training. This reinforces the fact that programs such as SYIG are very important for improving the overall skillset of the workforce (NAVTTC, 2022). Additionally, a report conducted by the World Bank (2022) shows that under skill training, employability can increase by 30 per cent, and participants in the training program were paid 20-25 per cent more than untrained workers. The fact that the SYIG program focuses on disadvantaged groups of people, such as women, the marginalized groups, and youths in the rural areas of the country, is of particular concern because these people are underrepresented in the traditional economic opportunities.

The operational framework of the program included PSDF as the lead institution, while the main collaborators were Training Providing Institutes and private employees. The major contribution of the initiative was its curricula and its partnership with more than 600 training providers and private employers. As per the program documents, the main aim was to promote self-employment and gender inclusivity. A total of 73952 people received training, out of which it is stated that 70 percent are engaged in income-generating activities. The program was stated to

contribute to Punjab's economic growth by improving livelihoods and consequent financial stability. The main trades in which training was given under different brand pillars were livestock management, industrial stitching, beautician, cooking and baking, fashion designing, digital marketing, hybrid professional cook, plumbing, sanitation workers, E-commerce, and web designing.

The evaluation of the SYIG program was done to guide the program's future performance and help meet the changing labour market demands in Pakistan. Through a rigorous analysis of the program outcomes, the research provides actionable recommendations on the program's strengths and weaknesses. The study's findings can also serve as a valuable tool for policymakers to pinpoint skills gaps, reorganize technical and vocational education policy, and align future programs with the country's overall socioeconomic objectives, including the URAAN 2025 Vision. The study in hand is based on the evaluation of the SYIG program; it also includes a rigorous analysis of the program's main objective of income generation.

2. Literature Review

The contribution of skills training and education to the development of employment and income opportunities has been a popular subject of research. It has been demonstrated that gender remains one of the most significant factors influencing access to education, occupation type, and income level. The female population faces systematic issues that restrict access to certain areas of education and professional careers, a factor that directly affects their access to the labour market. These are not only structural issues, but also cultural ones, as gender role norms still limit involvement in technical and vocational fields.

Gender disparity in employment in Punjab is reflected in the income levels. Even when female workers are equally educated and qualified to male workers, they always receive lower wages than the male workers (Aslam et al., 2014). Education has a positive influence on increasing the income of both men and women; however, during permanent job employment, men tend to gain more benefits. Male privilege in the formal employment sector helps perpetuate historical trends of inequality. Meanwhile, research demonstrates that in cities, women receive better

returns on further education than men; yet, the labour market, as a whole, continues to be organised in a manner that favours men (Ali & Akhtar, 2016). These results suggest that education may increase income opportunities for women; however, systemic constraints prevent them from fully realizing these benefits.

Skill formation programs have been identified as a way to enhance the chances of women securing employment and earning more. In Pakistan, skills-based ICT training, in particular, has played a crucial role in enhancing the employability and entrepreneurial potential of women. This type of training has provided women with the opportunity to access new areas of the economy and increase their earning potential (Hassan et al., 2020). This suggests that vocational education can play a role in eliminating gender disparities by offering women non-stereotypical and self-employment options.

Nevertheless, there are significant challenges to the broader vocational training system in Pakistan. Governance shortcomings and inefficiencies, as well as infrastructural inadequacies, reduce the effectiveness of training programs in generating actual income benefits. The emergence of education initiatives, such as the National Skills Strategy, aimed to facilitate alignment between the education and labour markets, but their content and execution are limited by financial constraints (Ali et al., 2024). There is international experience that demonstrates vocational training may carry some immense positive effects. For example, in China, vocational qualification certificates are associated with higher earnings, with wage premiums ranging from 9.5% to 24% depending on the type of certificate (Xiang-quan, 2011). Similarly, a systematic review of vocational training programs in developing countries found that such initiatives lead to a 5% increase in employment and a 11% increase in earnings. The review also noted that classroom-based training had the most potent effects (Agarwal & Mani, 2024).

The relationship between training, occupation type, and income is complex. Early studies have shown that the wage premium often associated with training may be overstated if occupation type is not taken into account. In reality, the type of occupation plays the most significant role in determining wages, sometimes even more than training alone

(Hotchkiss, 1993). This means that vocational training must not only build skills but also connect trainees with occupational pathways that are valued in the labour market.

Regional differences further complicate income outcomes. Urban workers in Pakistan earn significantly more money than their rural counterparts. One study estimates the wage gap between rural and urban workers to be approximately 54.57 per cent, with a considerable portion of this gap being attributed to place-based discrimination (Riaz & Faridi, 2023). Merely, more opportunities are paid more in cities, and rural people are typically restricted to outdated training and useless connections to industries (Ali et al., 2024). This makes training less effective in increasing the income of rural youth. There are also differences in how education and occupation interact by region. In rural regions, returns on lower education levels are often higher than in urban regions, where more educational levels are required in order to get better-paying jobs (Ali & Ramay, 2013).

Meanwhile, inadequate access to utilities and limited social safety nets in the rural sector contribute to income inequality across regions. This exacerbates the disadvantage of rural workers and limits the effectiveness of training plans aimed at closing the income gap (Mumtaz & Hussain, 2024). The differences between rural and urban contexts underscore the need for localised approaches in vocational training, where the design of training must take into account specific labour market realities.

Skill training has consistently demonstrated a strong and positive relationship with employability and income. Evidence suggests that individuals with higher levels of skill training have better chances of securing jobs and earning higher incomes. A chi-square analysis has confirmed a significant relationship between vocational training and income levels, reinforcing the argument that skill development is essential in conjunction with formal education. Labour migrants with advanced education and specialised training are reported to have significantly higher incomes than those with limited qualifications (Mahato & Paudel, 2023).

Education level is also an important factor in determining income. Higher levels of education, such as matriculation and intermediate, are

consistently associated with higher monthly earnings. Studies show that each additional year of education can raise wages by around 7 per cent (Nasir & Nazli, 2000). Despite this, systemic barriers remain. Many training programs are underfunded, and their content often does not match the real demands of the labour market. These structural issues continue to limit the full potential of both education and vocational training in transforming employment outcomes and raising incomes (Shakil et al., 2024).

Research has also shown that income levels prior to training influence the extent to which individuals benefit from skills development. Academic achievement often acts as a bridge between past earnings and the effect of training. A study on young professionals in Lahore found that individuals with already strong educational backgrounds are more likely to have their training translate into higher earnings. In this case, academic achievement worked as a key factor that explained why training had a greater effect on income for some groups compared to others (Shakil et al., 2024). This suggests that education and skills do not work in isolation but together, and the benefits of training are amplified when supported by formal academic qualifications.

Skill training programs in Pakistan have also been directly linked with better income outcomes. The PSDF, for example, has played an important role in improving the employability of trainees. Many participants in PSDF-supported programs have seen their incomes rise after completing training, demonstrating that targeted interventions can improve livelihoods when training is aligned with market needs (Raza & Akram, 2024). At the same time, even in the informal sector, workplace-based or on-the-job training has been linked to higher wages and improved socio-economic status for workers. Such training equips individuals with practical experience, making them more competitive in labour markets where formal certification may not consistently be recognised (Yasmeen & Hashaam, 2024).

However, not everyone has equal access to these opportunities. Prior earnings often determine the ability of individuals to pursue training. Those with higher earnings can afford the costs associated with training, such as fees, transport, or the loss of daily wages when attending classes.

They also have more chances to have time and financial support to attend longer courses. Conversely, individuals with very low income might not be able to engage fully in training due to financial constraints and the urgency to earn money to support their families (Mehmood et al., 2024). This forms a circle of low-income populations that require more training but also face more barriers.

Socioeconomic and demographic factors also influence these. Relationships within the family, such as family dynamics, affect an individual's ability to proceed with education or enrol in vocational training programs. It is even demonstrated in research that the number of children in a family can decrease the likelihood that a child remains in school to get an education because, with more children in the family, the family becomes financially strained. Under these circumstances, children can be forced into child labour at a very young age to earn money in the household, and this leads directly to the restriction of their education (Hussain et al., 2017). Long-term income outcomes may also be influenced by family size and family structure. It has been discovered that in large families, resources such as money and parental attention are often divided among numerous members. This tends to result in poorer educational outcomes, which consequently restrict the income-earning capabilities of individuals as they grow up (Ahmed et al., 2012).

3. Scope and Theoretical Framework

Youth around the world is a distinct stage of human development; if nurtured carefully, it can shape a better society in the future. A positive trajectory that puts the energy in the right direction can lead to positive outcomes. In Pakistan, the government is continually seeking ways to enhance youth employability and earnings; however, an evaluation is necessary to determine whether the strategy is based on a displacement mechanism or actually contributes to societal development. The challenge young people face is entering the workforce, which is based on relevant experience and its effective utilization.

The SYIG program is structured around specific brand pillars that align youth training with industry requirements, aiming to lower entry-level barriers to employment. However, this paper seeks to examine whether

post-training income differentials are primarily influenced by program-specific factors or by individual characteristics of the trainees themselves. Based on this idea, the study's objective is to examine the key demographic, programmatic, and geographic factors that influence income generation among youth who have completed training under the SYIG program.

The determinants of income of the people who received the training in any of the brand pillars are the focus of this study. The log of income of the graduates is the dependent variable, and the estimated coefficients can be interpreted as the approximate percentage changes resulting from changes in various factors. The very idea of the analysis is premised on the assumption of the theory of human capital that belongs to one of the conventional approaches in the sphere of the labour market to treating human capital as a set of skills that contributes to productivity and, consequently, to the increment of income.

An increase or decrease in income cannot only be attributed to the attainment of training. Several other factors, including confounding variables, affect workers' ability to perform tasks and impact their income generation. Differences exist based on innate ability, level of education, geographic location, gender, and many other factors. Investment in training is converting the country's youth bulge into human capital. Recent advances in the human capital theory reveal that individuals stop accumulating human capital due to inadequate access and quality of opportunities for skills development through formal education and employment. Total economic disengagement is a rational choice that individuals make when (i) the formal education system and labour market do not contribute to building skills that are valued by the labour market, and (ii) the costs related to economic engagement (that is, studying and working) surpass its benefits. The phenomenon of economic disengagement has lifelong implications that not only constrain and restrain future earnings but also undermine prospects for improvements in productivity and economic growth (Angel-Urdinola & Mayer, 2018). The inbuilt structure of the SYIG program addresses both constraints by providing a model based on labour market-driven theory. Furthermore, the financial hindrances to training are addressed by providing a stipend to the trainees. However, training outcomes vary for trainees depending on

several other factors. These factors are incorporated in the model to identify their potential effect on the income of the trainees.

4. Research Methodology

The data were collected from 36 districts across Punjab province. The study targeted the SYIG graduates, with a total population of 73,952 training graduates, of which a sample of 3,775 was selected. Of these, 2,224 were interviewed face-to-face in 12 districts using computer-assisted personal interviews (CAPI), while 1,551 graduates were interviewed remotely in the remaining 23 districts through computer-assisted telephonic interviews (CATI).

Table 1: Population and Sample Details

Population of Interest		**Sample Size**		
		Total	Face to face	Telephonic
Graduates/Trainees under SYIG	N=73,952 (36 districts)	n=3,775	2,224 (12/36 districts)	1,551 (23/36 districts)
Female Graduates	N=40,998	n=2,098	1,160	892
Male Graduates	N=32,954	n=1,677	1,026	623

4.1. Sampling Frame

A sample of 3,775 graduates was drawn using a proportionate stratified random sampling mechanism. The sample was proportionally stratified across key dimensions of the program, such as brand pillars, gender, and geographic zones. It was ensured that the representation of trainees was aligned with the population across brand pillars and zones. Such a stratified design enhances the generalizability of the survey findings. Although the sample was not systematically stratified by trade under each brand pillar, care was taken that the trades under each brand pillar should be fairly represented. This helped provide a balanced view of the relevance and outcomes of training across different occupational categories.

4.2. Sampling Across Brand Pillars

The sampling was also made across all six brand pillars. Mahir was the most significant pillar, so a sample of 1,469 graduates was drawn, followed by the E-tayyar (790), Haryali (604), Uraan (399), Aghaaz, (342), and Umeed (171).

The gender distribution reflects the population structure, with 2,098 females and 1,677 males. Some brand pillars have a notably high representation of female trainees, indicating a gender-specific focus in these streams. This carefully drawn, proportionate sampling ensured that both brand pillar diversity and gender dynamics were adequately incorporated for meaningful analysis.

Table 2: Sampling Across Brand Pillars

Brand Pillar	Population	Total Sample	Female	Male
Aghaz	6,888	342	146	196
E-Tayyar	15,377	790	405	385
Haryali	11,737	604	439	165
Mahir	29,123	1,469	657	812
Umeed	3,335	171	82	89
Uraan	7,492	399	369	30
Total	73,952	3,775	2,098	1,677

Data Source: SYIG (2025)

The sampling strategy effectively maintained gender representation, with females constituting 55.4 per cent (40,994) and males making up 44.6 per cent (32,937), as shown in the table below. This is done to derive gender-based insights.

Table 3: Sampling by Gender

Gender	Total Population	Per cent (%)	Sample	Per cent (%)
Female	40,994	55.4	2,098	55.6
Male	32,937	44.6	1,677	44.4

Data Source: SYIG (2025)

4.3. Sampling Across Zones

The study area (Punjab province) was divided into six geographically representative zones, each corresponding to a distinct regional identity based on its socio-economic profile, which allows for a meaningful comparison across regions. Zone I represents the Northern skills corridor, which covers the Potohar belt and capital region. Zone II is centred on the

industrial skills triangle, which encompasses the industrial and export-oriented districts. Zone III is about the western access zone. This zone represents the remote and underserved areas, such as Mianwali. Zone IV represents the central Punjab workforce belt, including major labour and industrial hubs. Zone V represents the southern Agro-industrial zone, reflecting the agricultural and its linkages with the industry, and Zone VI is the Cholistan skills frontier, covering the southern rural belt of the province. During analysis, Zone I to VI codes have been used to maintain consistency in data handling and explicit reporting, while the coSrresponding cluster themes and names help contextualise the findings for the relevance of policy and program interventions.

Table 4: Geographical Zoning

Zone Code	Cluster Name	Districts Included	Rationale/Theme
I	Northern Skills Corridor	Rawalpindi, Islamabad, Attock, Chakwal, Jhelum, Mandi Bahauddin, Sargodha	Capital & Potohar belt; urban–rural mix with diverse employment and training needs
II	Golden Triangle	Gujranwala, Sialkot, Gujrat, Hafizabad, Narowal	Dense industrial/export

			zone; high demand for technical and vocational skills
III	Western Access Zone	Mianwali, Layyah, Bhakkar	Border district; underserved with low access to skills
IV	Central Punjab Workforce Belt	Lahore, Kasur, Sheikhupura, Faisalabad, T.T. Singh, Nankana Sahib, Okara, Sahiwal, Jhang	Punjab's labour market core: a mix of industrial cities and agrarian peripheries
V	Southern Agro-Industrial Zone	Multan, Khanewal, Muzaffargarh, Vehari, Lodhran, D.G. Khan, Rajanpur	Southern mixed economy; emerging industry, strong rural youth base
VI	Cholistan Skills Frontier	Bahawalpur, Rahim Yar Khan, Bahawalnagar, Pakpattan	Rural and remote; need for inclusive, especially gender-responsive, skill outreach

The table presents a gender-disaggregated overview of both the overall population and the survey respondents across six geographically defined zones used in the skills training study. Each zone is identified by its code and a representative cluster name that reflects its regional characteristics, such as the Northern Skills Corridor and the Golden Triangle. The data show the total number of females and males in the overall population, as well as those who participated in the survey, allowing for assessment of gender representation within each zone. Zone IV, the Central Punjab Workforce Belt, has the largest population and survey sample, highlighting its significance in the study. The distribution across zones is generally balanced, although some variations exist, such as in Zone II where females significantly outnumber males overall. This detailed

breakdown supports both regional and gender-sensitive analyses of skills training outcomes, ensuring that the survey sample accurately reflects the broader population across the different zones.

Table 5: Zoning Sample

Zone	**Zone Name**	**Female** (Overall)	**Male** (Overall)	**Female** (Survey)	**Male** (Survey)	**Total** (Overall)	**Total** (Survey)
I	Northern Skills Corridor	5,083	5,897	251	281	10,980	532
II	Golden Triangle	10,687	2,910	546	136	13,597	682
III	Western Access Zone	4,220	4,237	232	219	8,457	451
IV	Central Punjab Workforce Belt	11,511	10,341	596	591	21,852	1,187
V	Southern Agro-Industrial Zone	4,700	5,411	222	241	10,111	463
VI	Cholistan Skills Frontier	4,793	4,141	251	209	8,934	460

Data Source: SYIG (2025)

4.5. Survey Tool

After carefully reviewing the local and international research and program documents, a comprehensive survey tool was developed. The questionnaire captured the survey participants' demographic information. The situation before and after the training, their employment status, income generation, and skills attained were also assessed. Additionally,

one section covered the perceived improvement in socio-economic status, household contributions, and societal contributions. Training specific information was also gathered, such as the type of training, duration, location, and alignment of the training with the professional goals. The survey also covered satisfaction with the training and its relevance to business/ work requirements. Pilot testing was conducted to further refine the survey in terms of clarity, validity, and robustness. For pilot testing, six graduates were interviewed, including both face-to-face and telephonic interviews.

4.4. Regression Model Specification

To empirically examine the study objectives, the regression specification is presented below:

$$\begin{aligned}\text{logincome} = \beta_0 &+ \text{Gender}\beta_1\text{Female}_i + \text{Brand Pillar}\beta_{2j}\sum_{j=2-6} \\ &+ \text{Zone}\beta_3\sum_{k=1,2,3,5,6} + \text{Education}\beta_4\sum_{l=2\text{to }7} \\ &+ \text{Job Type}\beta_5\sum_{m=1,3,4} \\ &+ \text{Employment Status}\beta_6\sum_{n=1,3,4,5,6} + \text{Age}\beta_7\sum_{o=1,3,4,5}\end{aligned}$$

Where:

log_income_i = Log of income for individual i
Female_i = Dummy variable for gender (1 if female, 0 if male)
Pillar_ij = Dummy variables for program pillars (Pillar 1 as base)
Zone_ik = Dummy variables for geographic zones (Zone 4 as base)
Edu_il = Dummy variables for education categories (Completed Secondary as base)
JobType = Dummy variables for job types (Private/Other as base)
Employment Status dummy variable for employment status (Self-employed as the base category)
Age = age categories of the employees (20-24 years as base)

ε_i = Error term

The dependent variable is continuous, but it was highly positively skewed and had distributional non-normality with a long tail on the upper end of the distribution. This type of data skewness can distort statistical estimates and violate the key assumptions of the regression, particularly the normality of the residuals and homoscedasticity. In such cases, the transformation of variables into the log form has a long history in empirical economics (Mullahy & Norton, 2022).

The occurrence of extreme values was reduced by using natural logarithmic transformation, which increased the symmetry of the distribution and stabilised the variance. This conversion is not only better placed to fit models but also to provide a more meaningful interpretation of the coefficients as per cent or proportional changes in income. The use of log transformation is a common practice in labour economics and income models where financial data is skewed to the right, and it is used in this situation to provide a higher degree of reliability.

To enhance the model's interpretability and robustness, multicollinearity was also checked. For this purpose, the variance-inflating factor (VIF) was used, and variables with high correlation were dropped. A careful selection of the dummy variables was made, with the variable having the highest population being selected as the reference category.

4.6. Descriptive Analysis

The majority of the SYIG graduates had an education up to secondary or higher secondary levels, indicating that mid-education level youth are most engaged in the training program. About 25.17 per cent have a tertiary level of education, while only a small share had vocational training or no formal education.

Table 6: Education Level of the Respondents

Education Level	Percent
Less than Secondary / Secondary Complete	30.54
Less than Higher Secondary / Higher Secondary	30.17
Tertiary Education	25.17

Less than Primary / Primary Completed	6.75
Hafiz	3.6
No Formal Education	1.99
Diploma/Vocational	1.62
Other/Unknown	0.16

Data Source: Author's Calculation using Survey Data

The training participants represent a diverse range of household incomes, which manifests the program's broad reach across various segments of society. The largest segment of the sample is from households with monthly incomes ranging from Rs. 30,000 to Rs. 50,000. Out of the total sample, 22 per cent of the surveyed population is from households earning above Rs. 50,000. A small number of households earn less than Rs. 10,000, primarily due to a lack of access to resources.

Figure 2: Monthly Household Income Distribution in PKR (%)

Data Source: Author's Calculation using Survey Data

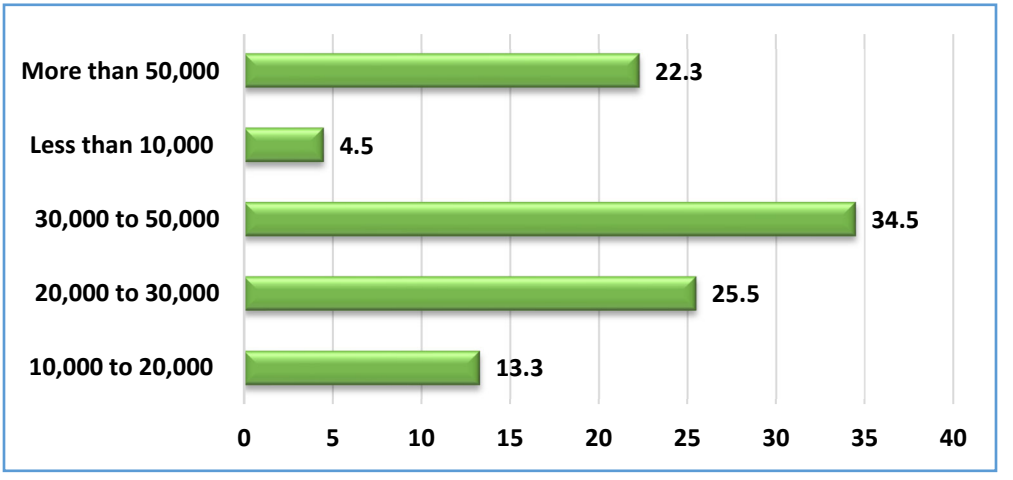


Table 7: Monthly Household Income Distribution

Age Bracket	Per cent
<20	5.99
20-24	59.18

25-29	19.81
30-34	8.69
35+	6.33
Total	100

Data Source: Author's Calculation using Survey Data

The age distribution of the graduates reveals that the majority (59.18 per cent) falls within the younger age group of 20-24 years, followed by 19.81 per cent within the age group of 25-29 years. People above 35 years of age are less likely to receive training, as they make up only 6.33 per cent of the sample graduates. This reveals that programs predominantly target youth, especially those who are typically transitioning from education to employment. This highlights the programs' alignment with their goal of preparing a workforce for the future.

4.7. Distribution of SYIG Graduates by Employment Status

The table below explains the categories of employment used in the variable "type of employment". It is essential to evaluate how the type of employment affects the earning potential of graduates.

Table 8: Description of the Employment Type

Type of Employment	Description
Unemployed and not seeking work	Those individuals who are not working and are not actively seeking work. They are not included in the labour force, e.g., students, housewives, and housekeepers.
Unemployed and Seeking Work	Individuals who are not currently employed but are actively looking for employment. They are part of the labour force and classified as unemployed.
Paid Wage Employment	Both full-time and part-time employees in the formal and informal sectors who are working for a salary and

	wage under an employer
Day laborer	People engaged in casual and daily wage work, usually hired on a per-day basis without any long-term contract, e.g., construction workers, farm workers,
Apprenticeship	Individuals enrolled in a structured training program where they learn a skilled trade by working under an expert, often receiving a stipend. It combines training and work.
Self Employed	Individuals working independently without a wage-earning employer and running their own businesses, e.g., shop owners, plumbers, electricians, freelancers.
OJT/Internship	Individuals engaged in on-the-job training and internships. This is a temporary placement set up for career exploration and skills development, often with a mentor, and sometimes it is paid.

A total of 27% of individuals are neither working nor searching for a job. This includes 15% who are studying or in training programmes, and another 12% who are simply not looking for work, including women and housekeepers. These individuals are not part of the labour force, according to standard definitions. In contrast, 18% are unemployed but actively seeking work. Then there is the broad category of those who are earning, such as graduates with paid wages at 17%, while day labourers make up 4% of the total graduates. Those undertaking apprenticeships account for only 1%, and those with on-the-job training and internships comprise 25%.

5. Results

Table 9: Regression Results

Variables	Coefficient	Std. Error	t-value	p-value	95% Confidence Interval
Female	-0.813***	0.082	-9.86	0.000	[-0.975, -0.651]
Program Pillar (ref: Aghaaz)					
E-Tayyar	0.151	0.132	1.14	0.025	[0.108, 0.409]
Haryali	-0.180	0.175	-1.03	0.304	[-0.525, 0.164]
Maahir	0.214*	0.119	1.79	0.074	[-0.021, 0.448]
Umeed	0.239	0.175	1.36	0.173	[-0.105, 0.583]
Uraan	-0.092	0.180	-0.51	0.611	[-0.444, 0.261]
Zone (ref: Zone IV)					
Zone I	-0.016	0.097	-0.17	0.869	[-0.206, 0.174]
Zone II	0.011	0.133	0.08	0.937	[-0.250, 0.271]
Zone III	-0.238**	0.112	-2.12	0.034	[-0.458, -0.018]
Zone V	-0.169	0.121	-1.40	0.163	[-0.406, 0.069]
Zone VI	-0.453***	0.131	-3.45	0.001	[-0.710, -0.195]
Education Level (ref: Secondary Completed)					
Diploma/Vocational	0.015	0.193	0.08	0.937	[-0.363, 0.394]
Hafiz	-0.072	0.207	-0.35	0.727	[-0.478,

					0.334]
Primary completed or less	-0.200	0.290	-0.69	0.491	[-0.770, 0.370]
Less than Higher Secondary (HS) and HS completed	0.007	0.095	0.08	0.939	[-0.179, 0.193]
No Formal Education	-0.374	0.528	-0.71	0.479	[-1.410, 0.662]
Tertiary Education	0.097	0.089	1.09	0.027	[0.078, 0.273]
Job Type (ref: Private/Other)					
Government	0.548***	0.128	4.27	0.000	[0.296, 0.800]
NGO	0.044	0.303	0.14	0.885	[-0.550, 0.638]
Others	0.083	0.184	0.45	0.654	[-0.279, 0.444]
Employment Status (ref: Self-Employed)					
Formal Education & Training	-0.870**	0.405	-2.15	0.032	[-1.665, -0.075]
Unemployed & seeking	-0.613*	0.353	-1.74	0.083	[-1.305, 0.080]
Day Laborer	-0.598	0.570	-1.05	0.295	[-1.717, 0.522]
Apprentice	-1.071***	0.368	-2.91	0.004	[-1.794, -0.348]
Paid Wage	-0.499	0.337	-1.48	0.140	[-1.161, 0.164]
OJT/Internship	-1.456**	0.551	-2.64	0.008	[-2.539, -0.373]
Age Bracket (ref: 20–24 years)					
<20	-0.624***	0.183	-3.41	0.001	[-0.983, -0.265]
25–29	0.182**	0.084	2.16	0.031	[0.017, 0.348]

30–34	0.104	0.135	0.77	0.441	[-0.161, 0.369]
35+	0.490**	0.223	2.19	0.029	[0.051, 0.929]
Constant	10.653***	0.348	30.65	0.000	[9.970, 11.335]

Data Source: Authors Calculation using Survey Data

The results indicate a significant gender gap in the income of training graduates. Holding other factors constant, females earn 55.65 per cent less than males. This sizable disparity suggests that, although similar training opportunities are available, even some trades are specifically women-centric, and the entire brand pillar Uraan has a complete focus on women-related skills enhancement. Nevertheless, there are still structural barriers, variations in employment opportunities, and social hindrances that limit their earning potential. Literature also suggests different effects of training based on gender (Attanasio et al., 2011; Blattman et al., 2012).

Under the SYIG program, training was provided under six brand pillars, out of which Haryali focuses on agriculture and livestock skills, Aghaaz on entrepreneurship, Mahir on vocational training, Uraan on women-focused programs, E-Tayyar on digital skills, and Umeed on marginalised communities. While examining the impact of different programs Maahir program stands out significantly, affecting income (24 per cent) relative to the Aghaaz, which is the base category. This reveals that training under the Mahir program is better aligned with the market demands and leads to better earning opportunities. The same is true for E-Tayyar, which is imparting digital skills. On average, graduates trained under the E-Tayyar program earn approximately 15.1 per cent more than those trained under the reference category Aghaz. This reveals ICT skills make training graduates more equipped and enable them to work according to the market demands (Atasoy, et al., 2021; Rêgo, et al., 2024). However, the lack of statistically significant effects for other programs could imply that differences between training modules may be less influential than other factors such as location or employment status.

The results show that income outcomes are greatly dependent on geographical location. The Central Punjab workforce belt, which encompasses major cities and constitutes the largest cluster, is the base category. As compared to the base category, Zone VI (Cholistan Skills Frontier) and Zone III (Western Access Zone) earn 36 per cent and 24 per cent less, respectively. This reflects regional disparities in terms of job availability, market access, or the training provided, which may not align with market demand. Zone VI is an underdeveloped and remote area that has limited job opportunities, and the labour force exhibits less earning potential due to a lack of opportunities. Meanwhile, other zones are showing no significant income differences with the reference category and are comparable in terms of economic conditions and labour market opportunities.

The relationship between income and the education level of the training graduates is examined. The category 'Secondary Completed' serves as the reference group in the analysis, as it includes the highest number of graduates in the dataset. The findings reveal that tertiary education is significantly linked with better income levels compared to other education categories. Individuals with the tertiary level of education earn approximately 9.7 per cent more than those who have secondary education. Those who have vocational training have higher wage differentials than those who have a formal education. However, when tertiary education is combined with skills training to integrate skills in the labour market better, it reveals that individuals gain a better understanding of the training materials and can apply them more effectively in the market (Wongmonta, 2023). In contrast, other categories of education, such as diploma, primary education, no formal education, and religious education, do not show statistically significant differences when compared to the income of the secondary education level. Overall, the results highlight that tertiary education is the only level that confers a clear and significant income advantage among SYIG program graduates.

A better wage premium is associated with government employment, which may suggest that public sector employees get more stable salaries and other benefits. The construction of the income variable includes all the benefits an employee receives, which are then calculated in monetary terms, and the total income is determined. This includes medical

allowance, provident fund, gratuity or old age benefits, in-kind support in terms of products (this is mainly in the case of factory workers), child protection, accommodation, etc. All of these benefits are more available to the government employees. In contrast, those working with NGOs and in other private sector jobs do not show a significant increase in income as compared to the reference category. The reference category in this variable is selected because the maximum training graduates are working in the private sector. However, those who received the training and are in government jobs are earning better; however, this cannot be attributed solely to the training. However, if the tasks performed on the government job are related to the skills learned through training, then it can clearly be attributed to the higher income levels of those in the government sector. In contrast, working for NGOs or in other private sector jobs does not significantly boost income compared to the reference group, highlighting that government employment remains a highly desirable and lucrative option in the region.

The regression analysis reveals a significant variation in income levels across the employment status of training graduates. The self-employed category is associated with higher income levels. Graduates working as apprentices, doing internships, or in formal education, however, have some source of income, but it is significantly less than that of the self-employed category. These results are significant and reveal the limited financial returns associated with the transitional roles of individuals in the process of building skills. A critical analysis of the results reveals that job creation as a result of training points to the problem of displacement, where job placement for some youth comes at the expense of others, and this does not generate income in the labour market as a whole (Fox & Kaul, 2018). Even the graduates are earning less than those who are self-employed, which seems to offer more sustainable income opportunities. Business training, access to finances, and mentorship can help youth enter and thrive in self-employment, generating more income, and in this way, program objectives can be met. A mere displacement of income and job opportunities will not lead to the overall benefit to society.

Age follows a logical pattern that is consistent with labour economics. Younger participants who are under 20 years of age earn significantly less, which reflects their limited work experience or informal or part-time

labour involvement. Income significantly increases for those aged between 25-29 years and above 35 years, which follows an expected trajectory of income growth with experience and skills accumulation. Overall, the age findings reinforce that work experience and maturity are the important determinants of income. Among youth aged 15 to 24, indicators of difficulty in transitioning from schooling to full-time employment and becoming productive citizens and providers for their families are among the most frequently cited (Adams, 2007). Overall, the findings on age reinforce the importance of work experience and maturity in determining income.

The intercept represents the expected baseline income of a male training graduate with secondary education who works in the private sector in the Central Punjab Workforce Belt and received training under the Aghaz program. This baseline serves as the foundation for understanding how variations in gender, program, location, education, employment status, and age affect income. In all the variables, a few categories showed insignificant results, which is due to a smaller number of training graduates in that particular category, such as Uraan and Umeed, which are not significant because they have an overall smaller number of graduates, and it does not affect income significantly. In the education variable, only a higher level of education significantly affects the income level. Lower levels of education do not show significant variation in income, indicating a limited impact on income levels.

5.1 Discussion & Recommendations

This model demonstrates that structural factors, such as gender, geography, and job type, are significant determinants of income outcomes, despite the importance of training programs. Post-training interventions to enhance earnings should, therefore, focus on broader sources of labour market inequalities, including gender and regional gaps, as well as skill development. A multidimensional approach is needed to achieve improved labour market reforms. Particularly one that incorporates gender sensitive training programs and job opportunities, region-specific economic planning and interventions, and entrepreneurial assistance to the youth.

The objective of generating income can be achieved by availing post-training placement services with particular attention to the female graduates. To improve the situation and make the training program more inclusive, it is possible to implement gender-sensitive entrepreneurship opportunities, primarily within the Mahir and E-Tayyar Brand pillars.

The pillars that are performing well should be focused more, and to achieve even better results, cross-pillar integration of the training can help graduates find better income generation opportunities. Entrepreneurship, for example, may be combined with the development of digital skills. The findings indicate that the development in the overall ecosystem will lead to improved outcomes.

The training, combined with the local economic development project, local market conditions, and improved investments, can be used to support underserved areas where training results are not as favourable, such as zones III and VI. To ensure that training programs provide increased income-earning opportunities for youth, technical training programs should be integrated into the formal education system. The realisation of previous learning to reskill people with higher education levels can be more effective in terms of income earning. If self-employment opportunities are incorporated into the program, it would be even more effective.

The training can provide start-up capital and mentorship, opening up opportunities for self-employment, as well as introducing income support or stipends to interns in the process of apprenticeship.

To reinforce the connection between training programs and employment rates within specific sectors, particularly in government and non-profit jobs, targeted policy solutions are necessary.

First, aligning training content with public sector competency frameworks can significantly improve job matching and ensure that trainees are equipped with the skills and knowledge relevant to available government roles.

Tiered training programs, based on experience and age, can lead to increased income generation. Providing basic skills and reskilling the ageing population can help align with evolving market needs. Displacement effects of the interventions

A more human-centred approach to youth employment policy begins with rethinking the goal of training programs, not just as tools to quickly place individuals into jobs, but as catalysts for creating meaningful, long-term employment opportunities. Rather than focusing solely on short-term placement targets, there is a need to prioritise interventions that genuinely generate new jobs and support sustainable livelihoods. This includes regularly assessing training initiatives for displacement effects, where one person's employment may come at the cost of another's, and refining targeting strategies accordingly. In labour markets that are already saturated, empowering youth to become job creators through entrepreneurship should be a central pillar. Programs must be designed to complement existing employment, especially by focusing on underserved sectors or emerging industries where labour demand is growing. Ultimately, these efforts should be embedded within broader, inclusive economic policies that stimulate overall demand for skilled labour, so that training does not just prepare young people for jobs, but ensures those jobs truly exist and are within reach.

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Public Health Care Financing Policy and Welfare Economics: An Analysis of Punjab's Sehat Sahulat Program in light of Global Markets

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Abstract: This paper examines international public health insurance (PHI) models through a theoretical lens, visualizing cross-country data (2010- 2020) on the Universal Health Coverage (UHC) Index, out-of-pocket (OOP) expenditure, catastrophic spending, and poverty to empirically test Kenneth Arrow's uncertainty framework. The correlations demonstrates that countries with stronger risk pooling—such as Germany, France, Thailand, and Turkey—achieve high UHC scores with minimal household impoverishment, validating Arrow's prediction that unregulated OOP reliance amplifies financial risk. Building on this comparative foundation, the paper develops a case study of Punjab's Sehat Sahulat Program (SSP), situating it within Arrow's framework and the broader tradition of welfare economics. The study pursues objectives of analyzing the global rationale for PHI adoption, evaluate impacts on equity and access, identify challenges, benchmark SSP against international reformers, and integrate cross-cutting themes of digitization, climate resilience, gender equity and overall SDGs. Findings show Pakistan and other low income countries trapped in a high-OOP, low-UHC quadrant with persistent catastrophic expenditures, poverty effects, and fragmented schemes, while reform-driven middle-income countries shows tangible gains through deeper and broader coverage. These reforms are vital to advancing UHC, ensuring equity, and enabling PHI to deliver sustainable welfare gains in the low middle incomes countries and especially Pakistan.
Keywords: Health financing, Universal Health Coverage (UHC), Sehat Sahulat Program (SSP), Public Health Insurance (PHI), Out of Pocket Expenditure (OOP), Welfare Economics, Arrow's theory of Uncertainty, Risk Pooling

1. Introduction

The welfare economics of public health supports human well-being, enhances societal productivity, and strengthens the effective deployment of social capital. Human capital[1], a central determinant of national income, is closely tied to the health and welfare of individuals;

[1] Schultz, T. W. (1961). *Investment in Human Capital.* American Economic Review.

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conversely, improvements in population health reinforce economic performance. In 1960s, Gary Becker's theory of human capital[2], alongside Schultz's pioneering work (1961), provides the theoretical grounding for analyzing healthcare as a form of investment. Health facilities, much like "normal goods[3]," exhibit rising demand with increasing income, and health services follow this economic pattern.

Investment in healthcare has therefore captured the attention of economists and policymakers alike. As a merit good[4], healthcare requires state intervention to correct market failures, generate positive externalities, and prevent exploitation by private providers. In practice, most countries rely on a mix of public and private insurance systems to guarantee uninterrupted health services. For example, the United States relies heavily on private insurance, while countries such as the United Kingdom, Denmark, Norway, New Zealand, Germany, Canada, and Taiwan[5], along with some low-income nations in Sub-Saharan Africa, recognize healthcare as a fundamental human right and provide universal or subsidized coverage through public financing and social insurance models. Historical precedents, such as Otto von Bismarck's 1883 Health Insurance Law[6], demonstrate the enduring value of risk pooling and insurance in ensuring equitable access to care. Today, Germany maintains a statutory health insurance system covering the majority of its population, comparable in function to Medicaid in the United States.

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[2] Soares, R. R. (2015). Gary Becker's contributions in health economics. *Journal of Demographic Economics*, *81*(1), 51-57.

[3] Normal goods are goods for which demand increases as consumer income rises.

[4] A merit good is a good that is socially desirable and tends to be under-consumed if left to the free market, often warranting government provision or subsidy.

[5] Firmansyah. (2024). Health insurance and public health: Analyzing the impact of financing and policy on healthcare access. *Jurnal Riset Kualitatif dan Promosi Kesehatan, 3*(1), 41–49. Wajahat. (2020). Public Financial Management and the SDGs a case study of Business Accounting and Finance, Government College University, 10, Jan, 2020 – 05 Aug, 2025.

[6] Busse, R., Blümel, M., Knieps, F., & Bärnighausen, T. (2017). Statutory health insurance in Germany: A health system shaped by 135 years of solidarity, self-governance, and competition. *The Lancet, 390*(10097), 882–897. https://doi.org/10.1016/S0140-6736(17)31280-1

The economics of healthcare also highlight the importance of risk pooling in the face of clinical uncertainty and expenditure shocks. Health insurance mitigates out-of-pocket expenditures by distributing risk, thereby stabilizing household welfare. This also make parallel with health economics principles, which highlight that optimal consumption occurs when marginal benefits equal marginal costs, both at the individual and systemic level. Globally, such frameworks have informed healthcare reforms and have been integrated into sustainable development efforts, particularly under the United Nations' Sustainable Development Goals (SDGs). Goal 3 of the SDGs places health at the center of global development, emphasizing universal access, improved quality of care, and reduced inequalities. The increasing role of digitization and artificial intelligence (AI) in health systems, along with cross-cutting themes such as gender and climate change, further shape the evolving setting of public health insurance policy.

In Pakistan, these global policy debates take on a critical dimension. The country faces persistent challenges of low health coverage, inadequate infrastructure, and high out-of-pocket expenditures that push millions into poverty each year. While healthcare expenditure remains low around 0.9% of the total GDP, with a PSDP budget of Rs. 103.5 billion, pertaining the gaps as the WHO guidelines suggest that the health spending must be **around 5% of GDP**[7], this leading to gaps remain in ensuring equitable, transparent, and efficient access. The health infrastructure aids 1,696 hospitals and 5,434 basic health units[8], although critical health indicators continue to raise alarms, such as an infant mortality rate of 50.1 per 1,000 births (2023) and a life expectancy of 67.6 years[9]. Pakistan's experience during the COVID-19 pandemic demonstrated resilience in crisis response, yet systemic weaknesses continue to constrain universal coverage.

[7] Ministry of Finance, Government of Pakistan. (2025). *Pakistan economic survey 2024–25*. Retrieved from Ministry of Finance website: https://www.finance.gov.pk/survey_2025.html

[8] **World** Bank. (2023). *World Development Indicators*. World Bank. https://databank.worldbank.org/source/world-development-indicators

Punjab's healthcare initiatives are supported out through the Punjab Health Initiative Management Company (PHIMC), focusing mainly on providing health coverage and easing the financial burden of medical expenditures for beneficiaries. The Universal Health Insurance Program/Sehat Sahulat Program is currently being implemented under the Public Sector Development Program (PSDP). For the fiscal year 2025, the PSDP allocation for this project is set at Rs 54 million, aimed at decreasing out-of-pocket healthcare expenses for vulnerable sectors of the population, utilizing a combination of both public and private service delivery. The developments in the health insurance program have resulted in substantial government savings of thirty-three billion rupees[10].

The motivation for this research is rooted in analyzing the global public health insurance models, evaluating their equitable and efficient structures to ensure cost-effectiveness, while also connecting these systems with overarching themes such as gender, climate, and data governance mechanisms to mitigate issues of information asymmetry and moral hazard. It also aims to develop a comparative analysis of successful PHI models across the world and drafting recommendations for Pakistan to roll out such models across the country- developing the case study of Sehat Sahulat program[11]. This addresses the equity concerns ensuring vertical and horizontal effectiveness and fairness. Global research on health insurance is extensive, but studies focusing on lower-middle-income countries—especially at the sub-national level in Punjab—are limited, emphasizing the need for this analysis. Accordingly, the research examines, the economic challenges of Punjab's Sehat Sahulat Program, and its capacity to address risk pooling, adverse selection, and fiscal space. Drawing on theoretical constructs from the Kenneth Arrow's work on uncertainty and expected utility[12], along with theories of moral hazard,

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[12] Arrow, K. J. (1963). "Uncertainty and the welfare economics of medical care." *American Economic Review, 53*(5), 941–973

principal-agent dynamics, and the public good nature of health[13], the study situates SSP within broader debates on health financing reforms.

The objectives of the study are fivefold: (i) to analyze the rationale for adopting public health insurance around the world; (ii) to assess its fiscal sustainability; (iii) to evaluate its impact on equity, access, and health outcomes; (iv) to identify governance and implementation challenges globally; and (v) to benchmark SSP against international best practices (vi) to link the emerging cross cutting themes of digitization, climate and gender with public health insurance models. The ultimate aim is to provide policy recommendations for strengthening Pakistan's health financing system, advancing UHC, and ensuring that public health insurance delivers meaningful welfare gains across society.

1. Research Gap

2.1. Empirical evidence of these gaps across regions and program

While health financing has improved globally, there are still problems with how impoverishment due to out-of-pocket (OOP) expenses is measured. Different countries practice different methods to assess poverty, making comparisons difficult[14]. Evidence is also thin on how differences in prepaid contributions and social security systems shape financial protection, while methodological weaknesses exists in addressing missing household survey data. In sub-Saharan Africa, fragmented financing structures undermine both equity and efficiency, yet little research identifies effective risk-pooling strategies, integration of frameworks, or sustained OOP reduction. China's experience similarly exposes inequities: OOP spending remains regressive despite expanded insurance, with insufficient analysis of how benefit package design, rural–

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[13] Schramme T. Health as Complete Well-Being: The WHO Definition and Beyond. Public Health Ethics. 2023 Jul 27;16(3):210-218. doi: 10.1093/phe/phad017. PMID: 38333767; PMCID: PMC10849326.

[14] S. Docrat, D. Besada, S. Cleary, C. Lund, "The impact of social, national and community-based health insurance on health care utilization for mental, neurological and substance-use disorders in low- and middle-income countries: a systematic review," Health Economics Review, 2020. https://doi.org/10.1186/s13561-020-00268-x.

urban disparities, and consumption patterns mediate protection outcomes. Mental health care, moreover, is rarely examined in relation to insurance reforms, as most studies assess service utilization without probing how scheme design links to financing and mental health outcomes[15]. Even the New Cooperative Medical Scheme, while improving service use, reveals persistent provincial and income-based inequities, with inadequate inquiry into how reimbursement rates, regional governance, and long-term protection mechanisms interact to reinforce or alleviate these divides. Collectively, these gaps underscore the need for context-sensitive, equity-driven research that integrates fragmented systems, addresses marginalized populations, and incorporates political economy insights to build more sustainable financing reforms. This research paper addresses this by empirically benchmarking SSP against cross-country UHC, OOP, and poverty indicators, highlighting how Pakistan's outcomes deviate from international reform capabilities.

2.2. Governance shows why reforms succeed or fail

Recent transformations in health financing highlight the growing role of governance and evidence-informed policy-making as determinants of reform trajectories. Beyond technical design of economics principles, the success of financing models increasingly depends on how governments mobilize institutional capacity, regulate provider incentives, and align reforms with broader socio-political programs[16]. China's late-2000s transition is a critical illustration: abandoning a rigidly centralized and bureaucratic framework, it adopted an insurance-driven universal coverage model that was reinforced by structural hospital reforms, signaling a recalibration of state roles from direct provider to strategic purchaser and regulator. This governance shift not only extended coverage but also rectified tensions between efficiency, equity, and sustainability, underscoring that historical trajectories shape the distributive

[15] M. Chen, W. Chen, Z. Yu-xin, "New evidence on financing equity in China"s health care reform - A case study on Gansu province, China," BioMed Central, 2012

[16]Zhou, Q., Liu, G.G. & Krumholz, S. Is Chinese National Health Insurance Effective in the Face of Severe Illness? A Perspective from Health Service Utilization and Economic Burden. *Soc Indic Res* **132**, 1307–1329 (2017). https://doi.org/10.1007/s11205-016-1330-5

consequences of reforms[17]. Situating contemporary health policies within such governance transitions is consequently essential to understanding their long-term implications for equity, system resilience, and health outcomes[18]. This paper addresses this by analyzing how weak institutional design and fragmented governance limit SSP's effectiveness, illustrating lessons from successful reforms in international best practices.

2.3. PHI design shows the conceptual blind spots

While public health insurance (PHI) is often presented as a pathway to equity and universal coverage, moving beyond its scope to the underlying principles of equity, efficiency, and sustainability in health systems, empirical evidence endorses that its effectiveness critically depends on the underlying institutional and conceptual design. Countries with comprehensive PHI schemes sometimes underperform because they neglect the principles to address Arrow's foundational insights on uncertainty, asymmetric information, and risk-pooling, weak incentive alignment persist, undermining both fiscal sustainability and service delivery[19]. While equity remains crucial, the analytical trial lies in operationalizing it—designing mechanisms that redistribute resources across income groups, regions, and risk pools without undermining fiscal sustainability.

For instance, systems that prioritize broad enrollment targets without robust mechanisms for provider accountability or cost containment often experience escalating expenditures with limited gains in health outcomes. Similarly, insurance models that focus narrowly on financial protection but overlook structural inequities in service distribution continue regional and class-based disparities. Thus, the paradox arises that even apparently comprehensive PHI systems can reinforce inefficiencies and inequities

[17] J. Kutzin, "Anything goes on the path to universal coverage? No.," World Health Organization, 2012. https://doi.org/10.2471/blt.12.113654
[18] A. Maeda, E. Arajo, C. Cashin, J. Harris, N. Ikegami, M. R. Reich, "Universal Health Coverage for Inclusive and Sustainable Development: A Synthesis of 11 Country Case Studies," None, 2014. https://doi.org/10.1596/978-1-4648-0297-3
[19] D. Erlangga, S. Ali, K. Bloor, "The impact of public health insurance on healthcare utilisation in Indonesia: evidence from panel data," Springer Science+Business Media, 2019. https://doi.org/10.1007/s00038-019-01215-2

when the conceptual foundations of health economics—risk pooling, expected utility under uncertainty, and the public good nature of health—are not adequately embedded in policy design[20]. Health financing research neglects the interface between design, governance, and political economy, which explains determined failures of PHI in LMICs despite reforms.

This paper addresses this by representing how SSP's inpatient-only design reflects these blind spots and by proposing an incorporated framework that links fiscal sustainability, governance, and equity with modern stressors such as AI, climate shocks, and gender inequities.

3. Theoretical backing of the public health insurance models:

3.1. Strong conceptual model for the public health insurance model:

Kenneth Arrow[21] (1963) showed that healthcare markets are fundamentally different from standard competitive markets due to uncertainty and unequal access to information. Illness is unpredictable, and medical knowledge is distributed unevenly among doctors, insurers, and patients. These characteristics lead to market failures, resulting in inefficiencies in unregulated private markets.

3.1 Asymmetric Information

Providers hold more information than patients and insurers, leading to supplier-induced demand, over-treatment, and inefficiencies. SSP's panel hospitals often overbill, exaggerate diagnostics, or induce admissions, with weak monitoring enabling rent-seeking.
Implication: SSP fails structurally because it expanded insurance without structuring governance capacity to counteract informational rents.

Figure 1 in Appendices

[20] D. A. Osei, F. Masiye, F. Tediosi, G. Fink, "Purchasing for high-quality care using National Health Insurance: evidence from Zambia," Health Policy and Planning, 2023. https://doi.org/10.1093/heapol/czad022

[21] Arrow, K. J. (1978). Uncertainty and the welfare economics of medical care. In *Uncertainty in economics* (pp. 345-375). Academic Press.

3.2. Adverse Selection

Arrow identified that if enrollment is optional or uneven, high-risk individuals dominate pools, driving up costs and undermining sustainability. SSP is universal in theory, but in practice, awareness and access are uneven. Utilization is focused among higher-risk and urban populations, creating imbalances.

Implication: SSP underperforms because it fails to secure broad, balanced participation and does not effectively integrate informal sector households into a sustainable pool.

3.3 Moral Hazard

Insurance reduces the direct cost of care, promising higher utilization, sometimes unnecessary. Evidence points to repeated claims, overutilization in tertiary hospitals, and unnecessary admissions, while preventive care is ignored since it is not covered.

3.4 Externalities and the Public Good Nature of Health

Health services, especially preventive ones, generate positive externalities (e.g., herd immunity, productivity). Left to markets, these services are under-provided. SSP is treatment-oriented, focused on curative inpatient services, while high-return preventive interventions like immunization, maternal health, and early screening remain underfunded.

Collectively, these factors warrant government action through regulation, subsidies, or public insurance. Public health insurance[22] is justified on five bases: (1) risk pooling through universal coverage, (2) equity by incorporating the poor and those in informal employment, (3) efficiency by distributing costs across the tax base, (4) regulatory measures to alleviate information disparities, and (5) acknowledgment of health as a public good that provides wide social benefits.

[22] Fischer, T., Frölich, M., & Landmann, A. (2023). Adverse selection in low-income health insurance markets: Evidence from an RCT in Pakistan. *American Economic Journal: Applied Economics*, *15*(3), 313-340.

3.5. Other Foundational Theories

These theories provide the intellectual backbone for understanding why health insurance is both necessary and effective in Pakistan:

Theory	Application to Public Health Insurance Models
Welfare Economics Theory[23]	Health insurance generates positive externalities and acts as a public good. State intervention is warranted to correct market failures like imperfect information, adverse selection, and moral hazard. Catastrophic health expenditures push million into poverty annually, validating the need of such and other programs as instruments of social welfare.
Risk Pooling and Risk Sharing Theory	It highlights that small private pools fails under high-risk concentration, whereas universal schemes spread costs across populations to ensure sustainability. Public health insurance operationalizes this by pooling government funds to protect weak households and reduce individual fiscal shocks.
Rawlsian Approach[24]	Access to healthcare is a basic right, positioning SSP not merely as welfare but as a distributive social justice and equity device.

These theoretical traditions deepen the rationale. However, these theories often assume strong fiscal and administrative capacity, which Pakistan (Punjab's health sector) lacks, creating a theory–practice gap.

3.6 Economic and Health Insurance Models

Different models of health insurance contextualized for Pakistan:

[23] Pigou, A. C. (1920). *The economics of welfare*. London: Macmillan.
[24] Bommier, A., & Stecklov, G. (2002). Defining health inequality: why Rawls succeeds where social welfare theory fails. *Journal of health economics*, *21*(3), 497-513.

Model	Relevance to Pakistan
Bismarck Model (Social Health Insurance)[25]	Funded via payroll taxes. Coverage is limited (~5% of formal sector).
Beveridge Model (National Health System)[26]	Funded through general taxation, aiming for universal coverage. SSP approximates this model but remains incomplete.
Private Insurance Market Model	Voluntary, premium-based insurance. Limited to middle/high-income groups due to affordability constraints.

These economic and insurance models offer further context. The Bismarck model is inapplicable beyond Pakistan's small formal sector, while the Beveridge model provides a closer analogue to SSP but suffers from fiscal constraints and weak tax compliance, likewise the case is with the private insurance remains regressive, catering only to elites. Thus, Pakistan's hybrid system borrows elements without fully comprehending the strengths of any model, raising sustainability crises.

3.7. Behavioral and Institutional Theories

These explain the operational inefficiencies and governance challenges:

Theory	Pakistan Context
Information Asymmetry	Patients and providers know more than insurers, leading to overbilling, fraud, and inefficiencies in SSP panel hospitals **(Akerlof, 1970).**
Public Choice	Insurance policy design influenced by political

[25] Tulchinsky TH. Bismarck and the Long Road to Universal Health Coverage. Case Studies in Public Health. 2018:131–79. doi: 10.1016/B978-0-12-804571-8.00031-7. Epub 2018 Mar 30. PMCID: PMC7149836.

[26] Beveridge, W. (1942). *Social insurance and allied services (The Beveridge Report)*. London: His Majesty's Stationery Office.

Theory[27] (PCT)	motives and donor preferences; SSP expansion sometimes aligns with electoral promises.
Institutional Theory[28]	Strong governance and monitoring are crucial. Weak institutional capacity in Pakistan leads to leakage, inequity, and sustainability challenges.

These theories also expose why performance lags. Akerlof's information asymmetry manifests in SSP hospitals through overbilling and fraud. PCT explains why developments align with electoral cycles rather than actuarial logic. Institutional theory endorses the idea that without enforcement and accountability, even well-planned schemes leak resources and fail to protect the vulnerable. Finally, **recognizing health as a public good[29] (non-rival and non-excludable)** e.g., **vaccination, epidemic control, maternal care** highlights services the market systematically underprovides. Pakistan's struggles with polio and maternal mortality exemplify why public financing is crucial, but also why weak delivery systems challenge returns.

4. Scope and data quality considerations

Some data gaps hinders robust analysis, with UHC Service Coverage Index data ending in 2018 and OOP data only available until 2020, limiting continuity in time-series assessment. While the study adopts a descriptive approach grounded in welfare economics rather than causal inference, concerns remain about harmonization across global repositories, uneven national reporting, and the omission of informal and non-monetary payments. Moreover, indicators like the UHC Service Coverage Index capture service availability and use but ignores the care

[27] Buchanan, J. M., & Tullock, G. (1962). *The calculus of consent: Logical foundations of constitutional democracy*. Ann Arbor: University of Michigan Press.

[28] **Institutional Theory** explains how organizational structures, practices, and behaviors are shaped by formal rules, social norms, and cultural expectations within their institutional environment, emphasizing legitimacy, conformity, and the influence of established institutions

[29] Ziegler, S., Srivastava, S., Parmar, D. *et al.* A step closer towards achieving universal health coverage: the role of gender in enrolment in health insurance in India. *BMC Health Serv Res* **24**, 141 (2024). https://doi.org/10.1186/s12913-023-10473-z

quality, highlighting the need for more comprehensive metrics for policy design.

The results are contextualized within Arrow's theoretical model, allowing for a combination of empirical findings and conceptual discussions related to public health insurance and government intervention in healthcare markets.

Indicator name	Short Form	Definition	Source
1. Financial hardship: population pushed below a relative poverty line by household health expenditures - 60% of median daily per capita consumption or income (%, national, rural, urban)	Population with impoverishing health expenditures, at a relative poverty line (60% of median daily per capita consumption or income)	The percentage of the population for whom the total household expenditure or income, inclusive of health-related spending, meets or exceeds the poverty threshold, while the total consumption expenditure or income, excluding health expenses, falls below that threshold. Household consumption or income, health expenditures, and the relative poverty threshold are all assessed based on their daily per capita values. To derive representative figures per individual, the household's sample weight is multiplied by the size of the household; if the sample is self-weighting, only the household size is utilized as the weight. The relative poverty line, which varies by country, is established at 60% of the median daily per capita consumption or income in each nation. This measure highlights the relationship between SDG target 1.2, which aims to eradicate poverty globally, and SDG target 3.8, which focuses on achieving Universal Health Coverage.	Global Health Observatory (WHO)[30]

[30] World Health Organization. (n.d.). *Global Health Observatory data repository*. World Health Organization. https://www.who.int/data/gho

Financial hardship: increase in poverty gap due to household health expenditures, expressed as a proportion of the $3.20 a-day poverty line	Poverty gap due to out-of-pocket health spending, expressed as a proportion of the 2011 PPP $3.20 a day poverty line	The rise in the poverty gap resulting from household health expenditures aligns with the increase in the average shortfall of consumption or income from a poverty line due to household health expenses. This increase in the average shortfall is represented as a percentage of the poverty line. Household consumption or income, health-related expenditures, and poverty lines are all expressed in terms of their daily per capita values. To derive representative figures per person, the household's sample weight, multiplied by the number of people in the household, is utilized. If the sample is self-weighting, then only the household size is considered as the weight. The international poverty line, set at $3.20 a day per capita in 2011 purchasing power parity (PPP), is referenced (denoted as $3.20-a-day). This line reflects the common benchmark used for evaluating national poverty levels in lower-middle-income nations. International poverty lines are adjusted to local currency units (LCUs) using the 2011 PPP exchange rates and consumer price indices (CPIs).	Global Health Observatory (WHO)
Out-of-	OOP%CH	Share of current health	Global

pocket expenditure as percentage of current health expenditure (CHE) (%)	E	expenditure funded from household out-of-pocket payments	Health Observatory (WHO)
Universal Health Coverage Index	UHC – Index	Coverage of essential health services (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, newborn and child health, infectious diseases, non-communicable diseases and service capacity and access, among the general and the most disadvantaged population). The indicator is an index reported on a unit less scale of 0 to 100, which is computed as the geometric mean of 14 tracer indicators of health service coverage. These 14 indicators span reproductive, maternal, newborn, and child health; infectious diseases and non-communicable diseases; as well	Sustainable Development Goals[31]

[31] United Nations, Department of Economic and Social Affairs, Statistics Division. (2024, January 8). *Universal Health Coverage (UHC) service coverage index [Official estimate]*. United Nations. https://data.who.int/indicators/i/3805B1E/9A706FD

		as health system capacity, including both infrastructure and workforce. By assessing service delivery for general and marginalized populations—such as services for family planning, antenatal care, immunization, and disease treatment—this index provides a standardized, evidence-based approach for evaluating health coverage.	

Financial hardship: population with household expenditures on health greater than 10% of total household expenditure or income (SDG 3.8.2) (%, national, rural, urban)	Population with household health expenditures greater than 10% of total household expenditure or income (SDG 3.8.2)	The proportion of the population with household expenditure on health exceeding 10% of total household expenditure or income.	
Health infrastructure: provincial hospitals, density per 100 000 population	Density of provincial hospitals	Number of provincial hospitals from the public and private sectors, per 100,000 population.	Global Health Observatory (WHO)
Pakistan Health Budget	% of GDP	% of GDP	Economic Survey of Pakistan 2024- 25[32]

[32] Economic Adviser's Wing. (2019–2024). *Pakistan economic survey*. Ministry of Finance, Government of Pakistan. https://www.finance.gov.pk

Punjab Health Budget	In millions	Expenditure done on health sector	Punjab Budget 2024-25[33]
Health Key Indicators		1. Prevalence of HIV 2. Neonatal mortality rate 3. Maternal mortality ratio 4. Life expectancy at birth 5. Infant mortality 6. Incidence of TB 7. Immunization	World Bank Development Indicators [34] UNICEF[35]

4.1 Financing versus household impact

i) UHC OOP Catastrophic Link

Cross-country evidence in figure.2 shows a strong negative correlation between UHC performance and out-of-pocket (OOP) reliance illustrating Arrow's prediction that the countries with stronger pooling, Germany, France, and the UK sustain UHC scores above 80 with OOP below 15%, reflecting robust risk pooling under social or tax-based insurance. By contrast, Pakistan, Bangladesh, and India exhibit UHC scores below 60 alongside OOP levels exceeding 50%, exposing households to catastrophic expenditures. This reliance on direct payments systematically drives vulnerability, as seen in Bangladesh, Ghana, and pre-Ayushman Bharat India, where large shares of households exceed the 10% threshold

[33] Government of Punjab. (2018–2025). *Punjab budget documents: Health sector allocations*. Finance Department, Government of the Punjab. https://finance.punjab.gov.pk

[34] World Bank. (n.d.). *World development indicators*. The World Bank. https://databank.worldbank.org/source/world-development-indicators

[35] UNICEF. (n.d.). *Data warehouse*. United Nations Children's Fund. https://data.unicef.org

for catastrophic spending. Effective risk pooling through prepayment schemes thus proves critical for insulating households from financial shocks.

Figure 2nd in the Appendices

4.1. Insurance Depth, Breadth, and Poverty Impact

Beyond service coverage, the design of public health insurance (PHI) determines its impact on poverty reduction. France, Germany, and the UK report negligible health-induced impoverishment, while reform-driven programs in Thailand[36], Turkey[37], and Mexico demonstrate substantial declines in poverty after broadening and deepening their coverage. Conversely, Pakistan continues to show widening poverty gaps due to shallow risk pooling, limited benefit packages, and exclusion of vulnerable groups. Comparative lessons reveal that universal health coverage alone is insufficient: only insurance models that align coverage breadth (population included) and depth (services provided) with financial sustainability can meaningfully reduce poverty risks.

Figure 3rd in the Appendices

4.2. Equity Dimension:

The effect of healthcare expenses on the poverty gap is influenced by both the coverage breadth (the population included) and the coverage depth (the benefits provided) of PHI. Thailand and Turkey—where insurance encompasses a broad spectrum of preventive and curative services—show little to no increase in poverty gaps. In contrast, Ghana's National Health

[36] Tangcharoensathien, V., Pitayarangsarit, S., Patcharanarumol, W., Prakongsai, P., Sumalee, H., Tosanguan, J., & Mills, A. (2013). Promoting universal financial protection: how the Thai universal coverage scheme was designed to ensure equity. *Health Research Policy and Systems*, *11*(1), 25.

[37] Ökem, Z. G., & Çakar, M. (2015). What have health care reforms achieved in Turkey? An appraisal of the "Health Transformation Programme". *Health Policy*, *119*(9), 1153-1163.

Insurance Scheme and Mexico's Seguro Popular[38] mitigate catastrophic risks but still have limitations due to narrow service offerings. Pakistan continues to experience rises in the poverty gap, revealing structural weaknesses in risk pooling, limited benefits, and exclusion issues.

By examining indicators of financial risk protection alongside UHC and OOP trends, it becomes clear that universal coverage alone, without robust financial pooling mechanisms, is inadequate. Effective PHI models mitigate both catastrophic expenses and poverty risks by ensuring alignment of coverage breadth, benefit depth, and financial stability. This systematically tests how PHI financing shifts household risk**.**

5. Linking Universal Health Coverage and Financial Protection: Insights from Public Health Insurance Models

The Universal Health Coverage (UHC)[39] Service Coverage Index, which aligns with SDG Indicator 3.8.1. UHC includes aspects like service availability, quality, and accessibility, this analysis highlights financial protection due to the following reasons:

- The WHO categorizes financial protection as a fundamental component of UHC.
- Public health insurance (PHI) models are designed to pool risk and reduce out-of-pocket expenditures.
- In lower-middle-income countries (LMICs), healthcare costs frequently drive families into poverty.

Figure 4th in the Appendices

5.1 Universality of UHC Index:

[38] García-Díaz, R., Sosa-Rubi, S. G., Serván-Mori, E., & Nigenda, G. (2018). Welfare effects of health insurance in Mexico: The case of Seguro Popular de Salud. *PloS one*, *13*(7), e0199876.

[39] World Health Organization. (2024, January 8). *UHC service coverage index*. https://data.who.int/indicators/i/3805B1E/9A706FD

PHI initiatives such as the Punjab's SSP use the UHC Index to assess if financial protection strategies are improving access, plummeting out-of-pocket spending, and progressing equity. However, most studies examine service delivery or financing in isolation, limiting a holistic understanding of UHC progress. The Index captures service availability and access but overlooks the depth of financial protection and the equity of public health insurance design, creating a blind spot where coverage may expand numerically yet still expose households to impoverishment.

Comparative evidence from Thailand and Mexico shows that integrating risk-pooling with redistributive financing can transform UHC outcomes, while Arrow's warning about uncertainty and asymmetric information underscores why poorly designed insurance cannot deliver true welfare gains. Against this backdrop, this research uses the UHC Index as a standardized, globally recognized metric but addresses its limitations by contextualizing findings with poverty and catastrophic spending indicators, thereby bridging the gap between access and financial protection.

Figure 6, illustrates trends in the UHC Index from 2000 to 2021 for twelve countries, underscoring disparities in access. Countries with high incomes like the UK, Germany, France, the US, and the Netherlands sustain high indices (approximately 79–80), which indicates strong healthcare and insurance infrastructures. Middle-income nations such as Thailand, Mexico, and Turkey reveal significant progress—Thailand's index increased from 43 to 80, and Mexico's rose from 56 to 75—demonstrating the impact of public insurance in broadening coverage[40]. Low-income countries including Rwanda, Ghana, India, and Bangladesh are making slow but steady advancements (for instance, Rwanda's index increased from 19 to 49, India from 30 to 63, and Bangladesh from 23 to 52), showing gradual access improvements for marginalized groups.

Comparative data reinforces this focus. Countries like Bangladesh and Thailand have made strides in UHC, yet some households still face

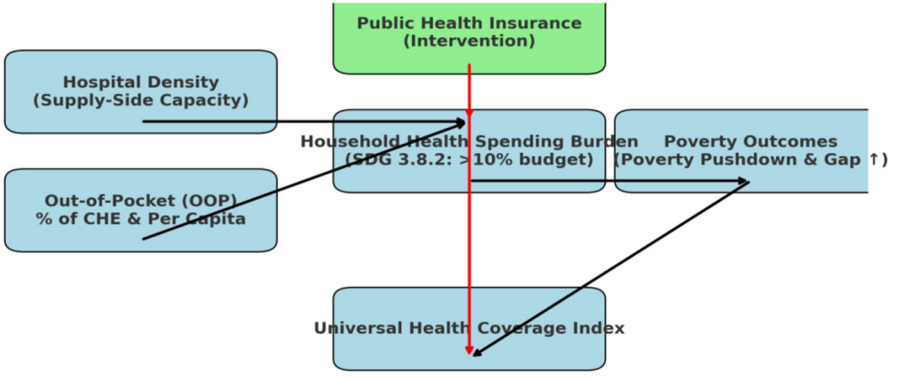
[40] Mathauer, I., Vinyals Torres, L., Kutzin, J., Jakab, M., & Hanson, K. (2020). Pooling financial resources for universal health coverage: options for reform. *Bulletin of the World Health Organization*, *98*(2), 132–139. https://doi.org/10.2471/BLT.19.234153

impoverishment due to healthcare costs, indicating deficiencies in financial protection. Pakistan displays a downward trend in UHC alongside ongoing poverty repercussions, reflecting systemic issues within its PHI framework. In contrast, Germany and France uphold high levels of UHC with minimal poverty effects, showcasing the success of their well-established insurance and tax-funded systems.

In conclusion, the data highlight an inverse relationship between the expansion of UHC and its impact on poverty. For LMICs, improving PHI necessitates not only broader service coverage but also robust financial protection systems. Public health insurance models serve as vital mechanisms for promoting UHC, especially in nations moving from limited to nearly universal coverage.

Figure 5th in the Appendices

5.2. Rational Link to Insurance Models



Contextual Model: Public Health Insurance & Financial Protection

5.3. Comparative Typology of PHI for LMICs

Model	Key Features	Strengths	Challenges

Beveridge[41] (Tax-Funded, Universal)	Universal coverage financed by taxation; state-owned providers **Case studies:** UK (NHS), Spain, Italy, Nordic states	Free at point of service; equity; low admin costs; high patient satisfaction	Long wait times; limited choice; funding pressures; bureaucracy
Bismarck (Social Insurance)[42]	Compulsory insurance via "sickness funds"; financed by employer–employee payroll contributions **Case studies:** Germany, France, Japan, Belgium, Switzerland	High-quality care; broad provider choice; short waits; efficiency via competition	High admin costs; aging population pressures; complex fund management
National Health Insurance (NHI)[43]	Single-payer insurance with private providers; universal access through taxation and contributions **Case studies:** Canada, south Korea, Taiwan, France, Japan	Administrative simplicity; equity in access; strong bargaining power; high-quality care	Risk of underfunding; delays; weak innovation incentives; rural inequities

[41] Cichon, M., & Normand, C. (1994). Between Beveridge and Bismarck: Options for health care financing in Central and Eastern Europe. *World Health Forum, 15*(4), 323–328. https://iris.who.int/bitstream/handle/10665/45367/WHF_1994_15(4)_p323-328.pdf

[42] Scholz, W. (2015). Financing social security out of contributions: About origins, present discussions and prospects of a success story. *International Social Security Review*, *68*(4), 3-24.

[43] Nghiem, S., Graves, N., Barnett, A., & Haden, C. (2017). Cost-effectiveness of national health insurance programs in high-income countries: A systematic review. *PLoS One*, *12*(12), e0189173.

Private Health Insurance	Voluntary, premium-based insurance; competitive providers **Case studies:** USA (pre-ACA), Gulf states	Innovation; consumer choice; advanced technology access		Exclusion of poor; high OOP costs; inequity
Community-Based Health Insurance (CBHI)	Local pooling by households/NGOs; donor and government subsidies **Case studies:** Rwanda, Ghana, Ethiopia[44], India (rural)	Inclusion of marginalized groups; local ownership; rural access gains		Limited scalability; reliance on community participation; sustainability issues
Mixed / Hybrid	Combines compulsory savings (Medisave), insurance (MediShield Life), and government subsidies Singapore	Efficient; fiscally sustainable; promotes personal responsibility	Higher OOP for middle class; gaps in some services	

6. Healthcare system in Pakistan: a review of Punjab

6.1 Pakistan's Health System: Progress and Gaps

Pakistan's health budget has increased over the period of time but its relative to GDP ratio presents a different case study, that the overall

[44] Yilma, Z., Mebratie, A., Sparrow, R., Dekker, M., Alemu, G., & Bedi, A. S. (2015). Impact of Ethiopia's community based health insurance on household economic welfare. *The World Bank Economic Review*, *29*(suppl_1), S164-S173.

situation is not much viable such that it allocates less than 1% of its GDP to health—ranking among the lowest in South Asia. Although there have been gradual advancements in infrastructure, workforce, and health indicators, the system continues to grapple with ongoing challenges: inadequate funding, substantial out-of-pocket expenses, unequal access, and poor service quality in rural regions.

Figure 6th in the Appendicies

Furthermore, the GDP of punjab for health is substantially increased post 2010, the 18th amendemnet, making the province responsible for the key indicators[45]. This amendment made it the responsibility of Punjab to oversee crucial health indicators, such as service delivery, accessibility, and equity in healthcare. As a result, the province acquired greater independence in the planning, funding, and execution of health policies, allowing for more focused interventions and localized strategies to meet specific needs. This transition also highlighted the importance of provincial governance in maintaining accountability and efficiency in resource use within the health sector. 7.1 million People received medical treatment under Universal health Insurance Program during 2023-24[46].

Figure 7th in the Appendicies

7. Discussion:

7.1 The Need for a Public Health Insurance System in Pakistan

Out-of-pocket (OOP) expenses, while slightly decreased from 67.7% to 56.2% of total health spending, still remain considerable and cannot solely be linked to the limited extent of the Sehat Sahulat Program (SSP), which only began operations in Punjab in 2020. This highlights the pressing

[45] Government of Punjab, Finance Department. (2024, June 10). ***Budget FY 2024–25*** [PDF]. Government of Punjab. **https://finance.punjab.gov.pk/system/files/WP24-25.pdf**

[46] Government of Punjab, Finance Department. (2024, June 10). *Budget FY 2024–25* [PDF]. Government of Punjab. https://finance.punjab.gov.pk/system/files/WP24-25.pdf

necessity for a comprehensive public health insurance (PHI) system that reallocates financial risk from households to collective funding mechanisms, safeguarding vulnerable communities from devastating health-related costs.

7.2 Persistent Poverty Issues Despite Reduced OOP

Although there has been a slight decline in out-of-pocket (OOP) spending, health vulnerabilities related to poverty continue to be a concern, with the percentage of households living below the poverty line rising from 1.49% in 2010 to 2.41% in 2013. Existing financing systems do not offer sufficient financial security, leaving larger families, elderly individuals, and low-income households at risk. An inclusive framework for public health insurance (PHI) is crucial to guarantee fair access to healthcare and shield these vulnerable groups from health-related financial hardship.[47]

Figure 8th in the Appendices

7.3 Limited UHC Progress Lacks Adequate Risk Protection

The data shows that Pakistan's total density of district/rural hospitals is extremely low—0.37 per 100,000 population in 2010, declining slightly to 0.35 in 2013[48]. This limited health infrastructure indicates a severe gap in physical access to healthcare in rural areas, compounding the already high out-of-pocket (OOP) spending and vulnerability to catastrophic health expenditure (CHE). Current social health protection programs like SSP cover primarily inpatient care, leaving outpatient services largely unprotected. Inadequate facilities and narrow insurance coverage together underscore that PHI in Pakistan is largely theoretical, highlighting the

[47] World Health Organization. (2023, September 18). *Tracking universal health coverage: 2023 global monitoring report.* World Health Organization https://iris.who.int/bitstream/handle/10665/374059/9789240080379-eng.pdf?sequence=1

[48] World Health Organization. (n.d.). *Health infrastructure: Hospitals, density per 100,000 population*. Global Health Observatory. Retrieved September 8, 2025, from https://www.who.int/data/gho/data/indicators/indicator-details/GHO/total-density-per-100-000-population-hospitals

urgent need for a well-structured, comprehensive system that expands both coverage and infrastructure to mitigate health-related poverty[49].

Figure 9th in the Appendices

7.4 Low Fiscal Commitment as an Obstacle to UHC

Pakistan's minimal health investment (~1% of GDP) contrasts sharply with OECD norms (7–10%) and the levels required for meaningful coverage. Insufficient fiscal commitment constrains the expansion of SSP and other PHI initiatives, forcing households to rely on OOP spending and exacerbating financial vulnerability. Sustainable PHI requires increased government allocation and efficient resource utilization to ensure comprehensive risk coverage and progress toward UHC.

Figure 10th in the Appendiceis

7.5 Health Outcomes and Workforce:

The Universal Health Insurance Program, funded under the Public Sector Development Program (PSDP)[50], has received an allocation of Rs. 54 million for FY2025[51], aimed at providing coverage for 34 million families across 360 hospitals. Nonetheless, significant challenges such as financing limitations, quality of services, and issues concerning maternal and child health persist.

These insights highlight the pressing need for a comprehensive public health insurance system in Pakistan. The data indicates that while some progress has been achieved, public health insurance models, particularly the Sehat Sahulat Program, are still nascent and lacking in depth. The inadequate fiscal investment coupled with limited coverage hinders the

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[49] World Bank. (2021). Pakistan development update: Reviving fiscal space for health. Washington, DC: World Bank.

[50] Rudiger, A. (2016). Human rights and the political economy of universal health care: designing equitable financing. *Health and human rights*, *18*(2), 67

[51] Pakistan Economic Survey 2024–25. (2025). Ministry of Finance, Government of Pakistan. Retrieved from https://www.finance.gov.pk/survey_2025.html

system's ability to produce the intended financial protection and poverty alleviation results. A transition towards risk sharing, enhanced coverage, and increased fiscal support is necessary to tackle the health financing issues faced by the populace. Reinforcing public health insurance will be vital in reducing out-of-pocket expenses, curbing catastrophic spending, and ensuring equitable access to healthcare, thereby improving financial protection and alleviating poverty in the future.

Workforce: 319,572 physicians, 54,123 dentists, 138,391 nurses, 49,554 midwives/LHVs, and 24,584 pharmacists—though their distribution is uneven

Outcomes: Life expectancy averages 67.6 years, with infant mortality at 50 per 1,000 live births (whereas the regional average is about 30), and DPT3 immunization rates at 86%.

Figure 11th in the Appendices

7.6 Obstacles in the Implementation of the Sehat Sahulat Program

Despite the Sehat Sahulat Program (SSP) having high aspirations, it encounters notable difficulties in its execution. Low utilization is attributed to insufficient public awareness, a lack of enrolled facilities, and administrative shortcomings. Certain districts exhibit enrollment deficits ranging from 22% to 74%, with only one hospital catering to thousands of families. Additionally, the SSP's emphasis on inpatient services overlooks outpatient care, which constitutes nearly 80% of catastrophic health expenditures (CHE). To offer comprehensive financial protection, it is crucial to extend coverage to include outpatient and preventive care. These findings are limited by data constraints (like SCI data only available until 2018), dependence on general indicators, and a descriptive methodology; therefore, they should be viewed as contextual evidence backing theoretical assertions rather than definitive causal evidence.

7.7 Dynamics of Health Insurance and Policy Implications

The landscape of health insurance in Pakistan is characterized by fragmentation, with insufficient coverage extending beyond public programs like SSP and the Employees Social Security Institutions. Private

and corporate insurance primarily caters to the formal employment sector, leaving a considerable portion of the middle class and informal workers without coverage. Although SSP has successfully broadened access, it grapples with issues regarding sustainability, governance, and instances of service denial[52]. Endorsed by international organizations such as the World Bank, WHO, and IMF, the SSP is pivotal to the pursuit of UHC in Pakistan. To enhance its effectiveness, there is a need for sustainable funding, improved targeting through Proxy Means Tests (PMT), capacity development of service providers, and strengthened cooperation among government, private sectors, and civil society organizations.

7.7.1 Types and Mechanisms of Public Health Insurance Financing

(i). Social Health Insurance (SHI)

Social Health Insurance systems in numerous low- and middle-income countries (LMICs) gather risks through compulsory contributions linked to payroll, enhancing access while raising concerns about equity due to uniform or regressive rates and challenges associated with the informal economy[53]. Implementation is further complicated by administrative difficulties, governance issues, and vested interests; debates surrounding SHI in South Africa exemplify these political and technical challenges (McIntyre, 2003). Research indicates that SHI tends to benefit wealthier populations when there are insufficient exemptions for those in need, underscoring the importance of engaging stakeholders to balance technical feasibility with political practicality[54].

(ii). National Health Insurance (NHI)

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[52] Saleem, S. (2023). Power, politics, and public health: understanding the role of healthcare expenditure in shaping health outcomes in Pakistan for policy enhancement. *Politica*, *2*(1), 58-72.

[53] A. Asante, N. Man, V. Wiseman, "Evaluating Equity in Health Financing Using Benefit Incidence Analysis: A Framework for Accounting for Quality of Care," Applied Health Economics and Health Policy, 2020. https://doi.org/10.1007/s40258-020-00597-2

[54] . Tangcharoensathien, W. Patcharanarumol, A. Kulthanmanusorn, N. Saengruang, H. Kosiyaporn, "The Political Economy of UHC Reform in Thailand: Lessons for Low- and Middle-Income Countries," Taylor & Francis, 2019. https://doi.org/10.1080/23288604.2019.1630595

National Health Insurance programs finance healthcare at a national level via taxation to improve risk-sharing and work towards universal coverage. The success of these programs relies on robust institutions and political will. Nepal's NHI Program suffers from low enrollment, high dropout rates, and political interference[55] (Khanal et al., 2023), while Pakistan's Sehat Card Plus has made strides in inpatient services but struggles with underfunding and inequities (Siddiqi et al., 2024). China exhibits broader coverage and enhanced benefits; however, it continues to deal with high out-of-pocket expenses (Chen et al., 2017).

(iii). Community-Based Health Insurance (CBHI)

Community-Based Health Insurance plans are voluntary and managed by communities, aiming to assist informal sector workers by pooling local risks (Docrat et al., 2020). They boost the utilization of services among rural and marginalized groups but face challenges like limited risk pooling, high dropout rates, and weak regulatory frameworks[56]. Continued out-of-pocket spending limits financial protection, indicating that CBHI serves as a partial remedy that needs to be integrated with national policies and supported by subsidies for long-term sustainability (Nguyen et al., 2023).

7.8 Solutions Specific to Pakistan

- **Broaden Coverage and Access:** Extend the Social Safety Program (SSP) to include outpatient, emergency, and rural care; consider mobile registration and online enrollment.
- **Strengthen Infrastructure:** Expand the number of hospitals, clinics, and beds; hire and train more health professionals.

[55] G. N. Khanal, B. Bharadwaj, N. Upadhyay, T. Bhattarai, M. Dahal, R. Khatri, "Evaluation of the National Health Insurance Program of Nepal: are political promises translated into actions?," Health Research Policy and Systems, 2023. https://doi.org/10.1186/s12961-022-00952-w

[56] O. Tayo-Ladega, T. Abdullahi, K. Islam, "Factors Militating Against Public Health Financing In Nigeria: An Empirical Review," None, 2021. https://doi.org/10.46281/AIJMSR.V7I2.1073

- **Improve Financial and Resource Allocation**: Increase funding, ensure its effective usage, and adopt performance-based financing to boost the quality of services.
- **Improve Governance and Monitoring:** Enhance coordination between federal and provincial levels; employ digital tracking for claims and fraud; establish transparent accountability systems.
- **Leverage Technology:** Implement telemedicine, digital health records, and mobile applications; utilize AI analytics for predicting demand, optimizing resources, and detecting fraud.

8. Conclusion

This study has shown that public health financing models across the world helped to improve the poverty dynamics and the health indicators, these observations are extrapolated for the case study of the Sehat Sahulat Program (SSP). It plays a crucial role in the larger effort to decrease out-of-pocket costs, enhance financial protection, and progress toward Universal Health Coverage (UHC). By placing Pakistan's experience in the context of broader theoretical frameworks such as Kenneth Arrow's principles of uncertainty, welfare economics, risk pooling, and equity, the research illustrates that public health insurance transcends mere welfare support, acting instead as a vital response to significant market failures. Comparative insights from nations like Thailand, Turkey, Mexico, and Germany indicate that sustainable health insurance reforms achieve the greatest success when underpinned by strong fiscal backing, transparent governance, and the integration of both preventive and curative health services. In contrast, Pakistan's focus on limited inpatient coverage, accompanied by low healthcare spending (approximately 1% of GDP), fragmented governance, and variable access, underscores the discrepancy between ambition and actuality.

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Appendices

Health Market Model

Figure 1

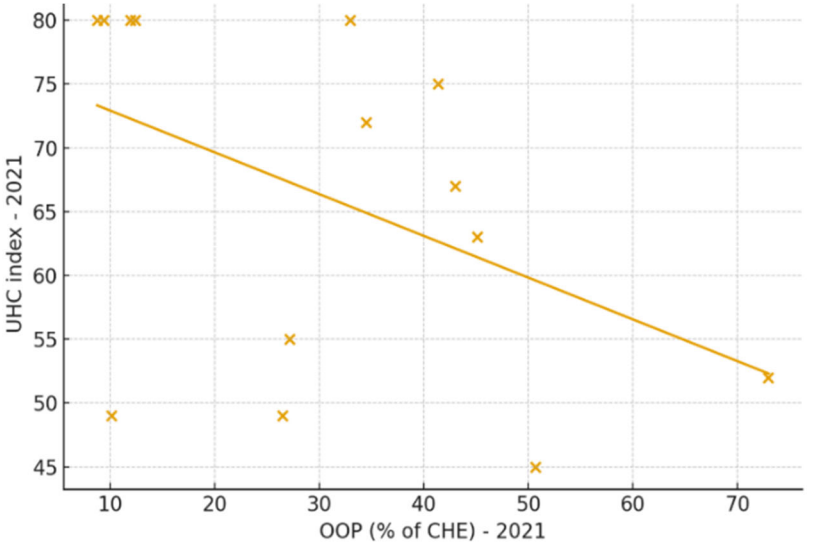
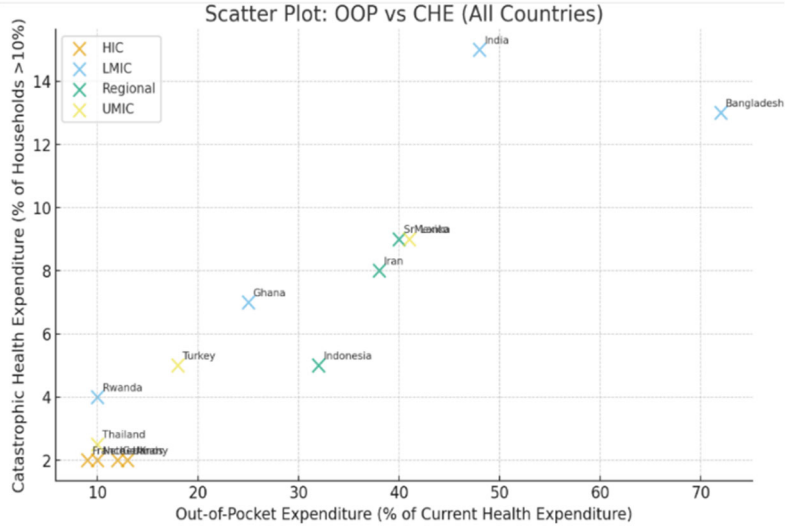


Figure 2nd



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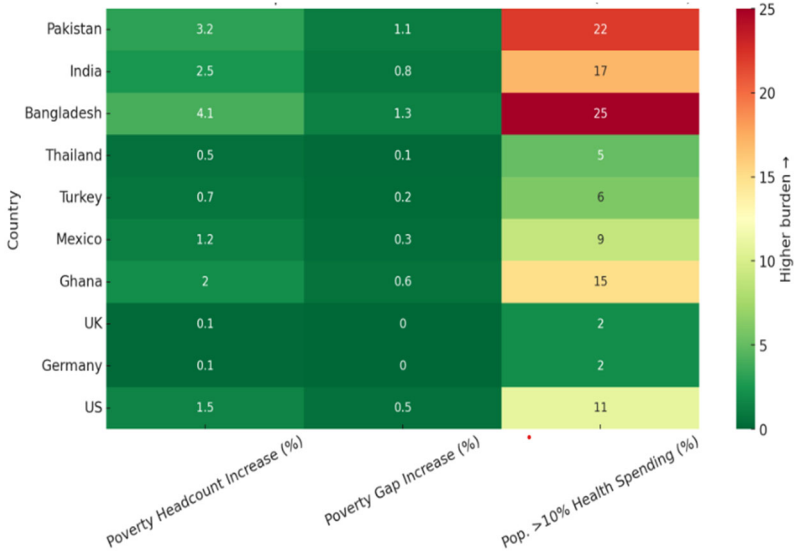


Figure 4th

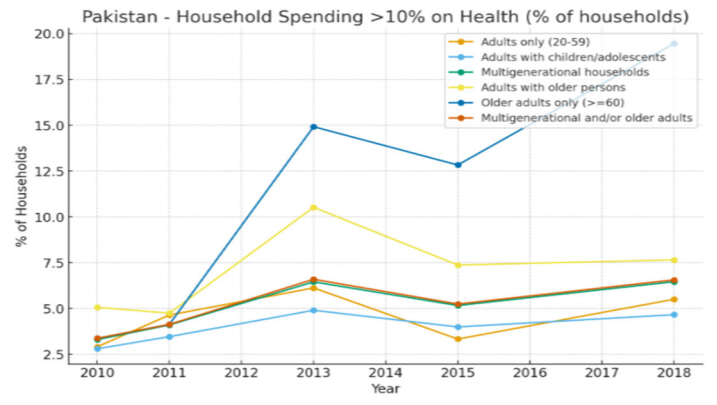


Figure 5th

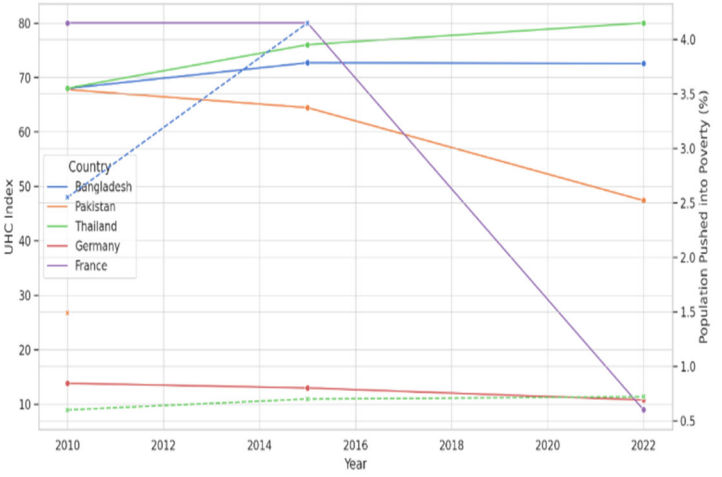
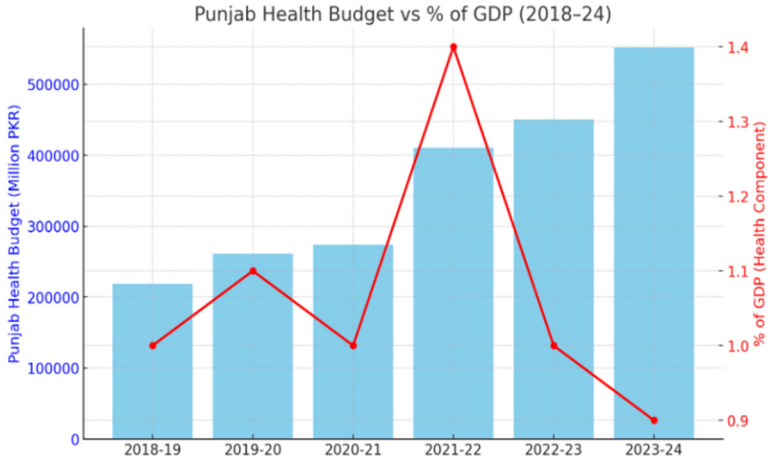

UHC Index
Population Pushed into Poverty (%)
Year
Country
Bangladesh
Pakistan
Thailand
Germany
France
80
70
60
50
40
30
20
10
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
2010
2012
2014
2016
2018
2020
2022

Figure 6th



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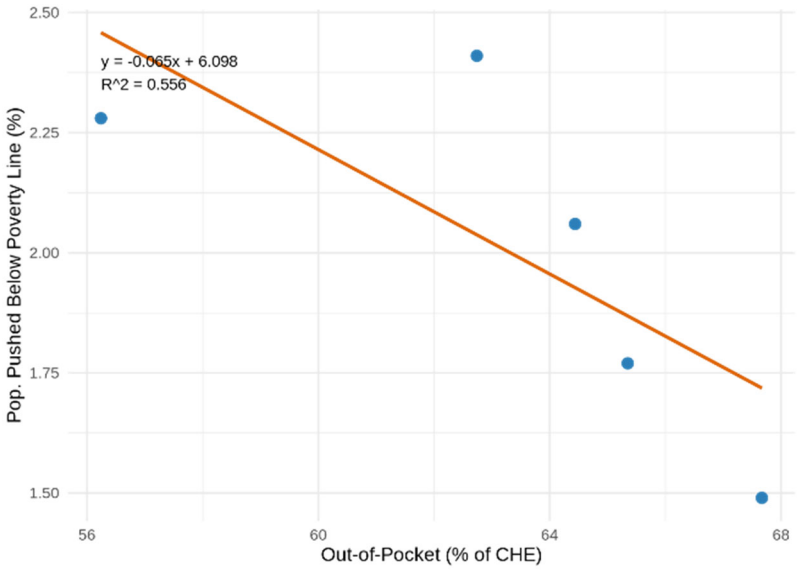

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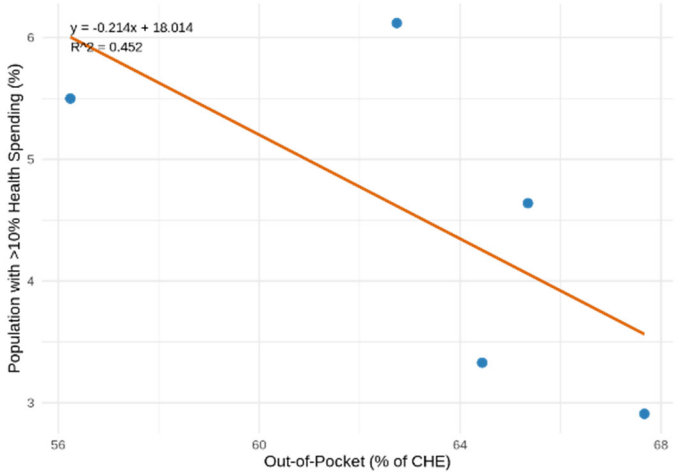

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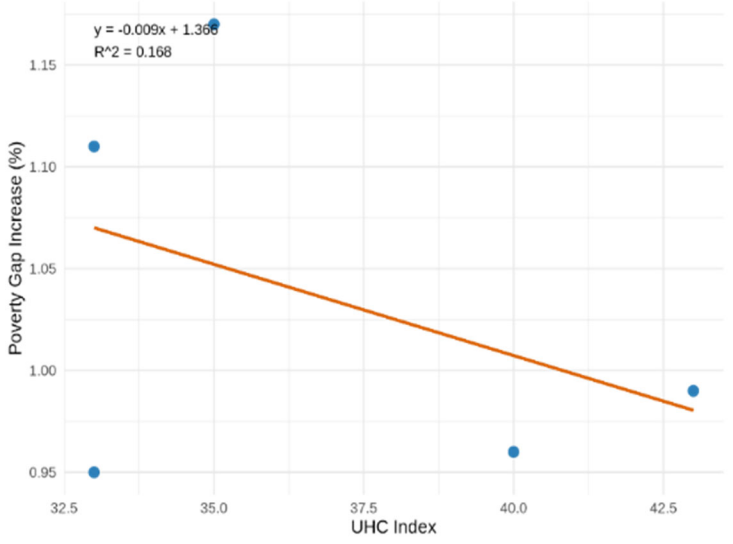

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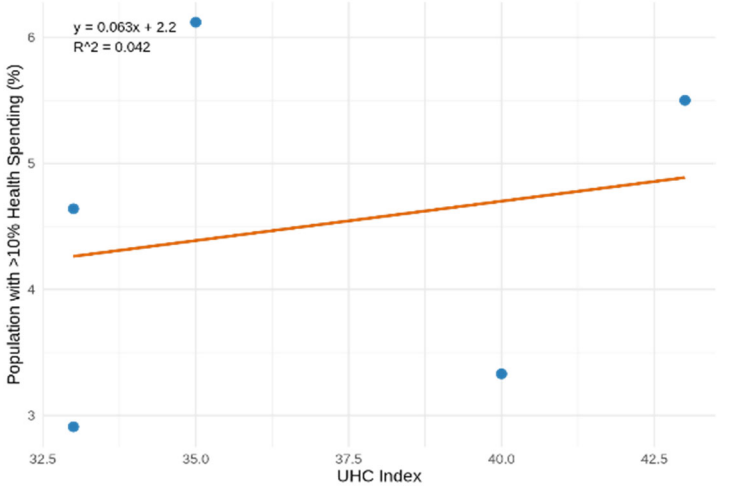
y = 0.063x + 2.2
R^2 = 0.042
Population with >10% Health Spending (%)
6
5
4
3
32.5
35.0
37.5
40.0
42.5
UHC Index

Figure 11th

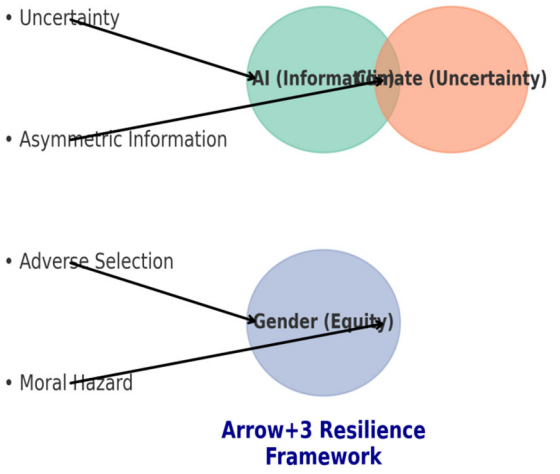

Figure 12th

4A UNDP Frameword Matrix:
Solutions to Public Health Insurance Challenges

	Global Challenges	Global Solutions	Pakistan-Specific Challenges	Pakistan-Specific Solutions
Access	• Inequitable access to healf.hcare • High out-of -pocket expenses • Geographic barners	• Universal health schames & pooled financing • Telemedicicine mobile clinics	• Expand SSP to rural / margimanalized populations • Predictive analytics & i for planning	• Expand SSP to rurul / marginalized populations • Estabich moble registration under SSP
Adopt	• Low adoption of digital health • Limited PPP integration	• Public-private partnerships • Electronic health records Ai-driven support • Task-shifting to trained non-physician workers	• Predictive analytics & Al for planning • Resilient health systems • Contingency health funds	• Digital monitoring & claims manage-ment • Establish emergency health funds
Anticipate	• Rising chronic diseases • Pandemics & health emergemcies • Catastrophic health expenditures	• Predictive analytics & Al for planning • Resilient health systems • Contingency health funds	• Use data analytics for forecasting demand • Establisity emergency health funds	• Scale SSP nationwoie with CNIC integration • Accelerate healthcare workforce training
Accelerate	• Slow scale-up of successful programs • Fraemented health policies	· Scale successful pilots nationally	• Scale SSP nationwaie with CNIC integration	• Awareness campaigns to improve utilization

Figure 18th