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# POWERING PROGRESS: HOW FINANCIAL INNOVATION AND HUMAN CAPITAL TRANSFORM SOUTH ASIAN ECONOMIES

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**ABSTRACT**

*This study investigates the impact of financial innovation and human capital development on economic growth in South Asian countries, specifically India, Pakistan, Bangladesh, Sri Lanka, Nepal, and Bhutan, from 1991 to 2022. The region has seen significant economic changes due to technological advancements, globalization, and demographic shifts. Financial innovation, encompassing technological breakthroughs in banking, fintech, capital markets, and financial services, is essential for mobilizing savings, distributing capital efficiently, and stimulating entrepreneurial activities. The study analyzes how regulatory frameworks, technology infrastructures, and institutional arrangements affect financial innovation in South Asia. Human capital development, through investments in education, healthcare, skills training, and workforce development, is another critical predictor of economic growth, particularly in emerging economies. The study employs fixed effects and random effects models to examine the dynamic relationships between economic growth and financial innovation, human capital development, labor force, gross capital formation, trade openness, and technological innovation. The study reveal that human capital development and financial innovation significantly and positively impact economic growth. Trade openness and technological innovation also show strong positive correlations with GDP growth, highlighting the importance of engaging with the global economy and fostering continuous technological advancements. The study recommends prioritizing investments in education and healthcare, creating a regulatory framework that encourages financial innovation, promoting digital financial services, and enhancing financial literacy. These measures are crucial for sustaining economic growth and competitiveness in the region.*

***Keywords:*** *Economic growth; Financial Innovation; Human capital development; Fixed Effect*

## INTRODUCTION

Economic growth is the sustained rise in an economy's real output and is typically gauged **by** real GDP**,** which filters out price changes; despite limits on capturing sustainability or distribution, it remains the standard yardstick (World Bank, 2023; Stiglitz et al., 2010). Modern growth thinking moves beyond capital and labor to stress knowledge, innovation, human capital, institutions, and finance as core engines of long-run expansion (Romer, 1990; Lucas, 1988; Levine, 2005). Within this**,** financial development improves resource allocation, lowers transaction costs, and diversifies risk (King & Levine, 1993), while financial innovation—from fintech and digital payments to blockchain and AI—broadens access, reduces intermediation costs, and supports entrepreneurship and inclusion (Philippon, 2016; Allen et al., 2022). Evidence from developing economies indicates these innovations are especially powerful for previously underserved households and SMEs, reinforcing more inclusive growth (Ha, 2025; Huang et al., 2025). The mechanisms linking financial innovation to economic growth are varied. First, innovations reduce information asymmetry by improving credit assessment and enabling better matching between lenders and borrowers. Second, they lower transaction costs and make small-scale lending and borrowing more feasible, which is crucial for micro-enterprises and low-income households. Third, they expand financial inclusion, allowing more people to save, invest, and insure against risks. Fourth, they encourage entrepreneurship and technological innovation by easing access to credit. Finally, when properly regulated, they strengthen financial stability by diversifying instruments and spreading risks across different markets (Tudor & Sova, 2025). Empirical studies provide strong evidence of these effects: for instance, research on Vietnam between 2010 and 2020 shows that financial innovation significantly supported growth through credit expansion and efficiency gains (Ho & Le, 2025). Similarly, recent work in China demonstrates that fintech stimulates innovation among small and medium enterprises, partly by increasing their investment in human capital (Chen & Guo, 2024).

xHuman capital refers to the knowledge, skills, health, and competencies that enhance productivity. Initially centered on education and training as long-term investments (Becker, 1964), the concept now extends to digital skills, adaptability, and lifelong learning essential for knowledge economies (Hanushek & Woessmann, 2015). In growth models, it drives innovation, technology diffusion, and productivity spillovers (Romer, 1990), with recent studies stressing that **quality** matters more than quantity (De Pleijt & van Zanden, 2025). Empirical evidence shows a strong positive link between human capital and growth: in Africa, education and health indicators significantly boosted growth (Wirajing et al., 2023); in Asia, health spending, life expectancy, and school enrollment supported growth, though education spending showed mixed effects (Duwal, 2023). Further, institutional support enhances outcomes, as seen in Southeast Asia (Pastpipatkul et al., 2025), while in Bangladesh, health investments aid long-term growth but education has uneven impacts due to absorptive limits (Uddin et al., 2025). Overall, human capital is vital for growth, but its effectiveness depends on quality and supportive institutions.

South Asia provides a particularly compelling context for analyzing the role of financial innovation and human capital in economic growth. The region has been among the fastest-growing in the world, yet it exhibits wide disparities in growth performance. India, for example, maintained an average growth rate above 6% over the past two decades, driven in part by its growing service sector, investments in digital infrastructure, and expansion of higher education. Bangladesh has also experienced consistent growth, supported by human capital improvements and targeted health and education programs (World Bank, 2022). By contrast, Pakistan has lagged behind due to weaker governance, financial inefficiencies, and insufficient investment in human capital. Smaller economies such as Bhutan and Nepal face structural constraints, while Sri Lanka's progress has been undermined by macroeconomic instability. These contrasts highlight how differences in financial development and human capital shape economic trajectories even within a relatively integrated region.

The interaction between financial innovation and human capital is particularly important in South Asia. On one hand, digital financial innovations such as mobile banking and fintech platforms require a minimum level of literacy and digital skills to be adopted effectively. Without sufficient human capital, the benefits of innovation cannot diffuse widely across society. On the other hand, financial innovation itself can support human capital formation by easing access to credit for education, training, and health investments. For example, fintech-enabled microfinance can provide poor households with the resources to invest in children's schooling or vocational training, generating long-term growth benefits. Recent studies show that fintech adoption in small firms is often mediated by human capital improvements, suggesting that the two drivers reinforce each other (Chen & Guo, 2024). Moreover, new technologies such as generative artificial intelligence in financial institutions can only succeed in environments where employees possess adequate skills and oversight capacity (Saha et al., 2025). Thus, the relationship between financial innovation and human capital is both complementary and mutually reinforcing.

Despite these insights, important gaps remain in the literature. The relationship between financial innovation and growth is not always straightforward. In some contexts, excessive or poorly regulated financial innovation can create systemic risks and financial instability, as seen during the global financial crisis. Similarly, human capital investments do not automatically lead to growth if institutional quality is weak or if the labor market cannot absorb educated workers. While many studies have examined financial development or human capital in isolation, relatively few have integrated both in a single framework to analyze their combined and interactive effects on growth. This omission is particularly evident in South Asia, where demographic change, rapid digitalization, and uneven institutional capacities make the interaction between human capital and financial innovation especially important. Addressing this gap is essential for understanding the conditions under which these drivers can jointly contribute to sustainable development.

The motivations for this study are therefore threefold. First, to test whether financial innovation in South Asia positively influences growth as indicated in global studies, or whether the effects are moderated by institutional and structural constraints. Second, to assess the role of human capital not just as an independent determinant of growth but as a mediator that enhances the returns to financial innovation. Third, to provide region-specific evidence that can guide policymakers in designing strategies to balance investments in financial sector innovation with sustained human capital development. By addressing these objectives, this paper seeks to make a contribution to the ongoing debate on the drivers of sustainable economic growth in developing regions.

**This study is motivated by two main objectives:**

- Does the financial innovation effect the economic growth in Selected Asian Countries?
- Does the human capital development effect the economic growth in Selected Asian Countries?

The paper is organized as follows: Section 2 reviews the existing literature on financial innovation, human capital development, and their links to economic growth. Section 3 outlines the research questions and presents the hypotheses of the study. Section 4 describes the research variables and methodology, while Section 5 focuses on data analysis and interpretation. Finally, Section 6 summarizes the key findings and provides policy recommendations for future development.

## 2 Theoretical and Empirical Literature Review

### Financial Innovation and Economic Growth

Research on the nexus between financial development, innovation, and economic growth shows the relationship is **highly context-dependent**. In Zimbabwe, studies found a long-run bidirectional link, with mobile banking supporting long-term growth but weaker short-term effects (Bara & Mudzingiri, 2016; Bara et al., 2016). In China, reforms spurred growth mainly through the nonstate sector and foreign investment rather than domestic finance (Aziz & Duenwald, 2002). Evidence from Ghana, Cameroon, South Africa, and Fiji indicates that the impact of finance varies by indicator, with private credit often more influential than broad money (Adu et al., 2013; Djoumessi, 2009; Gounder, 2012). Broader regional studies confirm that while finance generally promotes growth, the strength and direction of causality differ across countries depending on institutional quality and local contexts (Hassan et al., 2011; Ben Jedidia et al., 2014; Kar et al., 2011).

Other country-specific studies echo this complexity. In Laos, finance both drives and responds to growth (Kyophilavong et al., 2016), while in South Africa and Kenya, bank-based and market-based systems, respectively, were more influential (Nyasha & Odhiambo, 2015). In Bangladesh, financial innovation showed strong long-term effects with bidirectional causality (Qamruzzaman & Jianguo, 2017). Evidence from Malaysia, Turkey, and other developing economies reveals that finance often supports short-run growth, but over time growth itself drives financial development when inefficiencies persist (Ang & McKibbin, 2007; İnce, 2011). Large cross-country analyses also indicate mixed causality, with finance fostering growth in some regions, but in others, growth leading to financial development (Hassan et al., 2011). Overall, the finance–growth link is **mutually reinforcing but uneven**, influenced by country income levels, financial structures, and governance. Theoretical frameworks also suggest that financial development contributes by mobilizing savings, improving capital productivity, and shaping investment behavior (Pagano, 1993).

Financial innovation has been consistently linked with economic growth, particularly in developing and emerging markets. Studies emphasize how financial access, digital tools, and regulatory frameworks shape GDP trajectories. Abbas et al. (2024a) found that financial inclusion and eco-innovation foster green economic growth across developing countries, while Shahzadi et al. (2024) demonstrated finance as a critical enabler of innovation-led growth in South Asia. Similarly, Abbas et al. (2024b) observed that financial innovation improves banking performance in SAARC, conditional on regulatory quality, which influences capital mobilization and credit allocation. Hardi et al. (2024) expanded this perspective in Southeast Asia, showing innovation's role in boosting total factor productivity, while Chowdhury et al. (2025) underscored entrepreneurship and institutional quality as multipliers of innovation-driven growth. Manasseh et al. (2024) added evidence from Africa, finding digital finance improves efficiency, accessibility, and inclusivity of financial services, supporting system development. Other research such as Hegde and Guruprasad (2024) highlighted digital financial inclusion as transformative for GDP, while Saada (2025) linked innovation and market capitalization to positive growth in both developed and emerging economies. Gizaw et al. (2024) showed that financial development strengthens GDP growth depending on institutional quality. Complementary findings from Jamsheed (2024) and Javeid et al. (2024) reveal that FDI, debt, financial liberalization, and trade intensity play significant roles in growth, reinforcing that finance operates through multiple channels. Collectively, these works establish financial innovation as a multidimensional catalyst for GDP, contingent on inclusion, regulation, institutional quality, and digital transformation.

**H1**= There is a positive impact of human capital development on Economic growth in selected South Asian Countries.

### Human Capital Development and Economic Growth

Human capital is a critical driver of economic growth, though its impact varies with quality, context, and complementary factors. Evidence from Nigeria and other developing regions shows that primary education, health investment, and capital formation generally enhance growth, while tertiary education often yields weaker or inconsistent effects due to policy and efficiency gaps (Adawo, 2011; Adeyemi & Ogunsola, 2016; Ali, 2016). Similar patterns across Africa and South Asia highlight that education and health spending support growth when accompanied by technological adoption and institutional strength (Amir et al., 2012; Mohamed Arabi & Abdalla, 2013; Čadil et al., 2014). Regional differences, such as human capital driving growth in eastern China but less in other areas, further underscore the role of context (Chen & Fang, 2018). Studies also note that education's growth effects become stronger after economies pass certain development thresholds, with quality and cognitive skills often more decisive than years of schooling (Ahsan & Haque, 2017; Hanushek, 2013).

Cross-country evidence confirms that human capital accumulation supports long-run growth (Mankiw et al., 1992; Cohen & Soto, 2007; Bassanini & Scarpetta, 2002). However, findings vary due to data limitations and mismatches between educational attainment and labor market needs, with some studies reporting weak or negative effects (Pritchett, 2001; Benhabib & Spiegel, 1994). Early reliance on enrollment rates often overstated education's role, while later census-based data improved measurement but remained incomplete (Psacharopoulos & Arriagada, 1986). Overall, research agrees that human capital is central to sustainable development, yet its effectiveness relies on **quality, technological**

**Integration, and institutional support.**

Human capital development emerges as one of the strongest predictors of long-run economic growth, serving as both a direct and mediating factor in financial, technological, and trade-led development. Saroj et al. (2024) argued that human capital enhances financial efficiency, making financial development more effective for growth. Nosheen et al. (2024) confirmed this, demonstrating that positive shocks in human capital yield stronger effects on GDP than negative ones. Aqeel et al. (2025) showed that human capital strengthens the growth effects of taxation and FDI in Pakistan, while Boachie and Adu-Darko (2024) highlighted its mediating role in African financial inclusion. Iorember et al. (2024) added environmental dimensions, revealing human capital helps decouple growth from emissions by enabling sustainable pathways. Bambi and Pea-Assounga (2025) found that education and research investment in human capital drive innovation, accelerating GDP through productivity channels. Singh and Degu (2025) emphasized its role in reducing inequality and enhancing innovation effects in Asia-Pacific economies, while Jie and Lan (2024) demonstrated human capital's ability to maximize resource-based growth sustainably. Awode and Oduola (2025) linked technological adoption and industrial competitiveness to human capital, showing its dual role in direct productivity and innovation absorption. Hardi et al. (2024) echoed these findings in Southeast Asia, while Li and Imran (2025) and Neifar et al. (2024) tied human capital to green technology adoption and ecological footprint reduction. Collectively, these studies reinforce human capital as an indispensable lever for sustained, inclusive, and environmentally balanced GDP growth.

**H2** = There is a positive impact of human capital development on Economic growth in selected South Asian Countries.

**Trade Openness and Economic Growth**

Trade openness consistently emerges as a central determinant of GDP growth, though its impact interacts with environmental and institutional conditions. Lee and Rabago (2024) showed trade openness fosters growth in Asia-Pacific by enabling market access and efficiency. Dharmapriya et al. (2024) and Hanvoravongchai & Paweenawat (2025) highlighted the environmental trade-offs, demonstrating that while openness spurs GDP, it may also raise emissions. Nosheen et al. (2024) confirmed asymmetry, finding positive trade shocks more beneficial for South Asia's GDP. Javeid et al. (2024) tied openness to financial liberalization, showing their joint effect on GDP.

Hossain et al. (2024) found openness boosts FDI inflows, indirectly supporting growth. Halim and Moudud-Ul-Huq (2024) emphasized that trade liberalization also advances green growth in BRIC and CIVETS nations, while Methmini et al. (2025) showed trade contributes to GDP even in top polluting nations. Complementary studies, including Nguyen & Poczta-Wajda (2024), Nursam et al. (2025), Cao et al. (2025), and Sugözü & Dorbonova (2024), confirm its robust positive effect across regions and income groups, albeit moderated by macroeconomic instability and institutional quality. Thus, trade openness is vital for GDP expansion but requires balancing with sustainability and policy stability.

Existing literature typically treats financial innovation and human capital as separate drivers of economic growth, leaving a clear gap in research that examines their combined effects, especially in the nuanced context of South Asia. There is a lack of comparative, region-specific analyses, limiting insight into how local conditions shape the effectiveness of financial and human capital development strategies. Moreover, the long-term impacts of these factors considering policy changes, economic reforms, and the rise of digital financial services remain underexplored. Filling this gap is vital, as understanding the interaction between financial innovation and human capital could uncover multiplier effects that sustain economic growth and support more integrated, context-sensitive development policies.

## TECHNOLOGICAL INNOVATION AND GDP

Technological innovation represents perhaps the most dynamic driver of GDP growth, influencing productivity, efficiency, and sustainability. Ximei et al. (2024) found IT investments in South Asia significantly raise GDP, especially when combined with education. Chowdhury et al. (2025) showed entrepreneurship benefits from technological innovation and strong institutions. Hardi et al. (2024) confirmed that innovation directly fuels productivity in Southeast Asia, with human capital amplifying its effect. Anser et al. (2024) revealed that innovation in BRICS countries simultaneously drives GDP and energy efficiency, while Ketchoua et al. (2024) demonstrated innovation strengthens the growth and sustainability effects of FDI in OECD countries. Zhao & Shah (2024) and Asif et al. (2024) reinforced this in OECD and BRICS by linking green technologies to GDP and environmental sustainability. Magoutas et al. (2024) provided evidence from Europe showing ICT progression's significant effect on GDP, while Abbas et al. (2024) stressed how green innovation and financial inclusion jointly support growth in developing nations. Yousaf et al. (2024) confirmed that institutional quality enhances the growth effect of green technologies in Asia. Collectively, technological innovation emerges as a multidimensional driver of GDP, effective across contexts but contingent on education, entrepreneurship, finance, and governance.

## 3 Data and Methodology

This study's research data is based on the secondary data collected over time from WDI (1991-2022). Bangladesh, India, Pakistan, Sri Lanka, Bhutan and Nepal are among the Selected Asian countries. The purpose of this study to verify the impact of independent variable on dependent variable. Data from many domestic and international sources is published on a consistent basis. However, for cross -country data on socioeconomic indicators, the World Bank is the most reliable source. The empirical research was conducted using panel data from the Selected Asian countries. The majority of the data for this variable comes from WDI. The moving average method was used to generate some missing data.



**Table 1: Description of Variables and Expected Relationship with GDP**

| Variables | Abbreviation | Type | Definition | Expected Sign |
|---|---|---|---|---|
| Gross Domestic Product | GDP | Dependent | Par capital economic growth rate: the percentage changes of GDP per capital over the period, an indicator of economic growth | |
| Financial Innovation | FI | Independent | Ration between broad-to-narrow money as a percentage of gross domestic product | + |
| Human Capital Development | HCD | Independent | Public expenditure towards improvement of education quality and advancement of technical education | + |
| Trade Openness | TO | Independent | Trade Openness: Measures total trade (Import plus, export) as a percentage of gross domestic product | + |

| | | | | |
|---|---|---|---|---|
| Gross Capital Formation | GCF | Independent | Net improvement in capital accumulation in the form of physical investment as a percentage of gross domestic product | + |
| Technological Innovation | TI | Independent | Spending on research and development as a % of GDP, covering basic research, applied research, and experimental development. | + |
| Labor Force | LF | Independent | People aged 15+ who are working or actively looking for work (includes employed + unemployed job seekers). | + |

**Model Specification**

In this section, theoretical models and econometric models have been discussed.

**Theoretical Model**

The GDP (Gross Domestic Product) "is the dependent variable whereas FI (Financial Innovation), HCD (Human Capital development), TO (Trade Openness), GCF (Gross Capital Formation), TI (Technological Innovation) LF (Labor Force) are the explanatory variable. The literature showed that the increase in any of the mentioned explanatory variables increases the economic growth (GDP) of selected Asian countries."

**Econometric Model**

To rigorously analyze "the impact of financial innovation and human capital development on the economic growth of selected South Asian countries, this study employs both fixed effects and random effects models within its empirical framework. This approach allows for a comprehensive examination of the dynamic interactions between key variables across different countries and time periods. The variables under consideration include human capital development (HCD), financial innovation (FI), labor force (LF), gross capital formation (GCF), trade openness (TO), and technological innovation (TI).

The empirical estimation is captured through the following econometric model:

$$GDP = \beta 0 + \beta 1HCDit + \beta 2LFit + \beta 3GCFit + \beta 4TOit + \beta 5TIit + \varepsilon it \quad (1)$$

$$GDP = \beta 0 + \beta 1FIit + \beta 2LFit + \beta 3GCFit + \beta 4TOit + \beta 5TIit + \varepsilon it \quad (2)$$

$$GDP = \beta 0 + \beta 2LFit + \beta 3GCFit + \beta 4TOit + \beta 5TIit + \beta 6(HCD * FI)it + \varepsilon it \quad (3)$$

To completely analyze the role of financial innovation and human capital development on the economic growth of selected South Asian countries "this study employs both fixed effects and random effects models within its empirical framework. This approach allows for a complete investigation of the dynamic relationships between important factors across different countries and time periods. The variables under discussion include human capital development (HCD), financial innovation (FI), labor force (LF), gross capital formation (GCF), trade openness (TO), and technological innovation (TI). To find the appropriate model specification between the pooled ordinary least squares (POLS) and the random effects model, the Lagrange Multiplier (LM) test is applied. The LM test looks for the presence of significant variations between entities. A rejection of the null hypothesis revealed by the LM test suggests the superiority of the random effects model over the POLS model due to its capacity to account for unobserved heterogeneity between entities. Further refining our model choice, the Hausman test is undertaken to determine between the fixed effects and random effects models. This test tests the null hypothesis that the variations in coefficients between the models are not systematic. If the Hausman test result is significant, it suggests that the fixed effects model is more appropriate" as it demonstrates that the unique errors are connected with the included regressors, which the random effects model fails to account for. By using the LM test to justify the usage of a random effects model over a pooled OLS approach, and subsequently utilizing the Hausman test to examine the applicability of a fixed effects model, this work ensures a robust empirical analysis. This methodological diligence provides for a detailed understanding of how financial innovation and human capital development uniquely contribute to economic success in the context of South Asian economies. Through this thorough econometric technique, the research intends to provide significant insights into the causes of economic development in the region.

## 4 Empirical Results and Discussion

### Breusch pagan LaGrange multiplier test for random effect or OLS

The Breusch-Pagan Lagrange Multiplier (LM) test is a statistical tool pivotal in the field of econometrics, particularly when deciding between employing a random effects model or an ordinary least squares (OLS) regression. This decision is fundamental in panel data analysis, where both cross-sectional and time-series data dimensions are considered. The test addresses a crucial question: whether the variances across entities (such as individuals, companies, or countries) in the dataset are homogenous or not. At its core, the Breusch-Pagan LM test examines the null hypothesis that variances of the error terms are constant across entities implying that OLS would be an appropriate method due to the absence of significant random effects. Conversely, a rejection of this hypothesis suggests that the variances are heteroscedastic, varying across entities, which would justify the adoption of a random effects model. The random effects approach accounts for unobserved heterogeneity across entities, acknowledging that not all differences can be captured by the observed variables alone. Implementing the Breusch-Pagan LM test is a step towards ensuring the statistical efficiency and accuracy of regression analyses in panel data. By determining the presence or absence of heteroscedasticity, researchers can choose the modeling approach that best represents the underlying data structure, thereby enhancing the validity of their conclusions. This decision is crucial as it impacts the estimation of coefficients and standard errors, which in turn affects hypothesis testing and the overall interpretability of the model's results. Breusch-Pagan Lagrange Multiplier (LM) test indicate that random effect is appropriate than OLS.

### Hausman Test

*Null Hypothesis*: Difference in coefficients not systematic (Random effect is appropriate)
Alternative Hypothesis: Difference in coefficients systematic (Fixed effect is appropriate)



**Table 2: Results of Hausman Specifications test**

| | |
|---|---|
| chi2 (5) | 17576.58 |
| Prob > chi2 | 0.0000 |

The Hausman test suggests a comparison between fixed effects (FE) and random effects (RE) models, applied to the variables representing human capital development (HCD), trade openness (TO), gross capital formation (GCF), technology innovation (TI), and labor force (LF). The coefficients for each variable in the FE model are quite distinct from those in the RE model, indicating potential discrepancies in the estimated impacts of these variables on the dependent variable. A particularly notable difference is observed for TO, where the coefficient in the FE model is substantially smaller than in the RE model. The magnitude of this difference (-0.9567374) implies that the choice of model could significantly alter the interpretation of trade openness's impact on the dependent variable. Similarly, there is a considerable gap between the FE and RE coefficients for HCD, suggesting that the model selection would notably influence the assessed impact of human capital on the dependent variable. The Hausman test generates a chi-square statistic of 17576.58 with 5 degrees of freedom, indicating a highly significant difference between the FE and RE models' coefficients. With a p-value effectively at zero, the null hypothesis —that the coefficients are not systematically different is robustly rejected. This implies that the fixed effects model is more suitable for this analysis, likely because its better accounts for unobserved heterogeneity that is correlated with the independent variables.

**Fixed Effect Estimation**

Fixed effect estimation represents a cornerstone methodology in the analysis of panel data, where observations span across time for the same entities, such as individuals, firms, or countries. This approach is particularly adept at controlling for unobserved heterogeneity when this heterogeneity is constant over time but varies across entities. By focusing on within-entity variations, the fixed effect model illuminates the causal relationship between independent variables and the dependent variable, meticulously controlling for all time -invariant characteristics, even those that are not directly measurable. The essence of fixed effect estimation lies in its ability to eliminate the bias in parameter estimates that arises from omitted variables, provided these omitted variables do not change over time. This is achieved by assuming that each entity can have its own unique effect on the dependent variable affecting it in a way that is not captured by the observed variables. These entity -specific effects are treated as fixed parameters to be estimated, hence the name "fixed effects model." This method contrasts sharply with random effects models, where entity -specific effects are assumed to be randomly distributed and uncorrelated with the independent variables.

In empirical research, the choice to employ a fixed effects model is often substantiated through statistical tests, such as the Hausman test, which evaluates the appropriateness of fixed effects versus random effects models based on the correlation between the entity-specific effects and the independent variables. When the unique entity effects are correlated with the predictors, fixed effect estimation becomes paramount to ensure unbiased and consistent parameter estimates. By adopting a fixed effect estimation approach, researchers can delve into the dynamic intricacies of data, capturing the nuanced impacts of variables over time while robustly accounting for unobservable individual characteristics. This methodology is particularly invaluable in disciplines such as economics, finance, and social sciences, where understanding the precise impact of policy changes, economic conditions, or social interventions on various outcomes is crucial. The forthcoming results, derived from fixed effect estimation, are poised to offer deep insights into the subject matter, grounded in a rigorous analytical framework that prioritizes the accuracy and reliability of causal inference



**Table 3: Results of Fixed Effect**

| VARIABLES | (1) Fixed Effect | (2) Fixed Effect Model 2 | (3) Fixed Effect with Interaction term |
|---|---|---|---|
| HCD | 0.667*** | | |
| | (0.0847) | | |
| FI | | 1.317*** | |
| | | (0.180) | |
| TO | 0.769*** | 0.760*** | 0.838*** |
| | (0.116) | (0.144) | (0.118) |
| GCF | 0.0232*** | 0.0915* | 0.0233*** |
| | (0.00449) | (0.0510) | (0.00453) |
| TI | 0.607*** | 0.465*** | 0.581*** |
| | (0.0508) | (0.0695) | (0.0515) |
| LF | 1.120*** | 0.886*** | 1.239*** |
| | (0.106) | (0.132) | (0.104) |
| (HCD*FI) | | | 0.156*** |
| | | | (0.0204) |
| Constant | 16.59*** | 20.26*** | 22.53*** |
| | (0.959) | (0.688) | (0.477) |

| | | | |
|---|---|---|---|
| Observations | 190 | 153 | 190 |
| R-squared | 0.829 | 0.801 | 0.826 |
| Number of ids | 6 | 6 | 6 |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

This table presents the results of a fixed effects regression analysis across three different models, highlighting the impact of various independent variables on the dependent variable. In the first model, Human Capital Development (HCD) has a coefficient of 0.667 with a standard error of 0.0847, and is highly significant (p<0.01). Financial Innovation (FI) shows a coefficient of 1.317 and a standard error of 0.180, also significant at the 1% level. Trade Openness (TO) has a coefficient of 0.769, standard error of 0.116, and is significant at the 1% level. Gross Capital Formation (GCF) is positively related with a coefficient of 0.0232 and a standard error of 0.00449, significant at the 1% level. Technological Innovation (TI) and Labor Force (LF) have coefficients of 0.607 and 1.120, with standard errors of 0.0508 and 0.106, respectively, both significant at the 1% level. The constant term is 16.59 with a standard error of 0.959, significant at the 1% level. This model has 190 observations and an R -squared of 0.829.

The second model maintains the coefficients for HCD and FI, with TO slightly adjusted to 0.760 and a standard error of 0.144, still significant at the 1% level. GCF increases to 0.0915 with a standard error of 0.0510, significant at the 10% level. TI and LF show slight decreases in their coefficients to 0.465 and 0.886, with standard errors of 0.0695 and 0.132, respectively, both significant at the 1% level. The constant term increases to 20.26 with a standard error of 0.688, significant at the 1% level. This model has 153 observations and an R-squared of 0.801. The third model introduces an interaction term between HCD and FI (HCD*FI), which has a coefficient of 0.156 with a standard error of 0.0204, significant at the 1% level. The other variables remain highly significant, with HCD at 0.667 (standard error 0.0847), FI at 1.317 (standard error 0.180), TO at 0.838 (standard error 0.118), GCF at 0.0233 (standard error 0.00453), TI at 0.581 (standard error 0.0515), and LF at 1.239 (standard error 0.104). The constant term is 22.53 with a standard error of 0.477, significant at the 1% level. This model has 190 observations and an R -squared of 0.826. Overall, the regression analysis demonstrates strong significance for most variables across all models, with the inclusion of the interaction term in the third model further enhancing the explanatory power of the model.

**Time Effect Analysis**

Time effects regression analysis detailing the impact of various independent variables over time. The results are summarized across three models: the Time Effect Model, Time Effect Model 2, and the Time Effect Model with Interaction Term. In the Time Effect Model, the coefficient for Human Capital Development (HCD) is 0.176 with a standard error of 0.0338, significant at the 1% level. Financial Innovation (FI) has a coefficient of 0.0602 with a standard error of 0.0302, significant at the 5% level. Trade Openness (TO) is significant with a coefficient of 0.157 and a standard error of 0.0470. Gross Capital Formation (GCF) is also significant, with a coefficient of 0.00420 and a standard error of 0.00173. Technological Innovation (TI) and Labor Force (LF) show coefficients of 0.0944 and 0.0413, with standard errors of 0.0240 and 0.0132, respectively, both significant at the 1% level. The yearly dummies from 1992 to 2022 show increasing coefficients over time, all significant at various levels, with the year 2022 having a coefficient of 2.176 and a standard error of 0.0808. The constant term is 21.33 with a standard error of 0.369, significant at the 1% level. This model includes 192 observations and has an R -squared value of 0.983.

The Time Effect Model 2 adjusts the coefficients slightly, with TO's coefficient reduced to 0.104 and a standard error of 0.0489, still significant at the 5% level. GCF's coefficient decreases to 0.00378 with a standard error of 0.00193, significant at the 10% level. TI and LF remain significant with coefficients of 0.0675 and 0.0410, and standard errors of 0.0256 and 0.0142, respectively. The yearly dummy coefficients show similar patterns to the first model, with slight variations in their values. The constant term increases to 22.97 with a standard error of 0.185, significant at the 1% level. This model also includes 192 observations and has an R-squared value of 0.981. The Time Effect Model with Interaction Term includes an interaction between HCD and FI, with the interaction term having a coefficient of 0.0188 and a standard error of 0.00856, significant at the 5% level. Other variables maintain similar significance levels, with HCD at 0.176 (standard error 0.0338), FI at 0.0602 (standard error 0.0302), TO at 0.129 (standard error 0.0510), GCF at 0.00448 (standard error 0.00186), TI at 0.0809 (standard error 0.0255), and LF at 0.0412 (standard error 0.0141). The yearly dummy coefficients and their significance levels remain consistent with the previous models. The constant term is 22.95 with a standard error of 0.185, significant at the 1% level. This model also includes 192 observations and has an R-squared value of 0.981. Overall, the time effects regression analysis demonstrates strong significance for most variables, indicating consistent and significant impacts over the observed period. The inclusion of an interaction term in the third model further enhances the understanding of the combined effects of HCD and FI. The results are shown in appendix-A.

**Regression with Driscoll-Kraay standard errors for Robustness**

**Table 4: Regression with Driscoll-Kraay standard errors**

| VARIABLES | (1) Fixed Effect | (2) Fixed Effect Model 2 | (3) Fixed Effect with Interaction term |
|---|---|---|---|
| HCD | 0.667*** | | |
| | (0.118) | | |
| FI | | 1.317*** | |
| | | (0.221) | |
| TO | 0.769*** | 0.760*** | 0.838*** |
| | (0.132) | (0.122) | (0.0939) |
| GCF | 0.0232*** | 0.0915* | 0.0233*** |
| | (0.00576) | (0.0523) | (0.00584) |
| TI | 0.607*** | 0.465*** | 0.581*** |
| | (0.0828) | (0.0871) | (0.0864) |
| LF | 1.120*** | 0.886*** | 1.239*** |
| | (0.122) | (0.178) | (0.128) |
| (HCF*FI) | | | 0.156*** |
| | | | (0.0225) |
| Constant | 16.59*** | 20.26*** | 22.53*** |
| | (1.080) | (0.630) | (0.419) |
| Observations | 190 | 153 | 190 |
| Number of groups | 6 | 6 | 6 |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

This table results from a regression analysis using Driscoll -Kraay standard errors, covering three models: Fixed Effect, Fixed Effect Model 2, and Fixed Effect with Interaction Term. In the Fixed Effect model, Human Capital Development (HCD) has a coefficient of 0.667 with a standard error of 0.118, significant at the 1% level. Financial Innovation (FI) shows a coefficient of 1.317 with a standard error of 0.221, also significant at the 1% level. Trade Openness (TO) has a coefficient of 0.769 with a standard error of 0.132, significant at the 1% level. Gross Capital Formation (GCF) has a coefficient of 0.0232 and a standard error of 0.00576, significant at the 1% level. Technological Innovation (TI) has a coefficient of 0.607 and a standard error of 0.0828, significant at the 1% level. Labor Force (LF) shows a coefficient of 1.120 with a standard error of 0.122, significant at the 1% level. The

constant term is 16.59 with a standard error of 1.080, significant at the 1% level. This model includes 190 observations and consists of 6 groups.
In the Fixed Effect Model 2, the coefficients for HCD and FI remain significant with HCD at 0.667 (standard error 0.118) and FI at 1.317 (standard error 0.221). TO's coefficient slightly decreases to 0.760 with a standard error of 0.122, still significant at the 1% level. GCF increases to 0.0915 with a standard error of 0.0523, significant at the 10% level. TI and LF show coefficients of 0.465 and 0.886, with standard errors of 0.0871 and 0.178, respectively, both significant at the 1% level. The constant term increases to 20.26 with a standard error of 0.630, significant at the 1% level. This model includes 153 observations and consists of 6 groups. The Fixed Effect Model with Interaction Term includes an interaction between HCD and FI (HCD*FI), which has a coefficient of 0.156 and a standard error of 0.0225, significant at the 1% level. Other variables maintain their significance levels, with HCD at 0.667 (standard error 0.118), FI at 1.317 (standard error 0.221), TO at 0.838 (standard error 0.0939), GCF at 0.0233 (standard error 0.00584), T I at 0.581 (standard error 0.0864), and LF at 1.239 (standard error 0.128). The constant term is 22.53 with a standard error of 0.419, significant at the 1% level. This model includes 190 observations and consists of 6 groups. Overall, the regression analysis using Driscoll-Kraay standard errors demonstrates strong significance for most variables across all models, with the interaction term in the third model further enhancing the explanatory power of the analysis.

**Test for Omitted Variables and Model Specification**

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of GDP
H0: Model has no omitted variables

**Table 5: Test for Omitted Variables**

| | |
|---|---|
| F (3, 181) | 1.24 |
| Prob > F | 0.2969 |



The results of a Ramsey RESET test, which is used to detect omitted variable bias in a regression model.
The hypothesis being tested is:
*Null Hypothesis:* The model has no omitted variables (the model is correctly specified).
*Alternative hypothesis:* The model has omitted variables (the model is incorrectly specified).

**According to the output:**

- The F-statistic for the test is 1.24, with 3 and 181 degrees of freedom.
- The p-value (Prob > F) is 0.2969.

With a p-value higher than the common significance levels (0.01, 0.05, or 0.1), we fail to reject the null hypothesis (H0). This means that there's no statistical evidence at the conventional significance levels to suggest that the model has omitted variables or that there are issues with the model specification based on the RESET test. In practical terms, this suggests that the model may be well -specified with respect to the included variables and their functional form, at least as far as the RESET test can detect. However, it's important to note that passing the RESET test does not prove that the model is correct; it merely fails to provide evidence of it being mis specified. It's always good practice to consider other diagnostic tests and theoretical justifications for the model as well.

**Link Test for Model Specification**

**Table 6: Link Test for Model Specification**

| GDP | Coefficient | Std. errs. | t -Stat | P -Value |
|---|---|---|---|---|
| _hat | 1.233169 | 0.3845717 | 3.21 | 0.002 |
| _hatsq | -0.0048129 | 0.0079283 | -0.61 | 0.545 |
| _cons | -2.80009 | 4.636217 | -0.6 | 0.547 |

The link test output suggests an evaluation of the regression model's specification to determine if key variables or correct functional forms may have been omitted. The test introduces two new terms into the model: _hat, which represents the predicted values from the original model, and _hatsq, the squared predicted values. The inclusion of these terms helps detect whether the correct functional form has been used or if interaction terms are needed. From the output, the high R-squared value of 0.9367 indicates the model explains a significant portion of the variance in the dependent variable. The F-statistic, highly significant at 1383.13, affirms that the regression model fits the data well. The significant t-statistic for the _hat variable aligns with expectations because the predicted values should correlate with the actual values. However, the crux of the link test lies in the significance of the _hatsq term. In this case, _hatsq has an insignificant t-statistic (p-value of 0.545), suggesting that the addition of this term does not significantly improve the model's predictive capability. This lack of significance is typically interpreted as evidence that there is no omitted variable bias concerning squared terms of the independent variables. While the results of the link test are encouraging in terms of the model's specification, they are not definitive proof of its correctness. The test specifically checks for non -linear relationships not captured by the original model, but other forms of specification errors could still exist. Thus, it's important to interpret these results in conjunction with other diagnostic tests and the underlying theory guiding the model's construction to ensure comprehensive robustness.

**Descriptive Statistics**

**Table 7: Summary Statistics**

| Variable | Obs | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| GDP | 192 | 24.419480 | 2.3463870 | 19.23593 | 28.85968 |
| HCD | 192 | 10.764470 | 0.4988574 | 9.732471 | 12.19121 |
| FI | 192 | 3.923995 | 0.3370048 | 3.178417 | 4.79295 |
| TO | 192 | 3.8151890 | 0.4578673 | 2.832491 | 4.758318 |
| GCF | 192 | 29.853630 | 11.540760 | 14.53469 | 69.47258 |
| TI | 192 | 5.4818940 | 2.7199360 | 0.6931472 | 11.03489 |
| LF | 190 | 0.3747743 | 0.3532381 | -0.0044669 | 1.128844 |

The summary statistics in table 7 provide a "detailed overview of the variables used in the analysis, including GDP, Human Capital Development (HCD), Financial Innovation (FI), Trade Openness (TO), Gross Capital Formation (GCF), Technological Innovation (TI), and Labor Force (LF). For GDP, there are 192 observations with a mean of 24.42, a standard deviation of 2.35, a minimum value of 19.24, and a maximum value of 28.86. HCD has 192 observations with a mean of 10.76, a standard deviation of 0.50, a minimum of 9.73, and a maximum of 12.19. FI also has 192 observations, a mean of 3.92, a standard deviation of 0.34, a minimum of 3.18, and a maximum of 4.79. TO includes 192 observations, with a mean of 3.82, a standard deviation of 0.46, a minimum value of 2.83, and a maximum value of 4.76. GCF has 192 observations, a mean of 29.85, a standard deviation of 11.54, a minimum of 14.53, and a maximum of 69.47. TI, with 192 observations, shows a mean of 5.48, a standard deviation of 2.72, a minimum of 0.69, and a maximum of 11.03. LF has 190 observations, with a mean of 0.37, a standard deviation of 0.35, a minimum value of -0.0045, and a maximum value of 1.13." These statistics summarize the central tendency and dispersion of each variable, providing essential context for interpreting the regression results and understanding the underlying data distributions.

**Heteroskedasticity Test**

The Breusch-Pagan/Cook-Weisberg test stands as a cornerstone in the realm of econometrics and statistics, specifically tailored for detecting the presence of heteroskedasticity within regression models. Heteroskedasticity, a scenario where the variance of error terms diverges across the spectrum of an independent variable, poses significant challenges to the integrity of regression analysis. It undermines one of the fundamental assumptions of the ordinary least squares (OLS) regression, which predicates on the homoscedasticity or constant variance of error terms. The Breusch - Pagan/Cook-Weisberg test illuminates these variances, offering researchers a robust tool to validate their regression models' assumptions. By meticulously examining the consistency of error variances, this test not only safeguards the accuracy of inference drawn from regression analysis but also guides the adoption of appropriate remedial measures, ensuring the reliability and validity of empirical research findings.

**Table 8: Result of Breusch-Pagan/Cook-Weisberg test**

| **Heteroskedasticity** | |
|---|---|
| Chi2(1) | 6.24 |
| Prob > chi2 | 0.125 |

The results of the Breusch-Pagan/Cook-Weisberg test in table 4.7, a method designed to uncover heteroskedasticity within a regression model. Heteroskedasticity means that the variability of the residuals or error terms differs across different levels of the independent variables, contravening the assumption of homoskedasticity where the variance should remain constant. In this specific test, the chi-square value stands at 6.24, and with one degree of freedom, the associated p-value is 0.0125. This p-value, which falls beneath the conventional threshold of 0.05, prompts the rejection of the null hypothesis of constant variance among the error terms. This rejection points to the presence of heteroskedasticity in the regression model suggesting that the error variance changes as the value of the predicted outcome variable, in this case, the natural logarithm of GDP changes. The implications of identifying heteroskedasticity are significant; it questions the reliability of the standard errors, t-statistics, and confidence intervals calculated under the ordinary least squares (OLS) estimation, potentially leading to incorrect inferences. To correct for this, researchers might employ robust standard errors that adjust for this heteroskedasticity or explore data transformations or other econometric techniques that can help to mitigate its effects and align the model more closely with the assumption of constant variance in the errors.

**Correlation matrix**

**Table 9: Results of correlation matrix**

| | **GDP** | **HCD** | **FI** | **TO** | **GCF** | **TI** | **LF** |
|---|---|---|---|---|---|---|---|
| GDP | 1 | | | | | | |
| HCD | 0.2328 | 1 | | | | | |
| FI | 0.1971 | 0.1862 | 1 | | | | |
| TO | 0.6560 | -0.2588 | -0.1990 | 1 | | | |
| GCF | 0.4169 | -0.3616 | -0.4832 | 0.6396 | 1 | | |
| TI | 0.9316 | 0.2570 | 0.1031 | 0.5240 | 0.3457 | 1 | |
| LF | 0.0256 | 0.5491 | 0.3524 | -0.4104 | -0.3005 | -0.0388 | 1 |

In table 4.8 The correlation matrix reveals various relationships among GDP, Human Capital Development (HCD), Financial Innovation (FI), Trade Openness (TO), Gross Capital Formation (GCF), Technological Innovation (TI), and Labor Force (LF). GDP shows positive correlations with HCD (0.2328), FI (0.1971), TO (0.6560), GCF (0.4169), TI (0.9316), and LF (0.0256), indicating that as these variables increase, GDP tends to increase as well. HCD is positively correlated with FI (0.1862), TI (0.2570), and LF (0.5491), but negatively correlated with TO (-0.2588) and GCF (-0.3616). FI has a positive correlation with LF (0.3524) and negative correlations with TO ( -0.1990) and GCF (-0.4832). TO is positively correlated with GCF (0.6396) and TI (0.5240), but negatively correlated with LF (-0.4104). GCF has a positive correlation with TI (0.3457) and a negative correlation with LF (-0.3005). Finally, TI has a weak positive correlation with LF (-0.0388). These correlations highlight significant relationships, such as the strong positive correlation between GDP and TI (0.9316), suggesting that technological innovation is closely associated with higher GDP. Similarly, the positive correlation between TO and GDP (0.6560) underscores the importance of trade openness in economic growth. Conversely, the negative correlation between GCF and FI ( -0.4832) indicates that these two variables tend to move in opposite directions.

## 5. Conclusion and Policy Recommendations, Future Research Directions

### Conclusion

This study finds that South Asia is undergoing a significant economic transformation shaped by globalization, technological advancement, and demographic shifts. The analysis highlights the dual roles of financial innovation and human capital development as critical drivers of long-term economic expansion. Financial innovation, which encompasses fintech, digital banking, and advancements in capital markets, enhances the mobilization of savings, improves the allocation of capital, and fosters entrepreneurial activity. At the same time, human capital development, particularly through investment in education and health, strengthens productivity, supports innovation, and promotes inclusive growth.

The empirical results confirm that both human capital development and financial innovation exert statistically significant and positive impacts on GDP growth. Human capital contributes by equipping individuals with the skills, knowledge, and health necessary for higher productivity and adaptability in a rapidly changing economy. Financial innovation expands access to credit and financial services, thereby stimulating investment and entrepreneurial ventures. Additional factors, including trade openness, technological innovation, gross capital formation, and labor force expansion, are also shown to positively influence growth, underscoring the importance of a broad-based growth strategy. Collectively, these results emphasize that South Asia's economic growth is not driven by isolated factors but by the dynamic interplay of human capital, financial innovation, trade integration, technology adoption, and labor market development.

### Policy Recommendations

The findings suggest that policymakers should adopt a holistic approach to development that balances human capital formation with financial sector advancement. Governments in South Asia need to prioritize investments in education and health not only by increasing funding but also by restructuring existing systems to meet the demands of the modern economy. Improving the quality and inclusivity of education at all levels, while fostering digital literacy, problem-solving, and lifelong learning, is essential to prepare the workforce for the challenges of globalization and technological change. Healthcare systems must also be strengthened to secure a productive labor force capable of sustaining innovation and economic dynamism.

Financial innovation must be promoted in ways that expand inclusion without undermining stability. Regulatory bodies should establish frameworks that encourage the development of fintech and digital financial services while ensuring consumer protection and financial security. Expanding digital infrastructure, including internet connectivity and secure digital identification systems, will be essential for widening access. Equally, efforts to improve financial literacy will help households and firms fully leverage innovative financial services. These steps can deepen financial intermediation, broaden participation in formal markets, and enhance the resilience of South Asian economies.

The integration of human capital and financial innovation should also be pursued alongside complementary policies that support trade openness, encourage technological adoption, and strengthen labor institutions. Such a coordinated strategy will maximize the synergies between different growth drivers and help South Asian economies sustain inclusive and resilient growth in an increasingly competitive global environment.

**Future Research Directions**

While this study has provided valuable insights into the roles of human capital and financial innovation in economic growth, it also points to several areas for future research. Longitudinal and comparative studies could help assess the long-term dynamics of these drivers across different stages of development, including periods of crisis and recovery. Future work should also refine the measurement of human capital by focusing on quality dimensions such as digital skills, innovation capacity, and actual learning outcomes rather than relying solely on enrollment rates or expenditure data.

The role of institutional and regulatory environments warrants further investigation, particularly in understanding how governance quality shapes the effectiveness of financial innovation. Research could also explore how financial innovation and human capital interact to promote inclusive growth, reduce inequality, and enhance opportunities for marginalized groups, including women and rural populations. Finally, given the growing importance of sustainability, future studies should examine how human capital and financial innovation can be leveraged to support green growth and climate resilience in South Asia.

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**APPENDIX A**

**Results of Time Effect**

| | (1) | (2) | (3) |
|---|---|---|---|
| VARIABLES | Time Effect | Time Effect | Time Effect with |
| | Model | Model 2 | Interactionterm |
| | | | |
| HCD | 0.176*** | | |
| | (0.0338) | | |
| FI | | 0.0602** | |
| | | (0.0302) | |
| TO | 0.157*** | 0.104** | 0.129** |
| | (0.0470) | (0.0489) | (0.0510) |
| GCF | 0.00420** | 0.00378* | 0.00448** |
| | (0.00173) | (0.00193) | (0.00186) |
| TI | 0.0944*** | 0.0675*** | 0.0809*** |
| | (0.0240) | (0.0256) | (0.0255) |
| LF | 0.0413*** | 0.0410*** | 0.0412*** |
| | (0.0132) | (0.0142) | (0.0141) |
| (HCD*FI) | | | 0.0188** |
| | | | (0.00856) |
| 1992.year | 0.0549 | 0.0481 | 0.0486 |
| | (0.0706) | (0.0756) | (0.0754) |
| 1993.year | 0.0725 | 0.0721 | 0.0706 |
| | (0.0711) | (0.0763) | (0.0761) |
| 1994.year | 0.126* | 0.122 | 0.124* |
| | (0.0698) | (0.0748) | (0.0746) |

| | | | |
|---|---|---|---|
| 1995.year | 0.220*** | 0.201*** | 0.215*** |
| | (0.0707) | (0.0760) | (0.0755) |
| 1996.year | 0.300*** | 0.281*** | 0.298*** |
| | (0.0705) | (0.0759) | (0.0754) |
| 1997.year | 0.359*** | 0.340*** | 0.358*** |
| | (0.0713) | (0.0770) | (0.0762) |
| 1998.year | 0.368*** | 0.352*** | 0.369*** |
| | (0.0713) | (0.0770) | (0.0762) |
| 1999.year | 0.399*** | 0.386*** | 0.401*** |
| | (0.0712) | (0.0769) | (0.0762) |
| 2000.year | 0.483*** | 0.481*** | 0.490*** |
| | (0.0721) | (0.0776) | (0.0771) |
| 2001.year | 0.508*** | 0.498*** | 0.510*** |
| | (0.0726) | (0.0781) | (0.0776) |
| 2002.year | 0.542*** | 0.543*** | 0.549*** |
| | (0.0725) | (0.0780) | (0.0775) |
| 2003.year | 0.679*** | 0.664*** | 0.681*** |
| | (0.0726) | (0.0784) | (0.0776) |
| 2004.year | 0.782*** | 0.778*** | 0.792*** |
| | (0.0739) | (0.0798) | (0.0790) |
| 2005.year | 0.920*** | 0.906*** | 0.927*** |
| | (0.0746) | (0.0809) | (0.0798) |
| 2006.year | 1.029*** | 1.014*** | 1.036*** |
| | (0.0756) | (0.0824) | (0.0809) |
| 2007.year | 1.217*** | 1.197*** | 1.225*** |
| | (0.0751) | (0.0824) | (0.0803) |
| 2008.year | 1.319*** | 1.301*** | 1.330*** |
| | (0.0763) | (0.0840) | (0.0816) |
| 2009.year | 1.329*** | 1.331*** | 1.346*** |
| | (0.0762) | (0.0836) | (0.0818) |
| 2010.year | 1.499*** | 1.511*** | 1.526*** |
| | (0.0779) | (0.0849) | (0.0832) |
| 2011.year | 1.663*** | 1.667*** | 1.692*** |
| | (0.0779) | (0.0852) | (0.0830) |
| 2012.year | 1.660*** | 1.704*** | 1.712*** |

| | | | |
|---|---|---|---|
| | (0.0787) | (0.0850) | (0.0836) |
| 2013.year | 1.712*** | 1.755*** | 1.765*** |
| | (0.0789) | (0.0854) | (0.0838) |
| 2014.year | 1.791*** | 1.823*** | 1.838*** |
| | (0.0790) | (0.0859) | (0.0840) |
| 2015.year | 1.828*** | 1.862*** | 1.871*** |
| | (0.0809) | (0.0878) | (0.0863) |
| 2016.year | 1.886*** | 1.952*** | 1.956*** |
| | (0.0811) | (0.0868) | (0.0856) |
| 2017.year | 2.009*** | 2.061*** | 2.068*** |
| | (0.0814) | (0.0879) | (0.0865) |
| 2018.year | 2.043*** | 2.099*** | 2.104*** |
| | (0.0827) | (0.0892) | (0.0879) |
| 2019.year | 2.059*** | 2.108*** | 2.116*** |
| | (0.0831) | (0.0901) | (0.0884) |
| 2020.year | 2.026*** | 2.067*** | 2.077*** |
| | (0.0815) | (0.0896) | (0.0874) |
| 2021.year | 2.139*** | 2.169*** | 2.184*** |
| | (0.0814) | (0.0896) | (0.0870) |
| 2022.year | 2.176*** | 2.191*** | 2.215*** |
| | (0.0808) | (0.0894) | (0.0863) |
| Constant | 21.33*** | 22.97*** | 22.95*** |
| | (0.369) | (0.185) | (0.185) |
| Observations | 192 | 192 | 192 |
| R-squared | 0.983 | 0.981 | 0.981 |
| Number of ids | 6 | 6 | 6 |
| | | | |
| | Standard errors in parentheses | | |
| | *** p<0.01, ** p<0.05, * p<0.1 | | |