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Public Education Expenditure, Government Effectiveness, and Financial Development in Sub-Saharan Africa

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Abstract

This paper examines how public education expenditure shapes financial development in Sub-Saharan Africa (SSA) and whether this relationship depends on the quality of public-sector management. Using an unbalanced panel of SSA countries over 2000–2020, financial development is measured by the IMF Financial Development Index, education spending (% of GDP) by the World Bank's World Development Indicators, and government effectiveness by the Worldwide Governance Indicators. Fixed-effects estimates with country and year controls indicate that higher education expenditure is associated with stronger financial development, while inflation is negatively related to financial development. Interaction results show that the effect of education spending is conditional on government effectiveness: marginal effects are weak or statistically indistinguishable from zero at low levels of government effectiveness but become positive and significant as government effectiveness improves. Dynamic system GMM estimates confirm strong persistence in financial development and suggest that short-run effects of education spending are limited, consistent with lagged human-capital and institutional-transmission channels. The findings imply that education budgets alone are unlikely to deliver sustained financial deepening without improvements in public sector effectiveness and macroeconomic stability. Policies that strengthen budget execution, accountability, and service delivery in education—alongside credible inflation control—can raise the returns of education spending for financial sector development in SSA.

Introduction

Financial development is widely recognized as a critical driver of economic transformation, inclusion, and long-term growth. By mobilizing savings, facilitating investment, reducing transaction costs, and improving resource allocation, well-functioning financial systems support structural change, entrepreneurship, and poverty reduction. A developed financial sector also enhances households' ability to smooth consumption and firms' capacity to expand productive activities. Consequently, financial development has become a central objective of development policy, particularly in low- and middle-income economies.

In Sub-Saharan Africa (SSA), however, financial development remains limited, uneven, and highly vulnerable to institutional and macroeconomic constraints. Despite notable progress in financial inclusion and the expansion of mobile financial services, many SSA countries continue to exhibit shallow financial markets, limited access to formal credit, and weak financial intermediation (Beck & Cull, 2014; African Development Bank, 2020). These challenges are compounded by macroeconomic volatility, governance weaknesses, and structural fragilities, which collectively constrain financial systems' ability to support broad-based economic development.

At the same time, governments across SSA have increased public investment in education, recognizing human capital development as a cornerstone of inclusive growth and sustainable development. Education enhances productivity, improves financial literacy, and strengthens individuals' capacity to participate in formal financial systems. A more educated population is better equipped to engage with

financial institutions, assess financial risks, and utilize financial services effectively. Through these channels, education is expected to contribute to financial deepening and improved financial sector performance.

However, despite rising education expenditure in many SSA countries, financial development outcomes remain modest. This apparent disconnect suggests that education investment alone may be insufficient to drive financial sector development in the absence of complementary conditions. In particular, the effectiveness with which public education spending is translated into human capital and economic outcomes may depend critically on the quality of institutions and governance structures.

A growing body of literature emphasizes the role of institutions in shaping development outcomes. Government effectiveness—capturing the quality of public service delivery, policy formulation, implementation capacity, and administrative competence—plays a central role in determining whether public investments generate tangible economic and financial returns (Kaufmann et al., 2011). In contexts characterized by weak governance, limited accountability, and administrative inefficiencies, education spending may be subject to leakage, misallocation, or poor execution, thereby weakening its potential impact on financial development. Conversely, in environments with stronger government effectiveness, public education investment is more likely to enhance skills, productivity, and trust in formal institutions, reinforcing financial sector development.

Despite the conceptual importance of these interactions, empirical evidence on the joint role of education and government effectiveness in driving financial development in Sub-Saharan Africa remains limited. Much of the existing literature examines education, governance, or financial development in isolation, often focusing on aggregate growth outcomes rather than financial sector development. Moreover, relatively few studies explicitly test whether institutional quality conditions the effectiveness of education spending, particularly within a dynamic panel framework. Evidence specific to SSA—where institutional heterogeneity, fragility, and post-conflict challenges are pronounced—remains especially scarce.

Literature Review

Financial Development in Sub-Saharan Africa

The finance–growth literature emphasizes the role of financial systems in promoting investment, innovation, and productivity (Levine, 2005). Empirical evidence generally supports a positive relationship between financial development and economic growth, particularly in developing economies. However, in Sub-Saharan Africa, this relationship is often weak and unstable due to shallow financial markets, limited access to credit, and weak institutional frameworks (Beck et al., 2011).

Several studies document that financial development in SSA is constrained by macroeconomic instability, inflation, and governance weaknesses. These factors limit the effectiveness of financial intermediation and reduce trust in formal financial institutions (Allen et al., 2014). As a result,

improvements in financial development require complementary reforms beyond financial sector liberalization.

Education and Financial Development

Human capital theory posits that education enhances productivity and economic performance. Beyond growth effects, education influences financial development by improving financial literacy, reducing information asymmetries, and increasing demand for financial services. Educated individuals are more likely to save, invest, and participate in formal financial systems (Cole et al., 2014).

Empirical studies provide mixed evidence for Africa. While some studies find that education expenditure and school enrollment positively affect financial development indicators, others report weak or insignificant effects, particularly in countries with poor institutional quality (Asongu & Odhiambo, 2019). These findings suggest that the impact of education on financial development may depend on contextual factors, including governance.

Importantly, education investments may affect financial development with a time lag. Skills acquisition, labor market integration, and changes in financial behavior occur gradually, implying that dynamic specifications are necessary to capture the true impact of education on financial outcomes.

Government Effectiveness and Financial Development

Institutional quality has emerged as a critical determinant of financial development. Government effectiveness reflects the state's ability to design and implement sound policies, regulate markets, and deliver public services. Strong institutions reduce uncertainty, enforce contracts, and promote confidence in financial systems (Acemoglu & Robinson, 2012).

Empirical evidence shows that governance indicators—particularly government effectiveness—are strongly associated with financial development in low-income countries (Law et al., 2018). In SSA, weak government effectiveness has been linked to limited credit provision, regulatory failures, and financial exclusion.

Interaction between Education and Government Effectiveness

Recent studies suggest that the impact of education on development outcomes is conditional on institutional quality. In weak governance environments, educational spending may not translate into improved financial outcomes due to inefficiencies and poor implementation. Conversely, effective governments can enhance the productivity of education spending and strengthen its contribution to financial development (Hanushek & Woessmann, 2015).

However, empirical evidence on this interaction remains limited in the African context. This study addresses this gap by explicitly modeling the interaction between education and government effectiveness within a dynamic panel framework

Research Gap and Contribution

Despite a growing body of literature examining the relationship among education, institutions, and economic outcomes, several important gaps remain, particularly in Sub-Saharan Africa.

First, existing studies on financial development in Sub-Saharan Africa have largely focused on macroeconomic determinants such as income levels, inflation, trade openness, and institutional quality, often treating education as a secondary or control variable (Beck, Demirgüç-Kunt, & Levine, 2007; Allen et al., 2014). As a result, the **direct role of public education expenditure in shaping financial development** remains insufficiently explored.

Second, while the human capital literature emphasizes the importance of education for economic and financial outcomes, most empirical studies focus on **educational attainment or enrollment rates**, rather than **public education spending**, which is more directly linked to fiscal policy and government decision-making (Hanushek & Woessmann, 2012; Barro, 2013). This limits the policy relevance of existing findings for developing economies.

Third, although institutional quality is widely recognized as a critical factor for financial development, prior studies typically examine education and institutions **independently**, without explicitly testing whether institutional quality conditions the effectiveness of education spending (Law & Azman-Saini, 2012; Gennaioli et al., 2018). Consequently, little is known about whether educational investment can translate into financial development in weak-governance environments.

Fourth, the Sub-Saharan African context remains underrepresented in dynamic panel analyses that jointly consider **education expenditure, governance, and financial development** using comprehensive financial development measures such as the IMF Financial Development Index. Many studies rely on a single proxy for financial depth or access, which may not fully capture the multidimensional nature of financial systems in the region (Sahay et al., 2015).

This study addresses these gaps by (i) focusing explicitly on public education expenditure as a core determinant of financial development, (ii) incorporating government effectiveness as a moderating factor through an interaction framework, (iii) employing both fixed-effects and dynamic system GMM estimators to account for persistence and endogeneity, and (iv) using a comprehensive financial development index for a broad panel of Sub-Saharan African countries over the period 2000–2020. In doing so, the paper provides new evidence on the conditions under which education investment can effectively support financial development in developing economies.

Methodology

Data and Sources

This study employs an unbalanced annual panel dataset covering Sub-Saharan African countries over the period 2000–2020. The sample period is determined by data availability, particularly for the Financial Development Index compiled by the International Monetary Fund (IMF), which is available up to 2020. Restricting the analysis to this period ensures consistency across key variables and aligns with recent empirical studies on financial development in developing regions (Sahay et al., 2015; IMF, 2020).

The dependent variable, financial development (FD), is measured using the IMF Financial Development Index, a composite indicator that captures the depth, access, and efficiency of both financial institutions and financial markets. This index provides a comprehensive measure of financial system development and has been widely used in cross-country studies (Sahay et al., 2015).

The core explanatory variable is public education expenditure, measured as education spending as a percentage of GDP, obtained from the World Development Indicators (WDI) of the World Bank. Education expenditure reflects public investment in human capital, which is expected to influence financial development through enhanced financial literacy, skills acquisition, and institutional trust (Cole, Paulson, & Shastry, 2016).

Institutional quality is proxied by government effectiveness, drawn from the Worldwide Governance Indicators (WGI). Government effectiveness captures perceptions of the quality of public services, policy formulation, and implementation capacity, making it particularly relevant for assessing how effectively education spending translates into economic and financial outcomes (Kaufmann, Kraay, & Mastruzzi, 2011).

Following the literature, several control variables are included. Inflation, measured as the annual percentage change in the consumer price index, captures macroeconomic stability, which is critical for financial intermediation (Boyd, Levine, & Smith, 2001). Trade openness, measured as the ratio of exports and imports to GDP, controls for external integration effects on financial development (Baltagi, Demetriades, & Law, 2009). Gross capital formation, expressed as a percentage of GDP, captures investment activity that may complement financial sector development.

Model Specification

Baseline Fixed-Effects Model

The baseline fixed-effects model is specified as:

$$FD_{i} = \alpha + \beta_1 EDU_{i} + \beta_2 GOV_{i} + \gamma X_{i} + \mu_i + \lambda + \varepsilon_{i} \quad (1)$$

Where FD_{it} denotes the financial development index for the country i in year t; EDU_{it} represents education expenditure as a percentage of GDP; GOV_{it} is government effectiveness; and X_{it} is a vector of control variables including inflation, trade openness, and gross capital formation. Country fixed effects (μ_i) control for time-invariant heterogeneity, while year fixed effects (λ_t) capture common shocks affecting all countries. The error term is denoted by ϵ_{it}.

The fixed-effects estimator is appropriate given the likelihood that unobserved country-specific characteristics—such as legal origins, colonial history, and cultural factors—are correlated with education spending and financial development (Wooldridge, 2010).

Interaction Model

To assess whether the effect of education expenditure on financial development depends on institutional quality, the baseline model is augmented with an interaction term

$$FD_{i,t} = \alpha + \beta_1 EDU_{i,t} + \beta_2 GOV_{i,t} + \beta_3 (EDU_{i,t} \times GOV_{i,t}) + \gamma X_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

The interaction coefficient β_3 captures the conditional effect of education expenditure on financial development at different levels of government effectiveness. A positive and significant β_3 indicates that education spending is more effective in promoting financial development in countries with stronger governance structures. This specification is consistent with institutional complementarity frameworks in the development literature (Acemoglu & Robinson, 2012; Law & Azman-Saini, 2012).

Dynamic Panel Model

Financial development is inherently persistent, as financial systems evolve gradually over time. To account for this dynamic behavior and address potential endogeneity concerns, a dynamic panel model is estimated using a **two-step system Generalized Method of Moments (GMM)**:

$$FD_{i,t} = \delta FD_{i,t-1} + \beta_1 EDU_{i,t-1} + \beta_2 GOV_{i,t} + \beta_3 (EDU_{i,t-1} \times GOV_{i,t}) + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (3)$$

where $FD_{i,t-1}$ is the lagged financial development index. The system GMM estimator combines equations in first differences and levels, using lagged values of endogenous variables as instruments (Arellano & Bond, 1991; Blundell & Bond, 1998). This approach mitigates bias arising from simultaneity, omitted variables, and reverse causality.

Instrument proliferation is controlled by collapsing instruments, and model validity is assessed using the Arellano–Bond tests for serial correlation and the Hansen test of overidentifying restrictions.

Estimation Strategy and Inference

The Hausman test compares fixed- and random-effects estimators, with results favoring the fixed-effects estimator, indicating the presence of correlation between regressors and unobserved country-specific effects. The system GMM results are interpreted as robustness checks rather than primary estimates, in line with ADR's preference for transparent fixed-effects identification strategies when panel dimensions are moderate.

Empirical Results

Descriptive Statistics

Table 1 reports the descriptive statistics for the main variables used in the analysis. The average value of the financial development index is relatively low, reflecting the shallow nature of financial systems across Sub-Saharan Africa. This finding is consistent with earlier evidence that African financial systems remain underdeveloped compared to other regions due to structural constraints and institutional weaknesses (Beck, Demirgüç-Kunt, & Levine, 2007; Allen et al., 2014).

Public expenditure on education averages approximately 3.9 percent of GDP, although there is considerable variation across countries. This dispersion highlights differences in fiscal capacity and policy priorities within the region (World Bank, 2023). Government effectiveness has a negative mean value, indicating persistent governance challenges, including weak policy implementation and limited administrative capacity (Kaufmann, Kraay, & Mastruzzi, 2011). Inflation displays substantial volatility, underscoring the macroeconomic instability that characterizes many SSA economies and which has been shown to undermine financial sector development (Boyd, Levine, & Smith, 2001).

Overall, the descriptive statistics suggest that while countries have increased investment in education, weak governance and macroeconomic instability may constrain the ability of such investments to translate into financial development.

Table 1
Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Financial development index	966	0.136	0.109	0.000	0.643
Education expenditure (% GDP)	699	3.885	2.041	0.358	13.220
Government effectiveness	929	-0.788	0.639	-2.440	1.150
Inflation (%)	907	9.416	29.330	-16.860	513.907
Trade openness (% GDP)	793	70.096	41.055	9.955	347.720
Gross capital formation (% GDP)	774	22.814	9.736	-3.946	76.782

Note: *Financial development is measured using the IMF Financial Development Index. Government effectiveness is from the World Governance Indicators.*

Correlation Analysis

Table 2 presents the pairwise correlation matrix. Financial development is positively and significantly correlated with education expenditure and government effectiveness, suggesting that countries with higher investment in human capital and better institutional quality tend to exhibit more developed financial systems. These associations align with theoretical expectations that education enhances financial literacy and demand for financial services, while effective governance strengthens financial regulation and intermediation (Levine, 2005; Gennaioli, La Porta, Lopez-de-Silanes, & Shleifer, 2018).

Inflation is negatively correlated with financial development, consistent with the argument that macroeconomic instability discourages long-term financial contracts and weakens financial intermediation (Huybens & Smith, 1999). Trade openness and gross capital formation are positively correlated with financial development, reflecting the complementary roles of external integration and investment in fostering financial deepening (Baltagi, Demetriades, & Law, 2009).

Importantly, the correlation coefficients remain moderate, indicating that multicollinearity is unlikely to bias the regression estimates.

Table 2
Pairwise correlation matrix

Variable	FD	EDU	GOV	INFL	TRADE	GCF
Financial development (FD)	1.000					
Education expenditure (EDU)	0.392*	1.000				
Government effectiveness (GOV)	0.218*	0.105*	1.000			
Inflation (INFL)	-0.075*	-0.046	-0.069*	1.000		
Trade openness (TRADE)	0.366*	0.125*	0.323*	-0.078*	1.000	
Gross capital formation (GCF)	0.002	-0.010	0.099*	0.027	0.247*	1.000
Note: ** denotes significance at the 5% level.*						

Baseline Fixed-Effects Results

Table 3 reports the baseline fixed-effects estimates examining the impact of education expenditure and government effectiveness on financial development. Education expenditure is positive and statistically significant, suggesting that increased public investment in education contributes to financial development over time. This finding supports the human capital channel through which education enhances financial participation, savings behavior, and institutional trust (Cole, Paulson, & Shastry, 2016).

Inflation exerts a negative and significant effect on financial development, reinforcing evidence that price instability erodes financial sector performance by increasing uncertainty and transaction costs (Boyd et al., 2001). Government effectiveness, although negative, is not statistically significant in this specification, suggesting that governance alone may not be sufficient to drive financial development without complementary factors such as human capital accumulation.

The inclusion of country and year fixed effects controls for unobserved heterogeneity and region-wide shocks, strengthening the causal interpretation of the results.

Table 3
Fixed-effects estimates: baseline model Dependent variable: Financial Development Index

Variable	Coefficient
Education expenditure (% GDP)	0.0067**
	(0.0027)
Government effectiveness	-0.0151
	(0.0123)
Inflation	-0.00008***
	(0.00002)
Year fixed effects	Yes
Country fixed effects	Yes
Observations	651
Number of countries	44
Within R^2	0.386
Notes: Robust standard errors clustered by country in parentheses.	

*** p < 0.01, ** p < 0.05, * p < 0.10.

Interaction Effects: Education and Government Effectiveness

Table 4 introduces the interaction between education expenditure and government effectiveness. The interaction term is positive and statistically significant, indicating that the effect of education on financial development is conditional on institutional quality. Specifically, education spending has a stronger impact on financial development in countries with more effective governments.

This result highlights the importance of governance as a transmission mechanism through which human capital investment influences financial outcomes. In weak institutional environments, educational resources may be inefficiently allocated or fail to translate into productive skills, limiting their contribution to financial development (Hanushek & Woessmann, 2012). Conversely, effective governments enhance the efficiency of public spending, regulatory quality, and policy credibility, enabling education to support financial deepening.

These findings are consistent with institutional complementarity theories, which emphasize that the returns to human capital depend critically on governance structures (Acemoglu & Robinson, 2012; Law &

Azman-Saini, 2012)

Table 4
Education, government effectiveness, and financial development
Dependent variable: Financial Development Index

Variable	**Coefficient**
Education expenditure (% GDP)	0.0061**
	(0.0029)
Government effectiveness	-0.0207
	(0.0131)
Education × Government effectiveness	0.0061**
	(0.0025)
Inflation	-0.00009**
	(0.00004)
Year fixed effects	Yes
Country fixed effects	Yes
Observations	531
Number of countries	40
Within R^2	0.406
Notes: Robust standard errors clustered by country in parentheses.	

4.5 Marginal Effects of Education Conditional on Government Effectiveness

To further interpret the interaction between education expenditure and government effectiveness, Fig. 1 plots the average marginal effects of lagged education expenditure on financial development across different levels of government effectiveness, together with 95 percent confidence intervals.

Figure 1 shows that the marginal effect of education expenditure on financial development is weak or statistically insignificant at low levels of government effectiveness. However, as government effectiveness improves, the effect becomes positive and statistically significant. This indicates that education spending contributes more effectively to financial development in countries with stronger institutional capacity, highlighting the complementary role of governance in translating human capital investment into financial sector outcomes.

Dynamic Panel Results

Table 5 presents the system GMM estimates that account for persistence and potential endogeneity. The lagged financial development index is positive and highly significant, indicating strong inertia in financial systems, a common feature in developing economies (Arellano & Bond, 1991; Beck & Levine, 2004).

The short-run coefficients on lagged education expenditure and its interaction with government effectiveness are statistically insignificant. This result suggests that the impact of education on financial development materializes gradually rather than immediately. Education investments require time to translate into skills, labor market participation, and financial inclusion, particularly in low-income and institutionally constrained environments (Barro, 2013).

Diagnostic tests support the model's validity. The absence of second-order serial correlation, along with the Hansen test results, indicates that the instrument set is acceptable, despite the high persistence of the dependent variable.

Table 5
Dynamic system GMM estimates Dependent variable: Financial Development Index

Variable	**Coefficient**
Financial development (t − 1)	0.968***
	(0.112)
Lagged education expenditure	0.0002
	(0.0035)
Lagged education × government effectiveness	0.0007
	(0.0039)
Inflation	-0.00001
	(0.00003)
AR(1) p-value	0.120
AR(2) p-value	0.414
Hansen test p-value	1.000
Observations	490
Number of countries	39

Conclusion

This study examines the dynamic relationship between public education expenditure, government effectiveness, and financial development in Sub-Saharan Africa over the period 2000–2020. Using panel

data and employing fixed-effects and system GMM estimators, the analysis provides new evidence on the conditions under which investment in education contributes to financial sector development in the region.

The empirical results indicate that education expenditure has a positive and statistically significant effect on financial development in Sub-Saharan Africa. This finding supports the argument that public investment in education enhances financial development by improving human capital, financial literacy, and participation in formal financial systems. However, the results also show that the effectiveness of education spending is not uniform across countries.

A key contribution of the study is the evidence that government effectiveness conditions the impact of education expenditure on financial development. The positive and significant interaction between education spending and government effectiveness suggests that institutional quality plays a critical role in translating education investment into financial-sector outcomes. In countries with weak governance, education spending alone appears insufficient to generate meaningful improvements in financial development, whereas stronger government effectiveness enhances the returns to human capital investment.

The dynamic panel results further reveal a high degree of persistence in financial development, indicating that financial systems evolve gradually over time. While short-run dynamic effects of education expenditure are relatively weak, the overall findings underscore the importance of sustained investment in education, complemented by institutional improvements, to achieve long-term financial development.

Taken together, the results highlight that education and institutions are complementary rather than independent drivers of financial development in Sub-Saharan Africa.

Policy Implications

The findings of this study carry several important policy implications for Sub-Saharan African countries seeking to strengthen their financial systems.

First, increasing public expenditure on education remains a necessary but not sufficient condition for financial development. Policymakers should view education spending as a long-term investment whose financial benefits materialize gradually and depend on complementary institutional reforms. Short-term expectations of rapid financial deepening from education investment alone may therefore be unrealistic.

Second, strengthening government effectiveness is critical for enhancing the financial returns to education spending. Improving public sector capacity, policy implementation, and accountability mechanisms can help ensure that education resources are efficiently allocated and translated into skills that support financial participation and intermediation. Institutional reforms aimed at reducing leakage,

improving service delivery, and strengthening regulatory quality are likely to amplify the impact of education investment on financial development.

Third, macroeconomic stability remains an important prerequisite for financial development. The negative effect of inflation observed in the analysis highlights the need for credible monetary and fiscal policies that preserve price stability and support long-term financial contracts. Without a stable macroeconomic environment, the benefits of education and institutional reforms may be undermined.

Fourth, the persistence of financial development suggests that policy interventions should be sustained and coordinated over time. Fragmented or short-lived reforms are unlikely to produce lasting improvements in financial systems. A comprehensive approach that combines investment in education, institutional strengthening, and macroeconomic stability is more likely to support durable financial-sector development.

Finally, for fragile and post-conflict economies such as Sierra Leone, the results underscore the importance of sequencing reforms. Investments in education should be accompanied by efforts to rebuild public institutions and strengthen governance frameworks, enabling human capital development to contribute effectively to financial inclusion and financial sector resilience.

While this study provides new insights, it is subject to some limitations. Data availability restricts the sample period to 2020, limiting the inclusion of more recent developments in digital finance. Future research could extend the analysis to examine the roles of educational quality, financial literacy, and digital financial services, and to explore heterogeneous effects across income groups and institutional regimes within Sub-Saharan Africa.

Declarations

Ethical Approval and Consent to Participate

Not applicable. This study uses publicly available secondary data and does not involve human participants, animals, or confidential data.

Consent for Publication

Not applicable.

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Author Contribution

M.J. conceived the study, designed the methodology, collected and analyzed the data, and wrote the main manuscript. M.F. contributed to reviewing the manuscript, providing comments, and improving the clarity of the final version. Both authors read and approved the final manuscript.

Data Availability

The data used in this study are publicly available from internationally recognized databases. Education expenditure and macroeconomic variables were obtained from the World Bank's World Development Indicators (WDI). The Financial Development Index was sourced from the International Monetary Fund (IMF) Financial Development Database. Government effectiveness indicators were obtained from the Worldwide Governance Indicators (WGI). All datasets are publicly accessible through their respective official websites.

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Figures

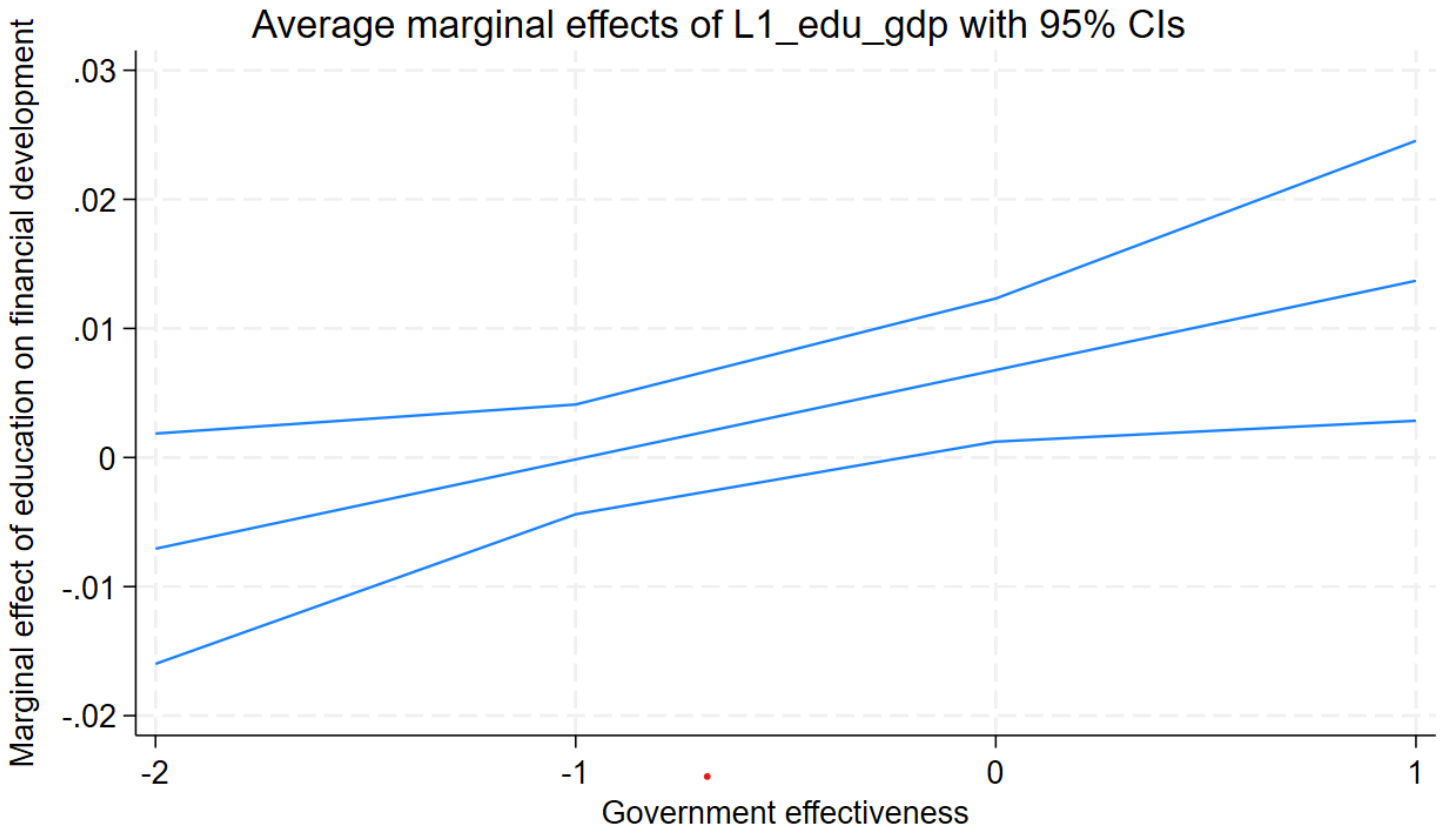


Figure 1

Average marginal effects of education expenditure on financial development across levels of government effectiveness (95% confidence intervals