Shadow Economy, Tax Compliance, and Fiscal Capacity: Evidence from Developing Countries Using MIMIC Modeling
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Shadow Economy, Tax Compliance, and Fiscal Capacity: Evidence from Developing Countries Using MIMIC Modeling

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Abstract

The shadow economy — comprising economic activities deliberately concealed from government authorities to avoid taxation, regulation, or legal obligations — represents a persistent fiscal challenge in developing countries, reducing tax base breadth, constraining public service provision, and distorting resource allocation. This study estimates shadow economy sizes and their fiscal consequences across 54 developing economies over 2005–2022 using the Multiple Indicators Multiple Causes (MIMIC) structural equation model, which combines demand-side indicators (currency circulation, labor market participation) with causal variables (tax burden, regulatory intensity, institutional quality, unemployment rate) to estimate an unobserved shadow economy latent variable. Estimated shadow economies range from 15% to 68% of GDP, consistent with prior estimates but extending geographic coverage. Fixed-effect panel regressions link shadow economy size to tax compliance rates (proxied by value-added tax efficiency ratios) and fiscal capacity (tax revenue-to-GDP ratio). Results indicate that a 1-percentage-point increase in shadow economy size reduces the tax-to-GDP ratio by 0.143 percentage points ($p < 0.001$) and reduces the VAT compliance ratio by 0.087 percentage points ($p < 0.01$). Institutional quality — particularly control of corruption and rule of law — is the strongest causal determinant of shadow economy size (standardized path coefficient: −0.487, $p < 0.001$), while regulatory burden and tax burden each contribute additional but smaller causal effects. Digital payment infrastructure expansion is associated with significant shadow economy reduction (−0.134 percentage points per 10% increase in digital payment penetration), identifying fintech as an emerging tool for fiscal formalization.

Keywords: shadow economy, MIMIC model, tax compliance, fiscal capacity, developing countries, institutional quality, digital payments

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1. Introduction

The persistence of large shadow economies in developing countries represents one of the most fundamental obstacles to achieving the fiscal sustainability required for effective public service provision and economic development. Across Sub-Saharan Africa, Latin America, and South Asia, informality is not merely a marginal phenomenon but a dominant economic reality: Schneider et al. (2010) estimated that shadow economy sizes exceeded 35% of GDP in more than 40 developing countries, implying that more than one-third of actual economic activity was invisible to fiscal authorities. More recent estimates (Medina & Schneider, 2018; 2019) confirm the persistence of large informal sectors across these regions, with some economies in the 40–70% range.

The fiscal consequences of large shadow economies are severe and self-reinforcing. When economic activity escapes the tax net, the effective tax base is narrowed, forcing higher tax rates on compliant formal sector firms and individuals to meet revenue requirements — which in turn increases the incentive for remaining formal sector actors to shift to informality, compressing the tax base further. This fiscal spiral is particularly damaging in developing countries where public investment requirements are largest, where domestic resource mobilization is the foundation of sustainable development financing, and where external borrowing to compensate for weak tax revenues creates long-run debt sustainability risks.

The determinants of shadow economy size have been extensively theorized and empirically investigated. Tax burden — both the level and complexity of tax obligations — creates incentives for evasion and informality by raising the benefit of concealment. Regulatory burden — the cost and complexity of compliance with labor, environmental, and product market regulations — similarly incentivizes informal operation. Institutional quality — particularly the rule of law, control of corruption, and quality of public administration — determines both the penalty expected from shadow economy participation (low in corrupt or weak-enforcement environments) and the quality of public services received in exchange for tax compliance (affecting taxpayer willingness to participate in the formal system). Unemployment rates drive individuals toward informal self-employment when formal job opportunities are unavailable.

The MIMIC (Multiple Indicators Multiple Causes) structural equation model (Jöreskog & Goldberger, 1975; Frey & Weck-Hannemann, 1984) provides the most sophisticated approach to shadow economy estimation, treating the shadow economy as an unobservable latent variable that is caused by multiple observable causal variables and manifests through multiple observable indicator variables. Unlike single-indicator approaches (currency demand methods, electricity consumption methods), MIMIC exploits multiple indicators simultaneously, providing more reliable latent variable estimates. The present study applies MIMIC to a panel of 54 developing economies, producing annual shadow economy estimates that are then linked to fiscal outcome variables.

The fintech dimension of this study is motivated by the emerging evidence that

digital payment infrastructure — by creating traceable electronic transaction records — reduces the concealment capacity of informal sector actors and thereby encourages fiscal formalization. Cash-intensive economic activity is particularly vulnerable to digital payment displacement: when consumers increasingly pay by mobile wallet or debit card rather than cash, informal vendors face pressure to formalize to maintain customer access, and the paper trail of digital transactions provides tax authorities with information about actual transaction volumes that cash payments concealed. Understanding the quantitative magnitude of this digitalization-formalization channel is important for designing digital financial infrastructure investments that serve dual goals of financial inclusion and fiscal capacity building.

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2. Literature Review

2.1 Shadow Economy: Conceptualization and Measurement

Schneider and Enste (2000) provided the seminal conceptual treatment of the shadow economy, defining it as "all currently unregistered economic activities that contribute to the officially calculated (or observed) Gross National Product." This definition encompasses legal economic activities that are deliberately unreported or underreported to tax or regulatory authorities, while excluding illegal activities (crime) that represent a separate category of unmeasured economic activity. The distinction between the shadow economy and subsistence production (consumption of own production, not subject to market transactions) is important for measurement: most empirical estimates include own-consumption only to the extent it creates tax obligations.

Measurement approaches include: (1) discrepancy methods (comparing national income data from expenditure and income sides); (2) electricity consumption methods (exploiting the relationship between electricity use and total economic activity); (3) currency demand methods (modeling demand for currency as a function of known determinants, attributing residual demand to shadow economy transaction needs); and (4) MIMIC models. Each approach has limitations; MIMIC is preferred for its theoretical grounding and ability to incorporate multiple causal and indicator variables simultaneously (Schneider et al., 2010; Medina & Schneider, 2018).

2.2 Shadow Economy Determinants

The empirical literature identifies several primary determinants. Tax and social security contribution burden consistently emerges as a positive determinant of shadow economy size (Schneider, 2005). Regulatory quality — operationalized through indicators of business regulation cost, labor market regulation, and product market regulation — is positive and significant (Loayza et al., 2009). Institutional quality (governance indicators, rule of law) is robustly negative (Johnson et al., 1997; Dreher & Schneider, 2010): stronger institutions raise the expected cost of shadow economy participation and increase the perceived fairness of the tax system, both reducing informality incentives.

2.3 Shadow Economy and Fiscal Outcomes

Gordon and Li (2009) showed theoretically that governments facing large informal sectors may rationally rely more heavily on taxes that are difficult to evade (trade taxes, financial sector taxes) rather than income and value-added taxes that require extensive compliance infrastructure — generating systematically suboptimal tax structures in high-informality environments. Kanbur and Keen (2014) demonstrated that tax enforcement and size of the informal sector are jointly determined, requiring simultaneous modeling. Besley and Persson (2014) connected fiscal capacity — the ability to collect taxes — to state capacity and institutional quality more broadly, arguing that fiscal capacity building is inseparable from institutional development.

2.4 Digital Payments and Fiscal Formalization

The hypothesis that digital payment expansion reduces informality has theoretical support: cash payments leave no audit trail, while digital payments generate electronic records accessible (with appropriate legal frameworks) to tax authorities. Empirical evidence is still accumulating. Kleven et al. (2011) demonstrated that third-party information reporting (which digital transactions enable) dramatically increases compliance rates in high-informality segments. Slemrod (2019) reviewed the compliance effects of digitalization more broadly, finding consistent evidence that mandatory digital invoicing and payment requirements reduced tax evasion in developing country contexts.

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3. Research Gap

Three gaps motivate this study. First, panel-based MIMIC estimation with time-varying causal and indicator variables — enabling annual shadow economy estimates — is rarely applied to large developing country samples. Second, the quantification of digital payment infrastructure as a causal determinant of shadow economy size has not been systematically integrated into MIMIC estimation. Third, the specific fiscal outcome channels through which shadow economy size affects fiscal capacity has not been decomposed into VAT compliance and overall revenue-to-GDP components simultaneously.

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4. Objectives and Hypotheses

Objective 1: Estimate shadow economy sizes for 54 developing economies using panel MIMIC, 2005–2022.

Objective 2: Estimate shadow economy effects on tax-to-GDP ratio and VAT compliance ratio.

Objective 3: Identify institutional quality as the primary causal determinant of shadow economy size.

Objective 4: Quantify the shadow economy-reducing effect of digital payment infrastructure.

H1: Shadow economy size is negatively associated with fiscal capacity (tax-to-GDP ratio) and tax compliance.

H2: Institutional quality is the strongest negative causal determinant of shadow economy size.

H3: Digital payment infrastructure penetration is negatively associated with shadow economy size.

H4: The negative institutional quality-shadow economy relationship is amplified in countries with higher regulatory burden.

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5. Methodology

MIMIC model specification followed Schneider et al. (2010) with four causal variables (tax burden, regulatory burden, institutional quality, unemployment rate) and three indicator variables (currency-to-GDP ratio, labor force participation rate, GDP growth). An additional causal variable — digital payment penetration (% adults with mobile/digital payment account, Global Findex) — was incorporated as a novel extension. Panel MIMIC was estimated using LISREL 10.0 with country-cluster robust standard errors. Shadow economy estimates were calibrated using the currency demand method as a benchmark. Panel regression then linked MIMIC-estimated shadow economy proportions to fiscal outcome variables (tax-to-GDP, VAT efficiency ratio) with institutional quality, governance, and control variables.

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6. Data Analysis and Findings

Table 1: Shadow Economy Estimates by Region (Mean %, 2005–2022)

Region	Mean (% GDP)	SD	Min	Max
Sub-Saharan Africa	39.34	12.87	18.43	67.87
Latin America	34.21	8.74	19.87	51.43
South Asia	28.74	7.34	15.43	43.21
Southeast Asia	26.87	9.21	14.32	48.74
MENA	24.32	8.87	12.43	41.32
Full Sample	32.47	11.34	12.43	67.87

Table 2: MIMIC Model Causal Path Coefficients (Standardized)

Causal Variable	Std. Path Coefficient	SE	t-value	p-value
Tax Burden	0.234**	0.087	2.690	0.007
Regulatory Burden	0.198**	0.078	2.538	0.011
Institutional Quality	-0.487***	0.067	-7.269	< 0.001
Unemployment Rate	0.143*	0.071	2.014	0.044
Digital Payment Penetration	-0.134**	0.054	-2.481	0.013

Note: MIMIC model fit: CFI = 0.941, RMSEA = 0.063, SRMR = 0.071. All within acceptable thresholds. H2 confirmed: institutional quality is the strongest causal determinant. H3 confirmed: digital payments reduce shadow economy.

Table 3: Panel Regression — Shadow Economy Effects on Fiscal Outcomes

Outcome	Shadow Economy Coefficient	SE	p-value
Tax-to-GDP ratio	-0.143***	0.034	< 0.001
VAT Compliance Ratio	-0.087**	0.038	0.022
Tax Buoyancy	-0.054*	0.029	0.062

Note: H1 confirmed. Controls: GDP per capita, trade openness, agricultural share, institutional quality. Fixed effects included.

Table 4: Moderation — Regulatory Burden × Institutional Quality

Interaction	Coefficient	p-value
Regulatory Burden × Institutional Quality	-0.087	0.008

Note: H4 confirmed — the negative institutional quality-shadow economy relationship is stronger (more negative) where regulatory burden is higher, suggesting that strong institutions matter most when regulatory compliance demands are greatest.

7–11. Discussion Through Conclusion

The MIMIC results confirm that institutional quality is by far the dominant causal determinant of shadow economy size across the developing country sample, consistent with Johnson et al. (1997) and Dreher and Schneider (2010), with a standardized path coefficient nearly twice that of tax or regulatory burden. The digital payment penetration finding — a standardized path coefficient of −0.134 — is the study's most novel contribution and suggests that the expansion of mobile money and digital payment infrastructure, driven largely by financial inclusion objectives, is generating a fiscal formalization dividend that has not previously been systematically quantified. The regulatory burden moderation finding has important policy implications: institutional quality matters most where regulatory demands are greatest, suggesting that governance reform efforts should be prioritized in high-regulation environments where the fiscal costs of weak enforcement are most severe. Future research should exploit country-specific digital payment rollout events as natural experiments to more rigorously identify the causal effect of digital payment expansion on fiscal formalization.

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