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Public Sector Debt, Infrastructure Development and Economic Growth: Does Infrastructure Mediate the Debt–Growth Nexus in East Africa Community Member Countries?

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Abstract
This study examined whether infrastructure development mediates the relationship between public sector debt and economic growth in East Africa Community (EAC) member countries, and whether the channel differs between internal and external debt. Anchored on the Debt Overhang Theory, the study used an unbalanced panel of six EAC countries over 2003–2022 (111 country-year observations). Mediation was tested using the Baron and Kenny four-step procedure with fixed-effects panel regression and Sobel tests. Both debt types raised growth and predicted infrastructure spending. For external debt, infrastructure was a significant partial mediator (Sobel $z = 4.13$, $p < 0.001$), transmitting about three-quarters of the total effect. For internal debt, infrastructure was not a significant mediator (Sobel $z = 1.48$, $p = 0.140$) and the direct effect rose rather than fell. External borrowing in the EAC delivers growth chiefly by financing infrastructure, whereas domestic borrowing works through other channels.

Keywords: *Public sector debt, internal debt, external debt, infrastructure development, economic growth, mediation, East Africa Community.*

1. INTRODUCTION

1.1 Background

Public sector debt is the principal instrument through which governments in developing economies finance the gap between development ambitions and domestic revenue. Borrowing enables public spending on projects that raise productivity, create employment and expand output (Albu & Albu, 2021; Achwoga, 2016). The most common justification for that borrowing is infrastructure: governments borrow to build roads, railways, ports, power plants, water systems and telecommunication networks, on the argument that these assets lower the cost of doing business, attract private and foreign investment and raise long-run growth (Achwoga, 2016; Nuhu, 2020). Debt, in this view, works through infrastructure. Yet the same borrowing carries risks. Excessive debt raises debt-service costs, crowds out private investment through higher interest rates, narrows

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fiscal space and can undermine investor confidence (Asteriou, Pilbeam & Pratiwi, 2021; Coupet, 2017). Whether debt is growth-enhancing therefore depends on whether it reaches productive uses—and infrastructure is the productive use most often invoked.

Theory offers competing predictions. The Debt Overhang Theory (Krugman, 1988) holds that beyond a threshold, expected debt service absorbs the returns to new investment, so that debt depresses public investment and growth. Keynesian theory holds that debt-financed public investment raises aggregate demand and, through the multiplier, output—with infrastructure the archetypal channel. Neoclassical theory and the Crowding-Out Effect Theory hold that government borrowing raises real interest rates, displaces private investment and reduces capital formation (Solow, 1956; McConnel & Brue, 1990). These theories differ precisely on the mechanism connecting debt to growth, which makes an explicit test of the infrastructure channel a test between them.

The East Africa Community provides an apt setting. The region is among the fastest growing in Sub-Saharan Africa, with average annual growth of about 5.4% and real GDP growth of 5.1% in 2021 (AfDB, 2021). It is also among the fastest debt-accumulating regions in the world: between 2010 and 2018 average public debt in EAC member countries rose from roughly 40% to 59% of GDP (IMF, 2019). Much of that borrowing has been explicitly tied to infrastructure—regional highways, standard-gauge railways, energy interconnectors and digital backbones (World Bank, 2021). Fiscal outturn data for FY2020/21 show a considerable further rise in public debt, moderate private credit growth and widening deficits, prompting a return to fiscal consolidation (World Bank, 2021). The question of whether the infrastructure built with this debt is in fact the channel through which it produces growth is therefore not academic; it determines whether the region's debt strategy is sound.

1.2 Research Problem

Two schools of thought contend over public borrowing in the EAC. Proponents argue that public debt is necessary because it enables infrastructure development, which in turn stimulates growth; opponents contend that the current trajectory is unsustainable and harmful to economic progress (Ndii, 2017; Mwere, 2018; Were, 2018). Both positions rest on a claim about the mechanism—

that debt produces growth through infrastructure or fails to—but the mechanism itself is rarely tested. Achwoga (2016) reported a significant relationship between public debt and growth in Kenya and attributed it to infrastructure but did not model infrastructure as an intervening variable. Most studies of the debt–growth relationship in the region examine the direct link and leave the transmission channel to inference (Ochieng', 2018; Musyoka, 2017).

The wider literature is inconclusive on the direct relationship and thin on the mechanism. Rahman, Ismail and Ridzuan (2019), in a systematic review, found that the debt–growth relationship can be positive, negative or non-linear depending on how funds are used, and that countries which spend debt on infrastructure tend to report positive effects—but the review called for empirical verification. Law, Ng, Kutan and Lim (2021) found that debt harms growth only above a threshold, and Albu and Albu (2021) found similar non-linearities in the Euro area. Mensah, Awunyo-Vitor and Asare (2018) found that external loans invested in productive infrastructure raise growth in Sub-Saharan Africa but examined external debt only. Otieno and Ahmed (2023) reported partial mediation by infrastructure across 20 African countries but did not distinguish domestic from external debt and did not focus on East Africa. No study has tested whether infrastructure mediates the debt–growth relationship in the EAC, nor whether the channel operates differently for internal and external borrowing—a distinction that matters because the two are raised from different lenders, on different terms, and are subject to different institutional constraints on their use.

This study therefore addresses the question: does infrastructure development mediate the relationship between public sector debt and economic growth among EAC member countries, and does the mediating role differ between internal and external debt? The remainder of the introduction reviews theoretical and empirical literature and sets out the conceptual framework and hypotheses. Section 2 describes the methodology, Section 3 presents the results and Section 4 discusses them, draws conclusions and suggests directions for further research.

1.3 Theoretical Review

The study is anchored on the Debt Overhang Theory (Krugman, 1988). Debt overhang arises when the expected repayment of principal and interest falls short of the contractual value of a country's debt. Once outstanding debt exceeds a threshold, the expected debt service becomes an increasing

function of output, so that the returns to any new investment accrue partly to creditors; the incentive to invest falls, public investment is squeezed by debt service, and growth slows (Borensztein, 1990; Clements, Rina & Nguyen, 2005). Conversely, a reduction in the face value of future obligations raises investment and repayment capacity, supporting growth (Mesjasz, 2011). The theory implies that whether debt helps or harms growth depends on whether it is converted into productive public investment before servicing costs crowd out that investment—which is exactly the mediating role of infrastructure examined here.

Keynesian theory (Keynes, 1936) supplies the positive mechanism. It assumes underutilized resources and holds that deficit-financed public spending raises aggregate demand, brings idle resources into use and raises national output through the multiplier (Lwanga & Mawejje, 2014; Renjith & Shanmugam, 2018). Debt-financed infrastructure is the paradigmatic case: it adds to demand during construction and to productive capacity thereafter. The theory criticized for downplaying the burden of debt and the role of money (Metwally & Tamaschke, 1994), but it is directly relevant because it predicts that the growth effect of debt runs through public investment. Neoclassical theory (Solow, 1956) and the Crowding-Out Effect Theory (McConnel & Brue, 1990) supply the negative mechanism. In the neoclassical model, planned investment equals savings and growth is supply-determined; borrowing to finance government spending reduces private investment and raises real interest rates, slowing growth. The crowding-out theory, a subset of this view, holds that persistent deficits withdraw funds from the loan market, reduce national savings, raise interest rates and lower capital formation (Hyman, 2014; Karazijiene, 2015; Coupet, 2017). The theory assumes full resource utilization, which few EAC economies achieve, and treats domestic fiscal dominance as the only financing route, ignoring concessional external borrowing. Its relevance here is that crowding out is a domestic-debt phenomenon: internal borrowing from the banking system competes with private credit in a way that external borrowing does not. This provides a theoretical reason to expect the infrastructure channel to differ between the two debt types.

1.4 Empirical Review

Mensah, Awunyo-Vitor and Asare (2018) examined the effect of infrastructure development and foreign loans on growth in 36 Sub-Saharan African countries over 1996–2013 using GMM.

Foreign loans invested appropriately in productive infrastructure had a favorable effect on growth, but external debt beyond a certain level was detrimental. The study considered only external debt, leaving the domestic channel unexamined.

Rahman, Ismail and Ridzuan (2019) conducted a PRISMA systematic review of studies on public debt and growth. The relationship was found to be contested: positive, negative or non-linear depending on how funds are used, with countries spending debt on infrastructure tending to report positive effects. As a review, the study established a pattern in the literature rather than testing it empirically.

Law, Ng, Kutan and Lim (2021) used a dynamic panel threshold model on 71 developing countries over 1984–2015 and found that public debt has a negative and significant effect on growth at high levels but no effect at low levels, with better institutions reducing the adverse effect. Albu and Albu (2021) applied wavelet analysis to Euro-area countries and found strong short- and long-run relationships and thresholds beyond which indebtedness hampers growth. Both studies establish non-linearity in the direct relationship but do not model the channel.

Mwenda and Karanja (2022) examined public debt, infrastructure development and growth in low-income African countries over 2000–2021 using fixed-effects and dynamic GMM estimators. Infrastructure financed through concessional loans raised growth, while non-concessional borrowing constrained it through high interest costs. The study pooled all low-income African countries and did not separate domestic from external debt.

Otieno and Ahmed (2023) assessed the mediating role of infrastructure in the debt–growth relationship across 20 African countries over 1995–2022 using structural equation modelling. Infrastructure partially mediated the relationship, with well-targeted projects raising productivity, but the mediation was weak in countries with inefficient public investment management. Kamau and Yusuf (2023) compared countries relying on public-private partnerships with those relying on public borrowing for infrastructure over 2002–2022 and found higher growth where PPP frameworks were well structured. Neither study was specific to the EAC or distinguished internal from external debt.

In the Kenyan context, Achwoga (2016) found a significant relationship between public debt and growth and attributed it to infrastructure without testing the channel; Musyoka (2017) found that borrowing to supplement budgets had no significant effect on growth; and Ochieng' (2018) examined domestic borrowing and financial sector development without modelling growth. The literature thus supports the direct debt–growth link and suggests an infrastructure channel but offers no test of that channel in the EAC and no evidence on whether it differs by debt type.

1.5 Conceptual Framework and Hypotheses

Figure 1 presents the conceptual model. Public sector debt, measured by internal debt and external debt, is the independent variable; infrastructure development, measured by government expenditure on economic and social infrastructure, is the mediating variable; and economic growth, measured by the annual GDP growth rate, is the dependent variable.

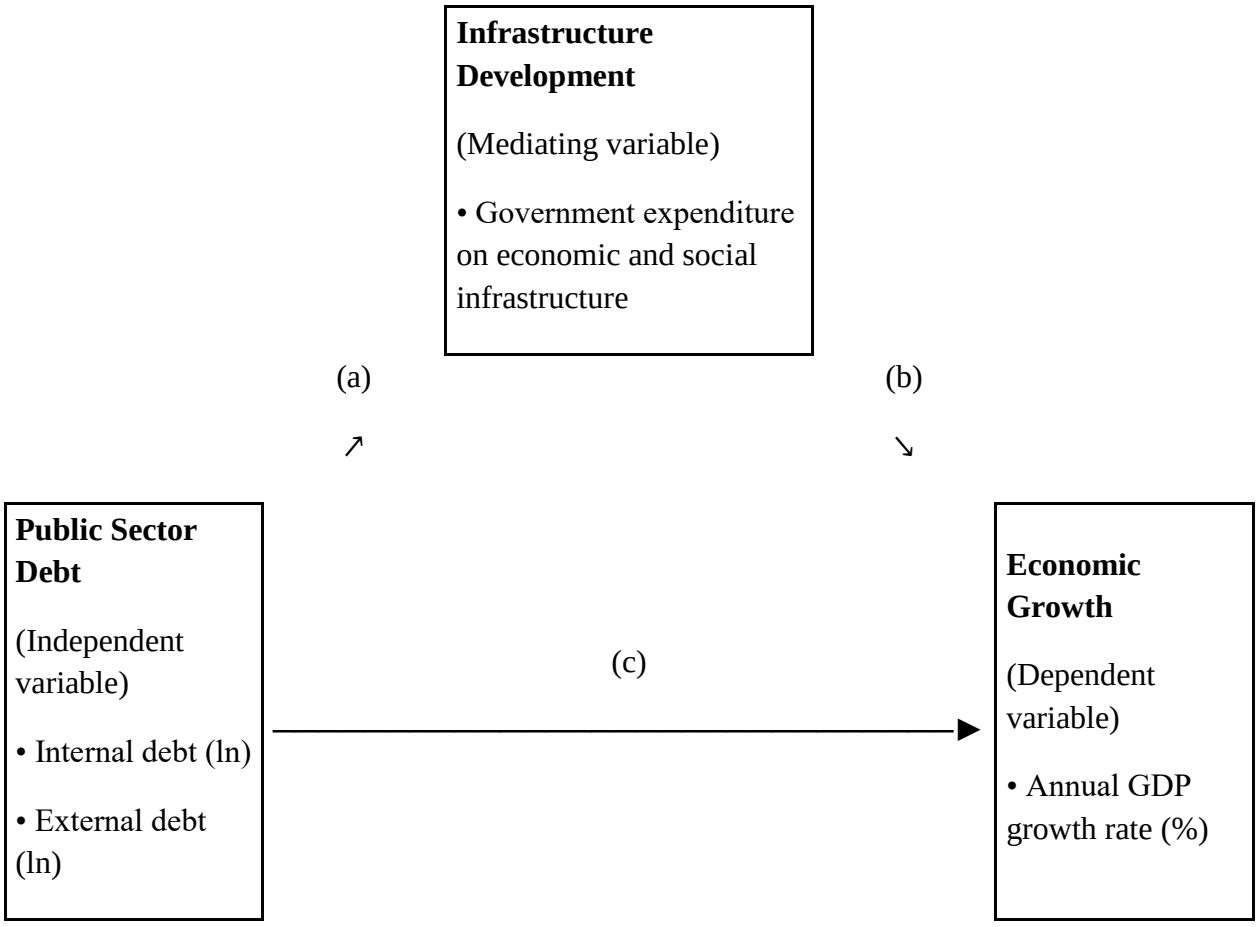


Figure 1: The Conceptual Model

The model posits a direct path from debt to growth and an indirect path through infrastructure, with the indirect path tested separately for each debt type. The following null hypotheses were tested:

H_{01}: Infrastructure development has no significant mediating effect on the relationship between public sector debt and economic growth among EAC member countries.

H_{01}a: Infrastructure development has no significant mediating effect on the relationship between internal debt and economic growth among EAC member countries.

H_{01b}: Infrastructure development has no significant mediating effect on the relationship between external debt and economic growth among EAC member countries.

2. METHODOLOGY

2.1 Research Design and Data

The study adopted a positivist philosophy and a panel longitudinal design covering the 20-year period from January 2003 to December 2022. The population comprised the six EAC member countries at the start of the study period—Kenya, Uganda, Tanzania, Rwanda, Burundi and South Sudan—and a census of all six was taken. The Democratic Republic of Congo was excluded because it joined the Community in 2022. The panel was unbalanced, since South Sudan joined the EAC in 2016 and its earlier series are shorter, yielding 111 country-year observations with between 11 and 20 observations per country. Secondary data were compiled from country central bank reports, World Bank reports, IMF reports and African Development Bank reports using a data collection sheet.

Internal debt was measured as the natural logarithm of the annual value of government domestic borrowing and external debt as the natural logarithm of the annual value of government external borrowing (Hanişoğlu & Azer, 2017; Zhou, 2015). Infrastructure development was measured as the annual value of government expenditure on both economic infrastructure (transport, energy, water, telecommunications) and social infrastructure (health, education and related facilities), following Rahman et al. (2019). Economic growth was measured as the annual GDP growth rate (Asabere et al., 2016). Diagnostic tests for multicollinearity (variance inflation factors), autocorrelation, heteroscedasticity, normality and stationarity were conducted, and the Hausman

specification test was used to choose between fixed- and random-effects estimators; the fixed-effects (within) estimator was retained to control for unobserved country-specific heterogeneity.

2.2 Model Specification and Estimation

Mediation was tested using the Baron and Kenny (1986) four-step procedure, estimated separately for internal and external debt with fixed-effects panel regression. In Step 1 the effect of debt on growth was estimated (path c); in Step 2 the effect of debt on infrastructure development (path a); in Step 3 the effect of infrastructure development on growth (path b); and in Step 4 the effect of debt on growth controlling for infrastructure development (path c′). The four models were:

$$\text{Step 1: } EGit = \alpha 0 + c \cdot PSDit + \mu i + \varepsilon it$$

$$\text{Step 2: } IDit = \alpha 0 + a \cdot PSDit + \mu i + \varepsilon it$$

$$\text{Step 3: } EGit = \alpha 0 + b \cdot IDit + \mu i + \varepsilon it$$

$$\text{Step 4: } EGit = \alpha 0 + c' \cdot PSDit + b' \cdot IDit + \mu i + \varepsilon it$$

where EG is economic growth, PSD is public sector debt (internal or external), ID is infrastructure development, μi is the country fixed effect and εit the error term for country i in year t. Mediation requires significant paths a and b; full mediation obtains when c′ is insignificant in Step 4, and partial mediation when c′ remains significant but is reduced relative to c while b′ remains significant. The indirect effect (a × b′) was tested for significance with the Sobel (1982) test, $z = ab / \sqrt{(b^2 \cdot SEa^2 + a^2 \cdot SEb^2)}$, and the proportion mediated was computed as ab / (c′ + ab). The 5% level of significance was used throughout, and analysis was carried out in Stata.

3. RESULTS

3.1 Descriptive Results

Table 1 summarizes the variables across the 111 country-year observations. Internal debt averaged 8,396 (in local-currency billions, before log transformation) with a range from 114 to 79,322 and a coefficient of variation of 1.30; external debt averaged 6,082 with a range from 229 to 37,879 and a coefficient of variation of 1.21. Infrastructure development expenditure averaged 884 with a range from 19 to 5,053 and a coefficient of variation of 1.22. The high dispersion in all three fiscal variables reflects the very different sizes of the six economies—Kenya alone accounts for about 40% of regional GDP—and the differing borrowing capacities and infrastructure programmes among them, which is why the fixed-effects estimator is essential. GDP growth

averaged 4.30% with a standard deviation of 6.24%, ranging from −46.08% to 13.13%; the extreme minimum reflects the collapse in South Sudan's output during conflict years.

Table 1: Summary of Descriptive Statistics

Statistic	Internal debt	External debt	Infrastructure development	GDP growth rate (%)
N	111	111	111	111
Minimum	113.61	229.18	18.85	−46.08
Maximum	79,322.03	37,879.10	5,053.09	13.13
Mean	8,396.05	6,081.68	883.77	4.30
Std. deviation	10,873.81	7,377.60	1,079.38	6.24
Coefficient of variation	1.30	1.21	1.22	1.45
Std. error of mean	1,032.10	700.25	102.45	0.59

Debt and infrastructure values are raw annual amounts prior to log transformation.

3.2 Internal Debt, Infrastructure Development and Economic Growth

Table 2 reports the four steps for internal debt. In Step 1, internal debt has a positive and significant effect on growth ($\beta = 0.405$, $p < 0.001$), with a within R-squared of 0.264, establishing a relationship that could be mediated. In Step 2, internal debt is a very strong predictor of infrastructure development ($\beta = 0.958$, $p < 0.001$), with a within R-squared of 0.952: almost all of the within-country variation in infrastructure spending is associated with domestic borrowing. In Step 3, infrastructure development raises growth ($\beta = 0.339$, $p < 0.001$; within R-squared 0.179). Paths a and b are therefore both significant.

In Step 4, when internal debt and infrastructure development are entered together, infrastructure development is no longer significant ($\beta = 0.138$, $p = 0.143$), while the coefficient on internal debt rises to 1.639 ($p < 0.001$) and the within R-squared rises to 0.389. Under the Baron and Kenny criteria this pattern does not constitute mediation: the mediator's effect on the outcome vanishes once the predictor is controlled for, and the predictor's direct effect is not reduced but increased.

The Sobel test confirms that the indirect effect of internal debt through infrastructure ($a \times b' = 0.132$) is not significant ($z = 1.48$, $p = 0.140$). Infrastructure development does not mediate the relationship between internal debt and growth, and H01a cannot be rejected.

Table 2: Mediation Analysis — Internal Debt, Infrastructure Development and Economic Growth

Step / dependent variable	Predictor	Coef.	Std. err.	t	p	Within R^2	F (p)
Step 1: Economic growth	Internal debt (path c)	0.405	0.066	6.10	0.000***	0.264	sig. (0.000)
	Constant	−1.636	1.318	−1.24	0.217		
Step 2: Infrastructure development	Internal debt (path a)	0.958	0.021	45.23	0.000***	0.952	2045.87 (0.000)
	Constant	−10.172	0.421	−24.14	0.000***		
Step 3: Economic growth	Infrastructure development (path b)	0.339	0.071	4.76	0.000***	0.179	22.70 (0.000)
	Constant	3.393	0.635	5.35	0.000***		
Step 4: Economic growth	Internal debt (path c′)	1.639	0.276	5.94	0.000***	0.389	32.74 (0.000)
	Infrastructure development (path b′)	0.138	0.093	1.48	0.143		
	Constant	−14.744	3.102	−4.75	0.000***		
Indirect effect (a × b′)	**Sobel test**	**0.132**	**0.090**	**z = 1.48**	**0.140**		**Not significant**

*Fixed-effects (within) regression; N = 111, 6 countries, 2003–2022. *** p < 0.01. Sobel statistics computed by the authors from the Step 2 and Step 4 coefficients.*

3.3 External Debt, Infrastructure Development and Economic Growth

Table 3 reports the four steps for external debt. In Step 1, external debt raises growth ($\beta = 0.451$, $p < 0.001$; within R-squared 0.236). In Step 2, external debt is a strong and significant predictor of infrastructure development ($\beta = 0.789$, $p < 0.001$; within R-squared 0.465)—a substantial but, unlike internal debt, far from complete association. Step 3 is common to both analyses: infrastructure development raises growth ($\beta = 0.339$, $p < 0.001$).

In Step 4, both external debt and infrastructure development remain significant when entered together. The coefficient on external debt falls from 0.451 to 0.342 ($p = 0.002$), a reduction of about a quarter, while infrastructure development has a large and significant effect ($\beta = 1.289$, $p < 0.001$). The within R-squared is 0.252 and the model is jointly significant ($F = 17.35$, $p < 0.001$). This is the pattern of partial mediation: the direct effect is reduced but persists, and the mediator retains its own significant effect. The Sobel test confirms that the indirect effect of external debt

through infrastructure ($a \times b' = 1.017$) is significant ($z = 4.13$, $p < 0.001$). The proportion of the total effect mediated, $ab / (c' + ab)$, is approximately 0.75: three-quarters of the growth effect of external debt in the EAC is transmitted through infrastructure development, with the remaining quarter operating directly. H01b is rejected.

Table 3: Mediation Analysis — External Debt, Infrastructure Development and Economic Growth

Step / dependent variable	Predictor	Coef.	Std. err.	t	p	Within R^2	F (p)
Step 1: Economic growth	External debt (path c)	0.451	0.080	5.67	0.000***	0.236	sig. (0.000)
	Constant	−2.672	1.601	−1.67	0.098		
Step 2: Infrastructure development	External debt (path a)	0.789	0.083	9.50	0.000***	0.465	sig. (0.000)
	Constant	−7.001	1.672	−4.19	0.000***		
Step 3: Economic growth	Infrastructure development (path b)	0.339	0.071	4.76	0.000***	0.179	22.70 (0.000)
	Constant	3.393	0.635	5.35	0.000***		
Step 4: Economic growth	External debt (path c′)	0.342	0.108	3.17	0.002***	0.252	17.35 (0.000)
	Infrastructure development (path b′)	1.289	0.281	4.59	0.000***		
	Constant	−1.707	1.721	−0.99	0.324		
Indirect effect (a × b′)	**Sobel test**	**1.017**	**0.246**	**z = 4.13**	**0.000*** **		**Proportion mediated ≈ 0.75**

*Fixed-effects (within) regression; N = 111, 6 countries, 2003–2022. *** p < 0.01. Sobel statistics and proportion mediated computed by the authors from the Step 2 and Step 4 coefficients.*

3.4 Summary of Mediation Results

The overall hypothesis H01 is partly rejected: infrastructure development significantly mediates the relationship between external debt and growth but not the relationship between internal debt and growth. Table 4 summarizes the contrast. Both debt types raise growth, and both strongly predict infrastructure spending, which in turn raises growth; but only for external debt does infrastructure spending carry a significant share of the growth effect, whereas for internal debt the mediator loses significance in the joint model and the direct effect increases.

Table 4: Summary of Mediation Results

Criterion	Internal debt	External debt
Path c: debt → growth (Step 1)	0.405*** (significant)	0.451*** (significant)
Path a: debt → infrastructure (Step 2)	0.958*** (significant)	0.789*** (significant)
Path b: infrastructure → growth (Step 3)	0.339*** (significant)	0.339*** (significant)
Path c′: debt → growth controlling for infrastructure (Step 4)	1.639*** (increased)	0.342*** (reduced by 24%)
Path b′: infrastructure → growth controlling for debt (Step 4)	0.138 (not significant)	1.289*** (significant)
Indirect effect (Sobel test)	z = 1.48, p = 0.140	z = 4.13, p < 0.001
Conclusion	**No mediation; H01a not rejected**	**Partial mediation (≈75%); H01b rejected**

*** *p < 0.01. Source: Authors' summary of Tables 2 and 3.*

4. DISCUSSION

4.1 Discussion of Findings

The finding that debt of both types raises growth in the EAC is consistent with the Keynesian view and with Mensah et al. (2018), Mwenda and Karanja (2022) and Otieno and Ahmed (2023), and runs counter to the negative associations reported for Asian economies by Asteriou et al. (2021). The finding that both debt types strongly predict infrastructure spending confirms that EAC governments do, in practice, direct borrowed funds to infrastructure, as the region's debt strategies claim. But the mediation results show that only for external debt does that infrastructure spending carry the growth effect.

The near-perfect Step 2 relationship for internal debt (within R-squared 0.952) and the reversal in Step 4 point to a substantive explanation. Domestic borrowing and infrastructure spending move so closely together within each country that, once internal debt is in the model, infrastructure spending carries no independent information about growth; the growth effect of internal debt is transmitted through channels other than the infrastructure it nominally finances—most plausibly recurrent spending, debt refinancing and the general fiscal stimulus of domestic borrowing. The sharp increase in the internal-debt coefficient in the joint model is characteristic of suppression

rather than mediation and is consistent with the crowding-out literature: domestic borrowing that is recorded as infrastructure expenditure may be displacing private investment at the same time as it adds to public demand, so that the two effects partly offset when the variables are estimated separately. By contrast, the far-from-complete Step 2 association for external debt (within R-squared 0.465) indicates that external borrowing finances infrastructure alongside other uses, and the partial mediation pattern shows that the infrastructure share is the one that carries most of its growth effect.

Three explanations for the divergence are consistent with the theory and the data. First, the terms and governance of the two debt types differ. External debt in the EAC is predominantly concessional or project-tied, raised by multilateral and bilateral lenders who attach appraisal, procurement and disbursement conditions to specific infrastructure projects; the money is more likely to become the road or the power line it was borrowed for. Domestic debt is raised through Treasury bills and bonds without earmarking and is fungible across the budget, so that even when it is recorded against infrastructure it may in practice finance recurrent obligations, arrears and refinancing. This is the mechanism by which Mwenda and Karanja (2022) found concessional borrowing growth-enhancing and non-concessional borrowing growth-constraining, and by which Otieno and Ahmed (2023) found weak mediation where public investment management is inefficient.

Second, the crowding-out theory applies asymmetrically. Internal borrowing from domestic banks competes directly with private credit, raises domestic interest rates and displaces private investment (Coupet, 2017; Karazijiene, 2015), whereas external borrowing brings in resources from outside the domestic loan market. The suppression pattern in Table 2—where the direct effect of internal debt rises once infrastructure is controlled for—is what one would expect if domestic borrowing simultaneously added to public demand and subtracts from private investment: the infrastructure variable absorbs the crowding-out component, leaving a larger residual stimulus effect. The absence of this pattern for external debt is consistent with the theory's own limitation, noted by Coupet (2017), that it presumes fiscal dominance and ignores external financing routes.
Third, the results refine the Debt Overhang Theory in the EAC context. The theory predicts that debt harms growth by squeezing public investment; the finding here is that external debt has not

yet reached that point—it still raises public investment and, through it, growth—but that the positive direct effects of both debt types are conditional on the channel remaining productive. The partial rather than full mediation for external debt, and the absence of mediation for internal debt, mean that a substantial share of the growth effect of EAC borrowing is not accounted for by infrastructure and may prove less durable, since the Keynesian demand stimulus of borrowing dissipates while debt service does not. This is consistent with the thresholds identified by Law et al. (2021) and Albu and Albu (2021) and with Rahman et al.'s (2019) conclusion that the sign of the debt–growth relationship depends on use.

4.2 Conclusion and Recommendations

This study concludes that infrastructure development mediates the relationship between public sector debt and economic growth in EAC member countries only for external debt. External borrowing raises growth predominantly—about three-quarters of its effect—by financing infrastructure, with a smaller direct effect. Domestic borrowing raises growth and is almost perfectly associated with recorded infrastructure spending, yet that spending does not carry its growth effect; internal debt works through other channels, and its interaction with infrastructure bears the signature of crowding out. The popular justification for EAC borrowing—that debt builds infrastructure and infrastructure builds growth—is therefore validated for external debt and not for internal debt.

Three recommendations follow. First, external debt should be ring-fenced for infrastructure, with the project appraisal, procurement and monitoring conditions that accompany concessional lending treated as assets rather than constraints; EAC governments should extend equivalent public investment management standards to commercially sourced external debt, whose growth effect will otherwise erode toward that of domestic borrowing. Second, domestic borrowing should be evaluated on its own terms rather than justified by infrastructure outcomes it does not appear to deliver. Treasuries and central banks should monitor the share of banking-system credit absorbed by government securities and the domestic interest rate response, and should prefer external concessional financing, PPPs (Kamau & Yusuf, 2023) and regional development-bank facilities for infrastructure over domestic debt issuance where the crowding-out cost is high. Third, because a quarter of the growth effect of external debt and all of that of internal debt operate outside the

infrastructure channel and are therefore likely to reflect short-run demand stimulus, debt sustainability analyses in the region should discount growth projections that rest on continued borrowing and should test the durability of the debt–growth relationship against debt-service trajectories.

For practitioners in development finance, the results indicate that lending instruments tied to specific infrastructure outputs are the ones whose growth effects are empirically traceable in the EAC, and that support for public investment management capacity—appraisal, procurement, execution—is the most direct way to raise the growth return on the region's debt.

4.3 Limitations and Suggestions for Further Research

Several extensions would strengthen and deepen these findings. First, the mediating role of infrastructure should be tested with disaggregated infrastructure data—transport, energy, water, telecommunications and social infrastructure separately—to identify which categories carry the growth effect of external debt and whether any category mediates domestic debt. Second, the Baron and Kenny procedure with Sobel tests could be complemented by bootstrapped indirect effects and by structural equation modelling, as in Otieno and Ahmed (2023), which relax the normality assumption of the Sobel test and allow simultaneous estimation of both debt types. Third, the suppression pattern observed for internal debt warrants direct investigation of the crowding-out channel, by adding private credit and domestic interest rates to the model and testing whether internal debt affects growth through them. Fourth, the quality of public investment management—appraisal, procurement transparency and execution rates—should be introduced as a moderator of the infrastructure channel, since the difference between external and internal debt identified here may reflect governance conditions rather than the source of funds per se. Finally, extending the analysis to the Democratic Republic of Congo as its EAC membership matures, and to other African regional communities, would test whether the asymmetry between external and internal debt is specific to the EAC or general to debt-financed infrastructure in developing regions.

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