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FULL LENGTH ARTICLE

How Education and Investment Affect Economic Growth in Asian Developing Countries?

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ABSTRACT

This study investigates how education and investment influence economic growth across selected Asian developing countries, with a particular focus on whether these relationships differ by income level and institutional context. Using panel data from 2010 to 2023, countries are divided into upper-middle-income (China, Indonesia, Malaysia, and Kazakhstan) and lower-middle-income (Uzbekistan, Tajikistan, Pakistan, Kyrgyzstan, Bangladesh, Philippines) groups. The analysis employs multiple regression models to examine the effects of government education expenditure, school enrollment rate, gross capital formation, labor force participation, foreign direct investment, and population dynamics on GDP per capita. Diagnostic tests, including Variance Inflation Factor (VIF), are applied to ensure model reliability. The findings reveal that education plays a stronger role in promoting economic growth in upper-middle-income economies, while lower-middle-income countries experience weaker and less consistent relationships. The findings suggest that the growth effects of education and investment depend on development level and institutional quality, emphasizing the need for tailored policy approaches. In upper-middle-income countries, policies should prioritize improving education quality and aligning skills with labor market demands, while also strengthening the connection between investment and workforce capacity. In contrast, lower-middle-income countries require broader structural reforms, including better governance, improved education outcomes, and incentives for school completion.

Keywords: Economic growth ▪ Education expenditure ▪ Investment ▪ Asian developing countries ▪ Income classification ▪ School enrollment

1. INTRODUCTION

Education is considered one of the fundamental drivers for good jobs and one of the safest ways out of poverty. For individuals, education brings about employment, financial profit, better health, and poverty reduction. Around the globe, there is approximately a 10% increase in hourly earnings for each extra year of schooling (World Bank, 2025). In today's highly digitalized and globalized world, investments in education are becoming an essential part of countries' long-term development strategy. Although they act as a tool to build human capital, maximize labor effectiveness, and establish an innovative economy, the efficiency of such investments depends not only on their volume but also on the value of educational programs, quality of teacher training, and general environment of the institutions [1]. The economic returns of education depend not only on individual outcomes but also on labor market conditions and macroeconomic factors. Maneejuk and Yamaka [2] support the idea that the contribution of higher education to the whole economy is related to available jobs for graduates who invest in skills to get a good job. Additionally, simply increasing the number of universities

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will not result in considerable economic development unless strengthened with improved teacher training and educational standards [1]. According to Triatmanto et al. [3], some of the macroeconomic indicators that are often in the spotlight because of their impact on economic growth are foreign investment and portfolio investment. Foreign investment carries a significant impact while improving a developing country's ability to boost its economy.

International education indicators show cross-country differences in access, participation, investment, and educational outcomes [4]. Once in a three-year period in the global educational system, OECD conducts PISA to test the critical thinking of 15-year-old students in math, science, and reading in more than 65 countries that make up to 90% of the world's economies (OECD, 2023). The average PISA score was 1321 in 2022, examining the knowledge of students in math, science, and reading. Students in some Asian countries performed particularly well, especially in China, where the score reached 1605. Kazakhstan and Malaysia followed this scenario, with scores of 1234 and 1213, respectively. In contrast, students in lower-middle-income countries such as Uzbekistan and the Philippines scored significantly lower, with results of 1055 and 1058, respectively (OECD PISA Results, 2022).

Based on the economic and educational disparities discussed above, this study addresses the following research questions:

RQ1: How do education expenditure, tertiary enrollment, and investment indicators influence GDP per capita in Asian developing countries?

RQ2: Do lower-middle-income and upper-middle-income countries experience different growth effects from education and investment?

The study explores the influence of education and investment on economic growth in selected Asian developing countries using panel data analysis. It contributes to the research field by delivering a fresh perspective on how factors such as education expenditure, capital formation, labor force, foreign investment, governance, and population growth collectively shape GDP per capita. Additionally, to compare and navigate the impact of such variables at different economic stages, the paper studies selected countries as two individual groups: lower-middle-income and upper-middle-income. The study also aims to introduce new empirical evidence on the long-term impact of education and investments, offering recommendations for optimizing effective policies and advancing economic competitiveness.

This study is significant both theoretically and practically. From a theoretical perspective, it contributes to the existing literature by integrating education, investment, and institutional quality into a unified empirical framework for analyzing economic growth in Asian developing countries. The comparative perspective helps refine growth theories by emphasizing the conditional role of governance, labor market structure, and demographic dynamics. Understanding whether education spending, foreign investment, and institutional quality produce different outcomes across income groups can help policymakers allocate resources more effectively and structure targeted reforms.

The organization of this paper is as follows. Following the introduction, Section 2 reviews the relevant literature and historical background. The methodology of the research, econometric models, and data sources are provided in Section 3. Section 4 presents a discussion of the empirical findings and their implications. Section 5 summarizes the study by outlining key takeaways and insights, acknowledging limitations and future research directions, and offering policy recommendations.

2. RELATED WORK

Strategies aimed at improving the quality of higher education should be aligned with national economic objectives, as emphasized by Liao et al. [5] in their study of Guangdong, China. Using panel data from 2000 to 2016, their cointegration and causality analysis of 21 cities reveals a significant two-year hysteresis effect. It indicates that while education is a vital determinant of sustainable growth, its impact on national GDP is not immediate and requires long-term policy commitment to see results.

Utilizing a 2SLS model across 50 US states between 1989 and 2006, Jr [6] suggest that the relationship between public higher education spending and economic growth is not universally positive. It yields a positive impact on growth primarily in regions with a small private education sector. According to the same study, public spending can negatively affect overall educational attainment unless the private market is large enough to offset these inefficiencies. Lupu et al. [7], studying the correlation between real GDP growth and ten various sections of public expenditure, conclude that spending on education and well-being of the population causes a positive impact on the economy.

By analyzing the idea of higher education quality from the stakeholder perspective—workers, teachers, and students—Aca-ac et al. [8] highlight that curriculum relevance, employability of graduates, and institutional reputation are the main factors in defining it. Such insights are important to examine whether investment in higher education meets the expectations and career aspirations of students and employees in emerging economies.

High economic growth and high productivity can be linked to an efficient labor force (Rahman and Anis, 2023). Unquestionably, efficiency is enhanced by education, and in return, it increases productivity, which is a necessity for long-term economic growth. Studying the impact of higher education on economic growth in ASEAN-5 countries, Maneejuk and Yamaka [2] investigate that economic growth can be affected by the increasing number of educated people who are unemployed. Thus, simply having a degree is not enough; rather, the economy needs to allocate jobs correctly to utilize the potential of those skills effectively. Besides, the research introduces an interesting finding: there is not a "diminishing returns" rule in government spending on college students among ASEAN countries. This means that the benefits of such spending do not fade away as the government spends more.

Analyzing data from 31 Chinese provinces from 2000–2021, Ma et al. [9] reveal that the success of education investment depends heavily on the existing environment. Higher ed-

ucation investment significantly boosts comprehensive development, combining innovation, sustainability, and social progress, only in provinces with high levels of human capital. Findings from Agustin (2023) summarize that the correlation between FDI and economic growth is positive and statistically significant for countries with adequately well-developed financial sectors and high levels of human capital. Raza et al. [10] further explore this relationship by examining both FDI and economic growth in the presence of good governance. A key finding is that FDI contributes more effectively to economic growth when supported by high-quality institutions.

Recent research by Chinnakum et al. [11] explores the significance of effective higher education budget allocation for achieving sustainable socioeconomic development, particularly in connection with SDG 4, Quality Education. The focus of the research lies on Chiang Mai University, evaluating the institution's socioeconomic impact on the regional economy of Northern Thailand by observing expenditure as well as teaching and training programs, using Input-Output (IO) and Social Return on Investment (SROI) models. The study reveals that the university generates substantial socioeconomic benefits, contributing more than THB 3 billion annually through combined direct and indirect effects across industry and service sectors. Additionally, every million Thai baht invested in the university makes a considerable socioeconomic impact.

Current research demonstrates that high-quality education combined with well-planned digital investment plays a significant role in driving economic growth. However, in countries where education systems are weak and skilled workers frequently emigrate, the economic benefits of technological investment tend to decline. This underscores the need to align education policies with digital development strategies. Overall, the findings emphasize that educational policies must be integrated with broader economic reforms, particularly those aimed at improving governance and transparency.

3. METHODOLOGY

3.1 Theoretical Framework

This study is grounded in Human Capital Theory, which considers education, skills, and knowledge as forms of capital that enhance individual productivity and contribute to economic growth. It models individuals as rational agents who invest in education and skills in response to expected returns [12]. In the context of a knowledge-based economy, Wuttaphan (2017) argues that human capital is viewed as an invaluable asset that firms and nations invest in to achieve competitiveness and sustainability. Similarly, Nafukho et al. [13] highlight that Human Capital Theory connects education and human resource development at individual, organizational, and national levels, reinforcing its importance for broader growth. Human Capital Theory provides a clear mechanism linking education to economic well-being, and a graphical presentation of this theoretical framework is presented in Figure 1.

Countries that allocate more resources to education and skill formation are more likely to experience sustained increases in GDP per capita [14]. Education expenditure and tertiary school enrollment serve as key indicators of human capital investment, as education enhances individuals' earning capacity, employment prospects, and overall economic growth [15]. While labor force size represents the productive human resource base of an economy, whose effective management and development significantly enhance labor productivity and performance [16], FDI promotes regional economic development by generating technology spillovers that improve productivity and local entrepreneurship [17].

3.2 Empirical Framework

The aim of this study is to examine how education, capital investment, and labor force dynamics influence economic growth in Asian upper-middle-income countries (China, Indonesia, Malaysia, and Kazakhstan) and lower-middle-income countries (Uzbekistan, Kyrgyzstan, Tajikistan, Pakistan, Bangladesh, and the Philippines) over the period 2010–2023. Using panel data analysis, the study aims to provide empirical insights about the roles of human capital and investments in shaping economic performance. The mathematical model based on the purpose of this research paper can be represented as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5) \tag{1}$$

In Equation (1), the dependence of GDP per capita (Y) on five independent variables (X) is considered.

$$\begin{aligned} \mathrm{GDP_PC}_{i,t} = {} & \beta_0 + \beta_1 \mathrm{GCF}_{i,t} \\ & + \beta_2 \mathrm{GEE}_{i,t} + \beta_3 \mathrm{FDI}_{i,t} \\ & + \beta_4 \mathrm{LFT}_{i,t} + \beta_5 \mathrm{SchoolEn}_{i,t} + \mu_{i,t} \end{aligned} \tag{2}$$

where i is the country (selected Asian developing countries), t is the year (2010–2023), and μ_i denotes country-specific effects. In Equation (2), GDP_PC refers to GDP per capita in current US dollars. All variables, including capital (GCF)—gross capital formation (% of GDP); government expenditure on education (GEE), total (% of GDP); foreign direct investment net inflows (FDI); labor force total (LFT); and SchoolEn—tertiary school enrollment (% gross)—are collected from the World Bank. Table 1 shows the full description of the selected variables, their definitions, and sources.

To examine the relationship between human capital variables and economic growth, several statistical methods are used. Descriptive statistics provide a general idea of the main characteristics of the dataset, such as mean, standard deviation, minimum, and maximum values of the variables. Second, a correlation matrix [18] is used to analyze pairwise relationships between the variables. Next, linear regression models [19] are estimated to evaluate the impact of the selected variables on GDP per capita. To compare the effects across different levels of economic development, regression models are estimated separately for upper-middle-income and lower-middle-income countries. In addition, the Variance Inflation Factor (VIF) test [20] is conducted to assess potential multicollinearity among the independent variables. All estimations are carried out using STATA 17 software.

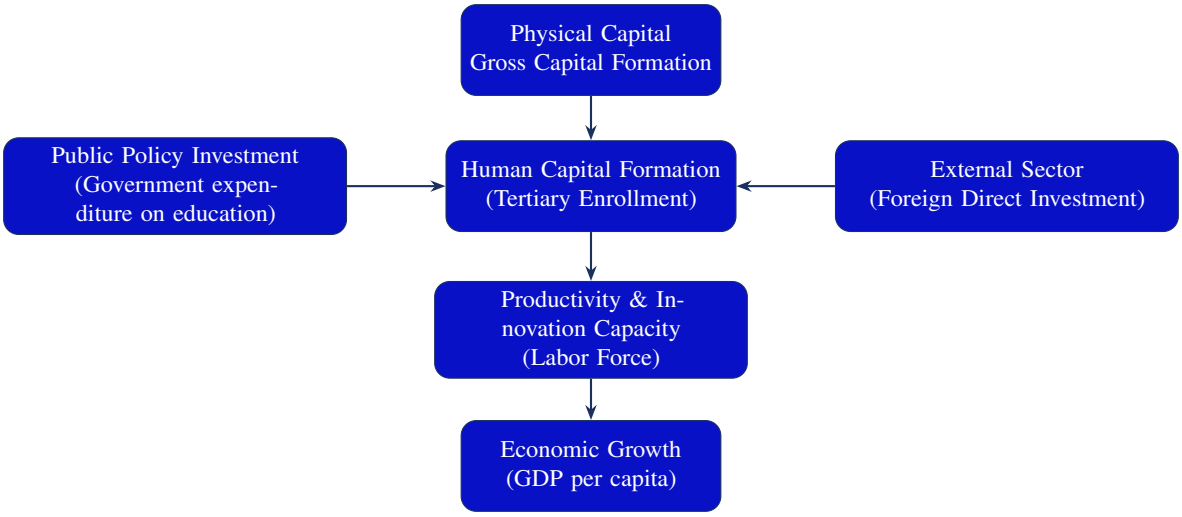


Figure 1. Conceptual framework of the study (developed by the author).

Table 1. Description of the variables.

Variable	Description	Source
GDP per capita (current US$) (GDP_PC)	The total income earned through the production of goods and services in an economic territory during an accounting period.	World Bank Data (WDI)
Gross capital formation (% of GDP) (GCF)	The total value of investments made in fixed assets, inventories, and valuables within an economy.	World Bank Data (WDI)
Government expenditure on education, total (% of GDP) (GEE)	Total public spending on education by central, regional, and local governments expressed as a percentage of GDP.	World Bank Data (WDI)
Foreign direct investment, net inflows (% of GDP) (FDI)	Net foreign investment inflows that give investors significant control (at least 10% ownership) in domestic firms, measured relative to GDP.	World Bank Data (WDI)
Labor force, total (LFT)	People aged 15 and above who are either employed or actively seeking employment.	World Bank Data (WDI)
School enrollment, tertiary (% gross) (SchoolEn)	Total enrollment in higher education relative to the population of the corresponding age group.	World Bank Data (WDI)

4. RESULTS ANALYSIS AND DISCUSSION

4.1 Descriptive Statistics

The descriptive statistics of the variables are represented in Table 2 for 10 countries over the period 2010–2023. The mean GDP_PC is US$4,438.5, ranging from US$737.3 to US$13,478.5, showing substantial income differences across countries. GCF averages 29.0% of GDP, while GEE has a mean value of 3.7% of GDP. The average FDI inflow is 2.46% of GDP, with values ranging from negative to relatively high positive levels, indicating fluctuations in foreign investment. The LFT varies considerably across countries due to population differences, and the average SchoolEn is 32.8%, revealing moderate participation in education across the sample countries.

Table 2. Descriptive statistics.

Variable	Descriptive statistics
GDP_PC	Obs.: 140; mean: 4438.548; SD: 3907.847; min: 737.339; max: 13478.46
GCF	Obs.: 140; mean: 29.027; SD: 7.919; min: 13.968; max: 46.27
GEE	Obs.: 140; mean: 3.747; SD: 1.553; min: 0.864; max: 7.384
FDI	Obs.: 140; mean: 2.457; SD: 2.472; min: -4.855; max: 17.131
LFT	Obs.: 140; mean: 1.129e+08; SD: 2.254e+08; min: 2035779; max: 7.812e+08
SchoolEn	Obs.: 140; mean: 32.777; SD: 15.835; min: 7.033; max: 74.593

4.2 Correlation Analysis

Pairwise correlations by income group are reported in Table 3. For upper-middle-income countries, GDP_PC shows a moderate positive correlation with GEE (0.607) and SchoolEn (0.667), suggesting that improvement in education is associated with higher income levels. This is in accordance with studies that found a positive relationship between education and economic growth [3, 1]. Similar results were also reached by Maneejuk and Yamaka [2], who state that school enrollment rates can significantly promote economic growth. While GCF has a negative relationship with GDP_PC (-0.313), FDI shows a weak positive relationship. A notable positive correlation is observed between GCF and LFT (0.928), which

Table 3. Pairwise correlations by income group.

Variable pair	Correlation
Upper-middle-income countries	
GDP_PC – GCF	-0.313
GDP_PC – GEE	0.607
GDP_PC – FDI	0.135
GDP_PC – LFT	-0.019
GDP_PC – SchoolEn	0.667
GCF – GEE	-0.073
GCF – FDI	-0.325
GCF – LFT	0.928
GCF – SchoolEn	0.036
GEE – FDI	0.205
GEE – LFT	0.125
GEE – SchoolEn	0.160
FDI – LFT	-0.310
FDI – SchoolEn	-0.110
LFT – SchoolEn	0.203
Lower-middle-income countries	
GDP_PC – GCF	-0.111
GDP_PC – GEE	-0.156
GDP_PC – FDI	-0.143
GDP_PC – LFT	0.201
GDP_PC – SchoolEn	0.058
GCF – GEE	0.593
GCF – FDI	0.303
GCF – LFT	-0.618
GCF – SchoolEn	0.437
GEE – FDI	0.454
GEE – LFT	-0.862
GEE – SchoolEn	0.567
FDI – LFT	-0.415
FDI – SchoolEn	0.364
LFT – SchoolEn	-0.497

Diagonal correlations are 1.000.

may indicate a close relationship between investment and labor force capacity in these economies. In lower-middle-income countries, the correlations between GDP_PC and the explanatory variables are generally weak, while GEE and SchoolEn show moderately positive relationships. A strong negative correlation is observed between LFT and GEE (-0.862), indicating significant structural differences among countries.

4.3 Regression Analysis

The linear regression results for upper-middle-income countries are represented in Table 4. They reveal that education expenditure has a positive influence on economic development, which is consistent with Human Capital Theory [12], suggesting that investment in education enhances necessary skills and productivity of the labor force, thereby contributing to long-term economic growth. The model's R-squared

Table 4. Linear regression results for upper-middle-income countries.

GDP_PC	Coef.	St.Err.	t, p, 95% CI, Sig.
GEE	1340.668	190.753	$t = 7.03$, $p = 0$; CI [957.716, 1723.621]; ***
LFT	0	0	$t = -2.62$, $p = .011$; CI [0, 0]; **
SchoolEn	173.232	20.17	$t = 8.59$, $p = 0$; CI [132.739, 213.725]; ***
FDI	56.973	129.02	$t = 0.44$, $p = .661$; CI [-202.046, 315.991]
Constant	-3649.725	1076.245	$t = -3.39$, $p = .001$; CI [-5810.376, -1489.074]; ***

Model statistic	Value
Mean dependent var	8450.987
SD dependent var	3205.092
R-squared	0.746
Number of observations	56
F-test	37.388
Prob > F	0.000
Akaike criterion (AIC)	995.353
Bayesian criterion (BIC)	1005.480

*** $p < .01$, ** $p < .05$, * $p < .1$. Source: developed by the author, 2026.

value is 0.746, meaning that approximately 74.6% of the variation in GDP per capita is explained by the selected variables. The overall model is statistically significant ($F = 37.388$, $p < 0.01$). GEE shows both a positive and statistically significant effect on GDP per capita, which aligns with Sultana et al. [21]. According to them, with improved life expectancy and government health expenditure, educational human capital works better and significantly drives growth.

The regression results for lower-middle-income countries are illustrated in Table 5. With an R-squared value of 0.084, only 8.4% of the variation in economic performance is explained by the independent variables. The model is not statistically significant, since the F-test value is 1.435 and the p-value is 0.221. SchoolEn shows a positive relationship with GDP_PC and is statistically significant at the 10% level. Although statistically insignificant, the negative coefficient of GEE is similar to findings by Shaddady [22], who observed a negative relationship between government spending and economic growth. This suggests that ineffective allocation of public resources may weaken the growth effects.

Initially, when both GCF and LFT were included in the model, very high VIF values were observed, indicating potential multicollinearity between the variables. To address this issue, GCF was excluded from the upper-middle-income regression model. After this adjustment, VIF values were close to 1, with a mean of 1.141, suggesting the absence of multicollinearity (Table 6). Although GEE and LFT reveal relatively higher VIF values, 4.479 and 4.192, respectively, they remain well

Table 5. Linear regression results for lower-middle-income countries.

GDP_PC	Coef.	St.Err.	t, p, 95% CI, Sig.
GCF	-2.14	15.498	$t = -0.14$, $p = .891$; CI [-32.995, 28.714]
GEE	-6.462	108.446	$t = -0.06$, $p = .953$; CI [-222.361, 209.436]
FDI	-34.021	36.4	$t = -0.93$, $p = .353$; CI [-106.487, 38.445]
LFT	0	0	$t = 1.12$, $p = .268$; CI [0, 0]
SchoolEn	14.039	7.909	$t = 1.78$, $p = .08$; CI [-1.706, 29.784]; *
Constant	1335.517	707.75	$t = 1.89$, $p = .063$; CI [-73.506, 2744.539]; *

Model statistic	Value
Mean dependent var	1763.588
SD dependent var	814.595
R-squared	0.084
Number of observations	84
F-test	1.435
Prob > F	0.221
Akaike criterion (AIC)	1368.037
Bayesian criterion (BIC)	1382.622

*** $p < .01$, ** $p < .05$, * $p < .1$. Source: developed by the author, 2026.

below the commonly accepted threshold of 10 (Table 7).

Table 6. Variance inflation factors for upper-middle-income countries.

Variable	VIF	1/VIF
FDI	1.196	.836
LFT	1.179	.848
GEE	1.117	.896
SchoolEn	1.072	.933
Mean VIF	1.141	

5. CONCLUSION

This study examined the impact of education and investment on economic growth in Asian developing countries through panel data analysis, from 2020 to 2023. By including government expenditure on education, capital formation, labor force dynamics, foreign investment, and education attendance in one framework, the research delivered fresh empirical evidence on how these variables collectively shape GDP per capita across different development stages.

The findings highlight a fundamental difference in growth dynamics between the two income groups. For upper-middle-income countries, the results show an essential role for human capital development, defined by expenditure on education and school enrollment. Conversely, the lower-middle-income group delivered a markedly different picture. The correlations

Table 7. Variance inflation factors for lower-middle-income countries.

Variable	VIF	1/VIF
GEE	4.479	.223
LFT	4.192	.239
GCF	1.695	.590
SchoolEn	1.54	.649
FDI	1.29	.775
Mean VIF	2.639	

between GDP per capita and independent variables were generally weak, with the exception of education expenditure and school enrollment, which showed moderately positive relationships. Most interestingly, the regression model explained merely 8.4% of economic variation and failed to achieve statistical significance ($F = 1.435$). This difference indicates that in relatively less developed countries, the bridge connecting education and investment to economic growth is blocked by structural barriers, institutional weaknesses, or incomplete policy interventions.

Policymakers should focus on quality-advancing reforms rather than quantity expansion, such as teacher training, curriculum modernization, and connection between educational outputs and labor market demands. The weak FDI-growth relationship suggests an urgent need for investment quality screening mechanisms that ensure foreign capital transfers technology and paves the way for local value chains to fully utilize cost advantages. The weak overall model performance in lower-middle-income countries shows that education and investment alone cannot solve structural problems that hinder economic growth.

While the study provides valuable empirical contributions, several limitations do exist. Firstly, the exclusion of gross capital formation from the final regression specifications, while necessary for statistical integrity, limits direct assessment of investment-growth relationships in upper-middle-income countries. Second, the country grouping strategy, though analytically effective, represents one of multiple classification approaches. Future research might benefit from simultaneously distinguishing the region and income level to capture the particularities in institutional development, cultural factors, and trade relationships that this study could not fully address. Additionally, qualitative case studies focusing on education policies in the selected countries could help explain the mechanisms behind the statistical results. Finally, future research could extend the dataset with post-pandemic observations to examine how economic recovery may affect the relationship between education and economic growth.

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