



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 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 innovative economy, the efficiency of such investments depends not only on their volume but also on the value of educational programs, quality of teacher trainings and general environment of the institutions (Tleppayev *et al.*, 2025). The economic returns of education depend not only on individual outcomes but also on labor market conditions and macroeconomic factors. Maneejuk and Yamaka, 2021 supports 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 will not result in considerable economic development unless strengthened with improved teacher training and educational standards (Tleppayev *et al.*, 2025). According to Triatmanto *et al.*, 2023, some of the macroeconomic indicators that are often in 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.

There is a clear correlation between the quality of a country's educational structure and its economic status and general well-being, with developed countries providing higher quality of education World Population Review (2026). 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 is conducted to explore 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 into 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 that have not been explored in detail for optimizing effective policies and advance 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, along with data sources, is provided in Section 3. Section 4 presents a discussion of all the empirical findings, as well as their implications. Section 5 summarizes the study by outlining key takeaways and insights, acknowledges limitations for future research directions, and offers 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.*, 2019 in their study of Guangdong, China. Using the 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, 2014 suggests 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 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.*, 2018, studying the correlation between real GDP growth and ten various sections of public expenditure, concludes 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.*, 2020 highlights 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, 2021 investigates 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 “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 the data from 31 Chinese provinces from 2000-2021 Ma, Gan and Huang, 2025 reveals that the success of education investment depends heavily on the existing environment. Higher education investment significantly boosts comprehensive development, combining innovation, sustainability, and social progress, only in provinces with high levels of human capital. Findings from Agustin 2023 summarizes that the correlation between FDI and economic growth is positive and statistically significant for countries with adequately well-developed financial sectors and human capital with high levels. Raza, Shah and Arif, 2021 further explores 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.

A recent research by Chinnakum *et al.*, 2024 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 the 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 socio-economic 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 that are 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 (Fleischhauer, 2007). 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.*, 2004 highlights 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 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 (Sairmaly and Saumlaki, 2023). 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 (*OECD Economic Studies*, 2002). While labor force size represents the productive human resource base of an economy, whose effective management and development significantly enhance labor productivity and performance (Koch and McGRATH, 1996), FDI promotes regional economic development by generating technology spillovers that improve productivity and local entrepreneurship (Barboza *et al.*, 2025).

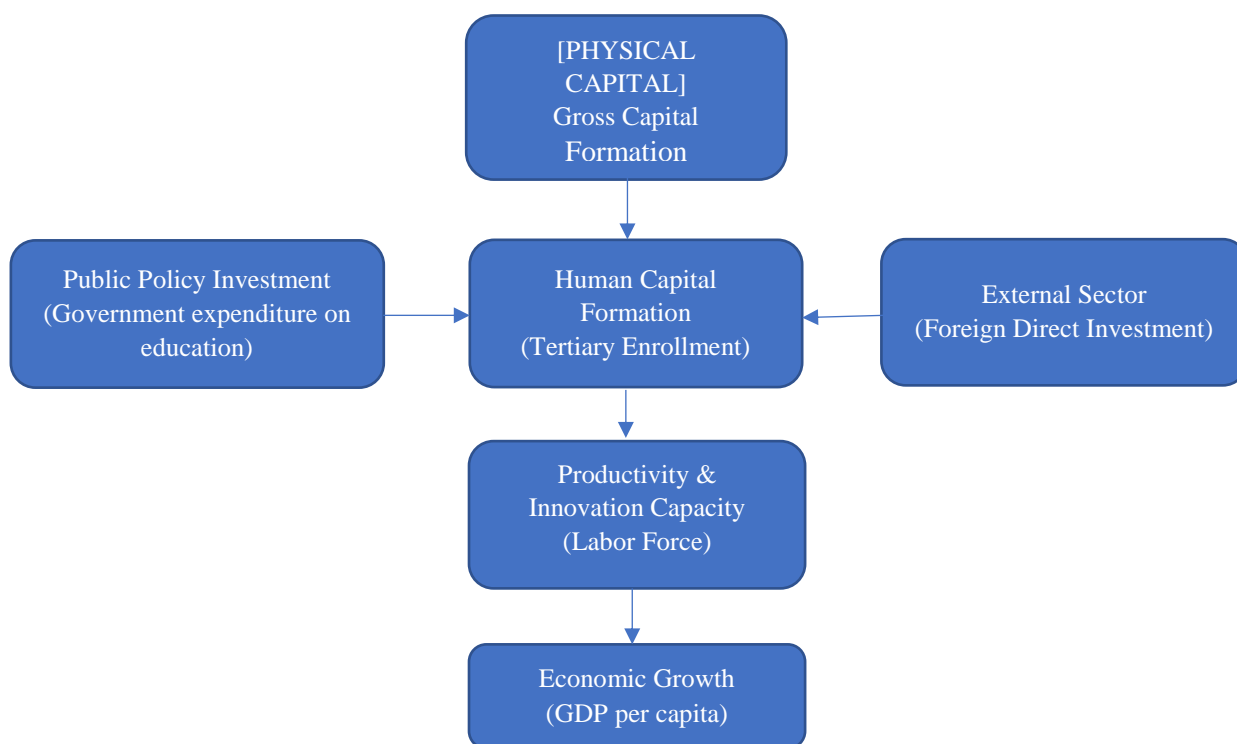


Figure 1. Conceptual framework of the study (developed by the author)

3.2. Empirical framework

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

$$\gamma = f(X_1, X_2, X_3, X_4, X_5) \quad (1)$$

In the above equation 1, the dependence of the amount of GDP per capita (Y) on 5 different independent variables (X) is considered.

$$GDP_PC_{i,t} = \beta_0 + \beta_1 GCF_{i,t} + \beta_2 GEE_{i,t} + \beta_3 FDI_{i,t} + \beta_4 LFT_{i,t} + \beta_5 SchoolEn_{i,t} + \mu_{i,t} \quad (2)$$

Where:

i = country (selected Asian developing countries)

t = year (2010-2023)

μ_i = country-specific effects

In equation 2, GDP_PC refers to the amount of GDP per capita within the current US\$. 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 – school enrollment, tertiary (% of gross) – are collected from World Bank. Below, table 1 shows the full description of the selected variables, their definitions, and sources.

Table 1: Description of the variables

Variables	Description of Variables	Sources
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)	It represents 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 (LTF)	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)

Developed by the author, 2026

To examine the relationship between human capital variables and economic growth, several statistical methods will be used. One of them are descriptive statistics, to give an general idea of the main characteristics of the dataset, such as mean, standard deviation, minimum, and maximum values of the variables. Second is the correlation matrix (Steiger, 1980) , to analyze the pairwise relationships between the variables. Next, linear regression models (*Technometrics*, 1997) will be 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 will be estimated separately for upper-middle-income and lower-middle-income countries. In addition, the Variance Inflation Factor (VIF) test (O'Brien, 2007) is conducted to assess potential multicollinearity among the independent variables. All estimations are carried out using STATA 17 software.

4. Results Analysis and Discussion

The descriptive statistics of the variables are represented in Table 2, for 10 countries over the period 2010-2023. The mean GDP_PC is 4438.5 USD, ranging from 737.3 to 13,478.5 USD, 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 LTF varies considerably across countries due to population differences, and the average SchoolEn is 32.8%, revealing moderate participation in education across sample countries.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP_PC	140	4438.548	3907.847	737.339	13478.46
GCF	140	29.027	7.919	13.968	46.27
GEE	140	3.747	1.553	.864	7.384
FDI	140	2.457	2.472	-4.855	17.131
LTF	140	1.129e+08	2.254e+08	2035779	7.812e+08
SchoolEn	140	32.777	15.835	7.033	74.593

Developed by the author, 2026

The correlation matrix for the variables is illustrated 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 several other studies which found a positive relationship between education and economic growth (Triatanto *et al.*, 2023; Tleppayev *et al.*, 2025). Similar results were also reached by Maneejuk and Yamaka, 2021, where the scholars 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 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.

Table 3: Matrix of correlations

Upper-middle-income countries	(1)	(2)	(3)	(4)	(5)	(6)
(1) GDP_PC	1.000					
(2) GCF	-0.313	1.000				
(3) GEE	0.607	-0.073	1.000			
(4) FDI	0.135	-0.325	0.205	1.000		
(5) LFT	-0.019	0.928	0.125	-0.310	1.000	
(6) SchoolEn	0.667	0.036	0.160	-0.110	0.203	1.000
Lower-middle-income countries	(1)	(2)	(3)	(4)	(5)	(6)
(1) GDP_PC	1.000					
(2) GCF	-0.111	1.000				
(3) GEE	-0.156	0.593	1.000			
(4) FDI	-0.143	0.303	0.454	1.000		
(5) LFT	0.201	-0.618	-0.862	-0.415	1.000	
(6) SchoolEn	0.058	0.437	0.567	0.364	-0.497	1.000

Source: developed by the author, 2026

The linear regression results for upper-middle-income countries are represented in Table 4. It reveals that education expenditure has a positive influence on the economic development which is consistent with Human Capital Theory (Fleischhauer, 2007), suggesting that investment in education enhances necessary skills and productivity of the labor force, thereby contributing to long-term economic growth. R-squared in the model has a value of 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 positive and statistically significant effect on GDP per capita, which aligns with Sultana *et al.*, 2022. According to them with improved life expectancy and government health expenditure, educational human capital works better and significantly in driving growth.

Table 4: Linear regression (upper-middle-income countries)

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

Mean dependent var	8450.987	SD dependent var	3205.092
R-squared	0.746	Number of obs	56
F-test	37.388	Prob > F	0.000
Akaike crit. (AIC)	995.353	Bayesian crit. (BIC)	1005.480

*** $p < .01$, ** $p < .05$, * $p < .1$

Source: developed by the author, 2026

The regression results for lower-middle-income countries are illustrated in Table 5. With an R-squared value of 0.084. It means that only 8.4% of the variation in economic performance is explained by the independent variables. The model is not statistically significant, since F-test value accounts for 1.435 and p value for 0.221. SchoolEn shows a positive relationship with GDP_PC and is statistically significant at the 10% level. Although statistically insignificant, negative coefficient of GEE is similar with findings from by Shaddady, 2022, who observed a negative relationship between government spending and economic growth. It suggests that the ineffective allocation of public resources may weaken the growth effects.

Table 5: Linear regression (lower-middle-income countries)

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

Mean dependent var	1763.588	SD dependent var	814.595
R-squared	0.084	Number of obs	84
F-test	1.435	Prob > F	0.221
Akaike crit. (AIC)	1368.037	Bayesian crit. (BIC)	1382.622

*** $p < .01$, ** $p < .05$, * $p < .1$

Source: developed by the author, 2026

Initially, when both GCP and LFT were included in the model, strongly high VIF values were observed, indicating potential multicollinearity between the variables. To address this issue, GCF was excluded from the 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 below the commonly accepted threshold of 10 (Table 7).

Table 6: Variance inflation factor (upper-middle-income countries)

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

Source: developed by the author, 2026

Table 7: Variance inflation factor (lower-middle-income countries)

	VIF	1/VIF
GEE	4.479	.223
LFT	4.192	.239
GCF	1.695	.59
SchoolEn	1.54	.649
FDI	1.29	.775
Mean VIF	2.639	.

Source: developed by the author, 2026

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 education expenditure by the government, capital formation, labor force dynamics, foreign investment, and education attendance into 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 of human capital development which is defined by expenditure on education and school enrollment. Conversely, the lower-middle-income group delivered a markedly different picture. The correlations between GDP per capita and independent variables were generally weak, with the exception of education expenditure and school enrollment showing moderately positive relationship. 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 more 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 that there is an urgent need for investment quality screening mechanisms which ensures that foreign capital transfer technology and paves way for local value chains to fully utilize cost advantages. The weak overall model performance in lower-middle-income countries proves that education and investment alone cannot solve structural problems that hinder economic growth.

While 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 the multiple classification approaches. Future research might benefit from simultaneously distinguishing the region and income-level to capture the particularity 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 also 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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