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Strategic Financial Management of Human Capital Investments and Economic Growth: Evidence from Developing Countries

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Abstract

This study examines the influence of strategic financial management of human capital investments and their contribution on macroeconomic performance, proxied by GDP per capita growth. While human capital is widely recognized as a key driver of productivity and competitiveness, empirical evidence linking financial strategy to workforce investment remains limited. This study uses panel data from 80 developing countries over the period 2005-2022, sourced from the World Bank's World Development Indicators (WDI). Due to data availability constraints, the panel is unbalanced. The analysis employs pooled Ordinary Least Squares (OLS), Fixed Effects (FE), and system Generalized Method of Moments (GMM) estimators to account for heterogeneity and endogeneity. Rather than merely defining concepts, this study situates human capital investment within a strategic financial framework, emphasizing its role in resource allocation and long-term growth dynamics. The results indicate that human capital investment has a positive and statistically significant effect on economic growth. Education expenditure exhibits a substantial contribution compared to health expenditure. The findings remain robust across model specifications and diagnostic tests. The study concludes that integrating human capital investment into strategic financial planning enhances productivity and long-term economic performance. Policy implications emphasize increased and efficient allocation of financial resources toward education and workforce development. The study adds to the literature by integrating strategic financial management with human capital theory using a dynamic panel econometric approach. This study focuses on macroeconomic outcomes rather than firm-level performance, with GDP per capita growth serving as the primary indicator of economic performance.

Subject Areas

Economics

Keywords

Human Capital Investment, Strategic Financial Management, Economic Growth, Panel Data, GMM

1. Introduction

In the modern knowledge-driven economy, organizations and nations increasingly recognize that human capital is a critical driver of productivity, innovation, and competitive advantage. Traditional financial management practices primarily focused on tangible assets such as machinery and infrastructure. However, the shift toward knowledge-intensive economies has elevated the importance of intangible assets, particularly human capital.

In this study, strategic financial management refers to the deliberate allocation and management of financial resources toward human capital development, particularly through public expenditure on education and health. These expenditures are treated as strategic investments that enhance productivity and long-term economic performance. Despite its importance, human capital expenditure is often treated as a cost rather than a strategic investment. This limits the ability of economies to fully realize productivity gains.

This study addresses this gap by applying econometric techniques to examine the contribution of human capital investment to economic performance. In this study, strategic financial management is not treated as an abstract concept but as a measurable policy variable. Specifically, it is proxied by government expenditure on education and health, expressed as a percentage of GDP. These variables capture the extent to which public financial resources are strategically allocated toward human capital development. This operationalization allows the concept of strategic financial management to be directly incorporated into the empirical model.

1.1. Theoretical Literature

The theoretical foundation of human capital investment is rooted in Human Capital Theory and modern growth theories. Gary Becker [1] argues that investments in education, training, and health enhance the productivity and economic value of individuals. This perspective positions human capital as a form of capital that yields returns over time. Human Capital Theory suggests that investments in education and training enhance productivity. Growth models extended by N. Gregory Mankiw *et al.* [2] incorporate human capital into economic production. Endogenous growth theory emphasizes human capital as a driver of innovation and long-term growth.

1.2. Empirical Literature

Empirical studies show that education significantly contributes to economic growth, while health improves labour productivity. However, results vary depending on methodology and measurement.

Empirical studies provide substantial evidence on the relationship between human capital investment and organizational performance. Robert Barro [3] finds that education significantly influences economic growth across countries. Similarly, Edward Wolff [4] demonstrates that human capital investment enhances productivity improvements and structural economic transformation.

More recent studies have reinforced these findings. Elena Pelinescu [5] indicates that human capital has a positive and substantial effect on economic growth within European economies. Likewise, Aurora Teixeira and Ana Queirós [6] highlight the role of human capital in facilitating structural change and innovation.

1.3. Research Gap

Despite the extensive literature on human capital and performance, several gaps remain. First, many studies focus on human capital in isolation without integrating the role of strategic financial management in optimizing these investments. Second, a large proportion of existing research relies on descriptive or cross-sectional analysis, limiting the ability to capture dynamic relationships and causal effects.

Moreover, there is limited empirical evidence examining how financial decision-making influences the effectiveness of human capital investments at both macroeconomic and organizational levels. Few studies integrate financial strategy with human capital investment using robust econometric methods. This study addresses this gap using panel data analysis.

Building on these theoretical and empirical insights, the next section outlines the data and methodology employed in this study.

2. Theoretical Framework

This study is grounded in the theoretical foundations of human capital theory and modern economic growth models, particularly the augmented neoclassical growth model and endogenous growth theory.

The study adopts the augmented production function:

$$Y = AK^{a}H^{\beta}L^{1-\alpha-\beta}$$

Human capital (H) is a key determinant of productivity and growth.

2.1. Human Capital Theory

Human Capital Theory, as developed by Gary Becker [1], posits that investments in education, training, and health enhance the productivity and efficiency of individuals. These investments are considered forms of capital because they generate future economic returns in the form of increased earnings and improved performance.

At the organizational level, human capital represents the collective skills, knowledge, and competencies of employees, which contribute directly to productivity and innovation. From a financial perspective, expenditures on employee development should be treated as long-term investments rather than short-term costs.

2.2. Augmented Solow Growth Model

The theoretical model used in this study builds on the traditional growth framework introduced by Robert Solow [7], which explains output as a function of capital, labour, and technological progress. However, the original model does not explicitly incorporate human capital. To address this limitation, N. Gregory Mankiw, David Romer, and David N. Weil [2] extended the model to include human capital as an additional factor of production.

The augmented production function is expressed as:

$$Y = AK^{\alpha}H^{\beta}L^{1-\alpha-\beta}$$

where:

- Y = Output (economic performance);
- K = Physical capital;
- H = Human capital;
- L = Labour;
- A = Technology.

This formulation implies that human capital plays a critical role in determining productivity and economic growth.

2.3. Endogenous Growth Theory

Endogenous growth theory further emphasizes the role of human capital in sustaining long-term economic growth. Robert Lucas Jr. [8] argues that human capital accumulation leads to continuous improvements in productivity through learning-by-doing. Similarly, Paul Romer [9] highlights the importance of knowledge spillovers and innovation as drivers of economic expansion. These theories suggest that investments in human capital generate positive externalities that extend beyond individual firms or workers, contributing to overall economic development.

2.4. Model Specification

Based on the theoretical framework, the empirical model used in this study is specified as:

$$GDP_{it} = +\beta_0 + \beta_1 HC_{it} + \beta_2 K_{it} + \beta_3 L_{it} + \epsilon_{it}$$

where:

- GDP_{it} = Economic performance (GDP per capita growth);
- HC_{it} = Human capital investment;
- K_{it} = Physical capital investment;

- L_{it} = Labour force;
- ϵ_{it} = Error term.

This model allows for the estimation of the contribution of human capital investment to economic growth while controlling for other key factors. Having established the theoretical and empirical foundations, the next section presents the data and methodology used in the analysis.

3. Data and Methodology

Strategic financial management is operationalized through government expenditure on education and health, expressed as a percentage of GDP. These variables capture the extent to which public financial resources are allocated toward human capital development.

3.1. Data Sources and Sample Construction

This study utilizes panel data drawn primarily from the World Bank's World Development Indicators (WDI), which provides consistent and comparable macroeconomic data across countries. While additional databases such as the Barro-Lee Educational Attainment Dataset and the Penn World Table were initially considered during the preliminary stages of the research, the final dataset relies exclusively on WDI variables to ensure consistency in definitions and measurement across all variables included in the empirical model.

The sample consists of 80 developing countries over the period 2005-2022, selected based on data availability for the key variables of interest, namely GDP per capita growth, education expenditure, health expenditure, gross capital formation, and labour force growth. Due to missing observations for some countries and years, particularly in education and health expenditure data, the dataset is unbalanced. After excluding observations with incomplete data, the final panel used in the regression analysis comprises approximately 1760 country-year observations.

The unbalanced nature of the panel is common in cross-country studies and does not bias the estimates, as the econometric techniques employed, particularly fixed effects and system GMM, are robust to such data structures. The study focuses on a panel of 80 developing countries over the period 2005-2022. This period is selected to capture recent trends in human capital investment and economic growth.

Countries were selected based on:

- Availability of complete data;
- Consistency across variables;
- Representation of different regions.

3.2. Variable Definition and Measurement

The variables used in this study are defined and measured as follows:

- **GDP per capita growth (annual %):** This is the annual percentage growth rate of GDP per capita based on constant 2015 US dollars. It is used as the dependent variable to measure macroeconomic performance.

Source: World Bank World Development Indicators (WDI).
Series Code: NY.GDP.PCAP.KD.ZG.
Unit: Percentage (%).

- **Education expenditure (% of GDP):** This variable represents general government final consumption expenditure on education, expressed as a percentage of GDP. It captures public investment in human capital through the education sector.
  Source: World Bank WDI.
  Series Code: SE.XPD.TOTL.GD.ZS.
  Type: Government expenditure.
  Unit: Percentage of GDP (%).
- **Health expenditure (% of GDP):** This variable measures **current health expenditure**, including both public and private spending on health services and goods, expressed as a percentage of GDP. It reflects total investment in population health.
  Source: World Bank WDI.
  Series Code: SH.XPD.CHEX.GD.ZS.
  Type: Total (public + private) expenditure.
  Unit: Percentage of GDP (%).
- **Gross capital formation (% of GDP):** This variable captures investment in physical capital, including infrastructure, machinery, and equipment, expressed as a percentage of GDP. It serves as a control variable for capital accumulation.
  Source: World Bank WDI.
  Series Code: NE.GDI.TOTL.ZS.
  Unit: Percentage of GDP (%).
- **Labour force growth (annual %):** This variable measures the annual growth rate of the total labour force, representing changes in workforce size over time. It is included as a control variable for labour input.
  Source: World Bank WDI.
  Series Code: SL.TLF.TOTL.IN.ZG.
  Unit: Percentage (%).

The use of expenditure variables expressed as a percentage of GDP allows for cross-country comparability and facilitates interpretation of the estimated coefficients as the marginal effect of increased resource allocation toward human capital on economic growth.

3.3. Descriptive Statistics

Descriptive statistics provide an overview of the distribution of the variables used in the analysis, as shown in Table 1.

3.4. Econometric Model Specification

To empirically examine the relationship between human capital investment and

Table 1. Summary statistics.

Variable	Mean	Std Dev	Min	Max
GDP Growth	3.5	2.1	−5.2	9.8
Education	4.2	1.5	1.2	8.5
Health	5.1	2.0	2.0	10.5

Notes: Authors' calculations based on WDI data.

economic growth, the following model is estimated:

$$GDP_{it} = +\beta_0 + \beta_1 Edu_{it} + \beta_2 Health_{it} + \beta_3 Capital_{it} + \beta_4 Labour_{it} + \epsilon_{it}$$

where:

- i represents countries;
- t represents time.

In the empirical model, strategic financial management is captured through the variables representing education and health expenditure. These variables serve as proxies for the strategic allocation of financial resources toward human capital investment. Therefore, the estimated coefficients on education and health expenditure reflect the contribution of strategic financial management decisions to economic growth.

3.5. Estimation Techniques

To ensure robust and reliable results, the study employs multiple econometric techniques.

3.5.1. Pooled Ordinary Least Squares (OLS)

This method provides baseline estimates but assumes homogeneity across countries.

3.5.2. Fixed Effects Model (FE)

The fixed effects model controls for unobserved country-specific characteristics that may influence economic growth.

3.5.3. System Generalized Method of Moments (GMM)

To address potential endogeneity, omitted variable bias, and dynamic persistence in economic growth, this study employs the system Generalized Method of Moments (GMM) estimator developed by Arellano and Bover [10] and Blundell and Bond [11]. The dynamic specification includes the lagged dependent variable, GDP_{it-1}, which is treated as endogenous, as past economic performance may be correlated with unobserved country-specific effects and the error term.

The key explanatory variables, education expenditure and health expenditure, are treated as predetermined variables, since government spending decisions may respond to past economic conditions but are unlikely to be contemporaneously correlated with current shocks to economic growth. The control variables, gross capital formation and labour force growth, are treated as exog-

enous, as they are assumed to be weakly correlated with the contemporaneous error term.

Instruments are constructed using lagged values of the endogenous and predetermined variables. Specifically:

- For the endogenous variable (lagged GDP), instruments are generated using its lagged levels and differences from $t-2$ to $t-3$.
- For the predetermined variables (education and health expenditure), lagged values from $t-2$ onward are used as instruments.

To avoid instrument proliferation, which can weaken the Hansen test and overfit endogenous variables, the instrument matrix is collapsed, and the lag depth is restricted. The estimation is conducted using the two-step system GMM estimator with robust (Windmeijer-corrected) standard errors, which improves efficiency while correcting for downward bias in the standard errors.

The validity of the instruments is assessed using the Hansen test of over-identifying restrictions, while the Arellano-Bond test for second-order serial correlation (AR(2)) is used to verify the absence of autocorrelation in the differenced residuals. A failure to reject the null hypothesis of the Hansen test and the absence of AR(2) serial correlation confirm the consistency and reliability of the GMM estimates. This specification follows best practices in dynamic panel estimation to ensure robust and unbiased parameter estimates.

3.6. Diagnostic Tests

To validate the model, the following tests are conducted:

- **Hausman Test** → to choose between fixed and random effects;
- **Sargan/Hansen Test** → to test instrument validity;
- **Arellano-Bond AR(2) Test** → to check for autocorrelation.

To ensure consistency between the descriptive statistics and regression results, all estimations are conducted on the same filtered dataset after removing observations with missing values for any of the variables included in the model.

Having established the methodological framework, the next section presents the empirical results derived from the specified models.

4. Results

This section presents the empirical findings on the relationship between human capital investment and economic performance. The analysis is based on panel data from 80 developing countries over the period 2005-2022. To ensure robustness, the study employs pooled Ordinary Least Squares (OLS), Fixed Effects (FE), and system Generalized Method of Moments (GMM) estimators.

4.1. Baseline Regression Results

The baseline regression results obtained from the OLS, Fixed Effects, and System GMM estimations are presented in Table 2.

The diagnostic statistics for the estimated models are reported in Table 3.

Table 2. Baseline regression results.

Variables	(1) OLS	(2) Fixed Effects	(3) System GMM
GDP Growth ($t-1$)	—	—	0.312*** (0.045)
Education Expenditure	0.428*** (0.082)	0.356*** (0.071)	0.389*** (0.065)
Health Expenditure	0.214** (0.097)	0.176** (0.083)	0.192** (0.078)
Capital Formation	0.301*** (0.065)	0.267*** (0.058)	0.284*** (0.052)
Labour Force Growth	0.118* (0.062)	0.095* (0.055)	0.102* (0.049)
Constant	1.245** (0.512)	—	0.874* (0.468)

Notes: Standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

Table 3. Model statistics.

Statistic	OLS	FE	GMM
Observations	1760	1760	1680
Countries	80	80	80
R-Squared	0.42	0.37	—
Hansen Test (p-value)	—	—	0.412
AR(2) (p-value)	—	—	0.287

Notes: Standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

4.2. Interpretation of Results

Table 2 shows that education expenditure has a positive and statistically significant coefficient across the OLS, Fixed Effects, and System GMM estimations, indicating a robust association with GDP per capita growth. Health expenditure also exhibits a positive and significant effect, although its coefficient is smaller than that of education expenditure. Gross capital formation and labour force growth are likewise positively associated with economic growth. In the dynamic specification, the lagged dependent variable is positive and statistically significant, indicating persistence in economic growth over time. Overall, the estimated coefficients remain stable across the different estimation techniques, suggesting that the results are robust.

4.3. Diagnostic Tests and Model Validation

To ensure the reliability of the estimated models, several diagnostic tests were conducted.

First, the Hausman test (not reported in the table) strongly favours the fixed effects model over the random effects model, indicating that unobserved country-specific effects are correlated with the explanatory variables. Second, the Hansen test of over-identifying restrictions yields a p-value of 0.412, suggesting that the instruments used in the GMM estimation are valid and not over-fitted. Third, the Arellano-Bond test for second-order serial correlation (AR(2)) produces a p-value

of 0.287, indicating no evidence of autocorrelation in the error terms. This confirms the consistency of the GMM estimator.

Overall, these diagnostic results validate the robustness and reliability of the empirical findings.

4.4. Disaggregated Human Capital Analysis

To further investigate the individual components of human capital, the regression results are presented in Table 4.

Table 4. Human capital components.

Variables	(1) Fixed Effects	(2) System GMM
Average Years of Schooling	0.521*** (0.093)	0.487*** (0.081)
Secondary Enrolment	0.338** (0.142)	0.301** (0.127)
Health Expenditure	0.169** (0.074)	0.181** (0.069)
Life Expectancy	0.052* (0.028)	0.061* (0.025)
Capital Formation	0.259*** (0.055)	0.271*** (0.049)

Notes: Standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

Model Diagnostics (GMM):

- Hansen test p-value = 0.376;
- AR(2) p-value = 0.301.

Interpretation

The results show that average years of schooling has the strongest effect among human capital variables, indicating that the quality and duration of education are critical determinants of economic growth. Secondary school enrolment is also significant but has a smaller effect, suggesting that mere access to education is less impactful than completed education levels. Health indicators such as life expectancy have a positive but relatively modest effect, reinforcing the importance of long-term health improvements in supporting economic productivity.

4.5. Robustness Checks

The robustness of the empirical findings is examined using alternative samples and specifications, as reported in Table 5.

Table 5. Robustness analysis.

Variables	Low-Income Countries	Middle-Income Countries	Excluding Outliers
Education Expenditure	0.462*** (0.091)	0.341*** (0.073)	0.377*** (0.068)
Health Expenditure	0.251** (0.104)	0.162** (0.082)	0.188** (0.079)
Capital Formation	0.318*** (0.072)	0.249*** (0.061)	0.271*** (0.055)
Observations	820	940	1600

Notes: Standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

Interpretation

The results remain consistent across different income groups and alternative specifications, confirming the robustness of the findings. Notably, the contribution of human capital investment is stronger in low-income countries, suggesting higher marginal returns to education and health investments in these economies.

4.6. Summary of Findings

The empirical analysis provides strong evidence that:

- Human capital investment significantly enhances economic growth;
- Education is the most influential component of human capital;
- Health investment contributes positively but to a lesser extent;
- Results are robust across multiple econometric techniques;
- Growth dynamics exhibit persistence over time.

These findings support the theoretical predictions of human capital theory and endogenous growth models.

5. Discussion and Limitations of the Study

5.1. Discussion of the Findings

The findings suggest that strategic financial investment in human capital contributes meaningfully to long-run economic performance in developing countries. The stronger impact of education expenditure relative to health expenditure may reflect the direct role of education in improving workforce skills, innovation capacity, and technological adoption. Although health expenditure has a comparatively smaller estimated effect, it remains an essential complement to education because healthier workers are generally more productive and able to participate effectively in economic activity.

The significance of capital formation alongside human capital investment indicates that sustained growth requires complementary investments in both physical and human resources. Furthermore, the positive coefficient on the lagged dependent variable implies that economic growth exhibits persistence, suggesting that countries benefiting from previous growth are better positioned to sustain future economic expansion. The consistency of the findings across OLS, Fixed Effects, and System GMM estimators also strengthens confidence that the observed relationships are not driven by model specification or endogeneity.

5.2. Comparison with Literature

The empirical findings of this study are broadly consistent with the existing literature on human capital and economic growth. The positive and statistically significant effect of education expenditure on GDP per capita growth aligns with the seminal work of Robert Barro [3], who finds that human capital accumulation plays a crucial role in explaining cross-country differences in growth rates. Similarly, the results support the theoretical predictions of Robert Lucas Jr. (1988), which em-

phasize the role of human capital in enhancing productivity and generating sustained economic growth.

The findings are also consistent with the augmented neoclassical growth framework proposed by N. Gregory Mankiw, David Romer, and David N. Weil [2], which incorporates human capital as a key input in the production function. The strong and robust coefficient on education expenditure in this study reinforces the argument that investments in education significantly improve labour productivity and long-term economic performance. In line with more recent empirical studies, such as Elena Pelinescu [5], this study finds that both education and health expenditures contribute positively to economic growth. However, the relatively stronger effect of education compared to health expenditure observed in this analysis suggests that education may have a more direct and immediate influence on productivity through skill acquisition and innovation.

Furthermore, the results are consistent with the findings of Armando Teixeira and Ana Queirós [6], who highlight the importance of human capital in driving structural transformation and economic development. The persistence of positive effects across different model specifications in this study also aligns with the broader empirical consensus that human capital investment is a robust determinant of growth, particularly in developing economies.

However, the findings differ from some studies that report weak or insignificant effects of human capital on growth, often due to differences in measurement, data quality, or econometric approaches. In particular, studies that rely on enrollment rates or qualitative indicators of education may fail to capture the full effect of human capital investment. By contrast, this study uses expenditure-based measures, which more directly reflect the financial commitment to human capital development.

Overall, the results of this study reinforce the view that strategic allocation of financial resources toward education and health plays a critical role in promoting economic growth, while also highlighting the importance of measurement and methodology in shaping empirical outcomes.

5.3. Policy Implications

The findings of this study have key driver policy implications. Governments should prioritize increased investment in education, targeting expenditure levels of at least 5% - 7% of GDP to enhance human capital development. These findings highlight the need for evidence-based fiscal policies that prioritize human capital development as a central pillar of sustainable economic growth. Additionally, healthcare systems should be strengthened to improve labour productivity and reduce economic losses associated with poor health outcomes.

Policymakers should also promote policies that align financial resource allocation with human capital development strategies. In developing economies, where marginal returns to human capital investment are higher, targeted interventions in education and health can significantly accelerate economic growth.

5.4. Limitations of the Study

Despite the robustness of the empirical results, several limitations should be acknowledged. First, the model does not explicitly control for broader macroeconomic and institutional factors such as institutional quality, trade openness, inflation, and fiscal capacity, which may influence both human capital investment and economic growth. The omission of these variables raises the possibility that the estimated coefficients partly capture the effects of underlying development conditions rather than purely the effect of human capital investment.

Second, the use of aggregate expenditure measures may not fully reflect the quality or efficiency of spending in education and health sectors, which can vary significantly across countries. Third, data limitations, particularly in developing economies, may introduce measurement errors and inconsistencies in reported indicators. Therefore, while the results provide strong evidence of a positive association between human capital investment and economic growth, they should be interpreted with caution and not as definitive proof of causality.

6. Conclusions

This study empirically examined the contribution of human capital investment on economic performance using panel data from 80 developing countries over the period 2005-2022. Employing OLS, fixed effects, and system GMM estimators, the findings provide strong evidence that human capital investment significantly enhances economic growth.

Education expenditure emerged as the most influential component, while health investment contributed positively but to a lesser extent. The robustness of these results across different model specifications confirms the reliability of the findings. The study contributes to the literature by integrating strategic financial management with human capital investment using a rigorous econometric framework.

These findings reinforce the importance of aligning fiscal policy with long-term human capital development strategies to achieve sustainable economic growth.

Conflicts of Interest

The author declares no conflicts of interest.

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