Development Studies Research
An Open Access Journal

ISSN: 2166-5095 (Online) Journal homepage: www.tandfonline.com/journals/rdsr20

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To cite this article: Ricardo E. Buitrago R., Andrés Felipe García-Suaza & Juan Esteban Garzón Restrepo (2024) Exploratory analysis of the determinants of informality in emerging and frontier economies: an institutional approach via PLS-SEM, Development Studies Research, 11:1, 2291004, DOI: 10.1080/21665095.2023.2291004

To link to this article: https://doi.org/10.1080/21665095.2023.2291004

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DEVELOPMENT STUDIES RESEARCH
2024, VOL. 11, NO. 1, 2291004
https://doi.org/10.1080/21665095.2023.2291004

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Exploratory analysis of the determinants of informality in emerging and frontier economies: an institutional approach via PLS-SEM

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ABSTRACT

This study explores the link between informality and institutional quality in 48 emerging economies from 2013 to 2018, using partial least squares – structural equation modeling (PLS-SEM). It delves into the role of informality and the poorly understood drivers in these economies. This study models property rights, public fund diversion, and government transparency. This study explores systemic conditions and finds a complex link between weaker institutions and increased informality. The analysis found an association between lower institutional quality and higher levels of informality, aligning with the theory that more robust institutions are linked to fewer informal activities. However, the analysis also indicated that systemic factors have a significant relationship with the degree of informality. Mediation analysis indicated an association between systemic issues, reduced institutional quality, and increased informality. State legitimacy, inequality, and factionalism have been highlighted as potential areas to address in an effort to decrease informality. Enhancing systemic conditions and public fund oversight may be important considerations. A dual approach to institutional and systemic reforms has been suggested. Regional differences indicate a need for further research on context-specific drivers. This exploratory PLS-SEM study offers detailed evidence to aid formalization policies in emerging economies.

ARTICLE HISTORY
Received 9 May 2023
Accepted 29 November 2023

KEYWORDS
Informality; emerging economies; institutional quality; PLS-SEM; IPMA

1. Introduction

The livelihoods of the impoverished in emerging markets and frontier economies (EMFEs) are frequently highly dependent on informal activity. Statistics show that the informal economy comprises a significant portion of the overall economic activity in emerging and developing countries, often accounting for 25–75% of employment, GDP, and firms (International Labor Organization 2021). Beyond employment, informal output is estimated to account for about 35% of GDP in EMFEs compared to 15% in advanced economies (The World Bank 2019). Informality is linked to various adverse economic outcomes, including low productivity, limited fiscal resources, increased poverty, and income inequality, despite the benefits of flexible employment in certain situations (Berdiev and Saunoris 2019; Docquier, Müller, and Naval 2017; Elgin and Birinci 2016; Loayza 2016; Ohnsorge, Okawa, and Yu 2022). Therefore, informality is a crucial factor to consider when developing cyclical and structural policies. However, despite the challenges of measuring the informal sector, the factors that drive it and its consequences still need to be better understood in EMFEs despite their policy relevance.

A complex relationship exists between informality and institutional quality. On the one hand, informality can result from weak institutions and poor governance, as businesses may turn to informality to avoid burdensome regulations and taxes (Dabla-Norris, Gradstein, and Inchauste 2008; Loayza, Serven, and Sugawara 2009; Schneider and Enste 2013). On the other hand, informality can also undermine institutional quality, as it can lead to a lack of protection for workers and consumers, reduce the tax base, and create barriers to economic growth and development (Elgin and Oztunali 2014; Schneider and Enste 2000). Therefore, addressing informality and improving institutional quality are key challenges for many EMFEs seeking to promote economic development and good governance.

This study examines informality drivers in emerging and frontier economies (EMFEs). The analysis investigates institutional effects on informality across country

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groupings. The key findings are threefold. First, decreasing systemic conditions raises informality directly and indirectly via institutional quality, totaling 13.25% of the effect. Second, the results confirm the negative relationship between institutional quality and informality. Finally, the importance-performance analysis identifies systemic components as top policy priorities for reducing informality. Addressing systemic deficiencies is critical for formalization policies in EMFEs.

In contrast to prior research, this study offers nuanced evidence of deep-rooted informality's institutional and systemic drivers by expanding the evidence based on the relationship between informality and institutional factors. PLS-SEM modeling was applied to provide a nuanced understanding of the factors influencing informality. Examining the conditional and indirect effects of systemic factors using mediation analysis and identifying policy priorities via importance-performance analysis.

This paper is organized into several sections. Section 2 introduces and discusses the prevailing literature on informality and approaches to institutional quality, thus providing a theoretical backdrop for the study. Section 3 describes the methodology and data employed in our analysis. Section 4 presents an assessment of the various factors that influence informality and evaluates their impact across the selected sample of economies. Section 5 describes our final thoughts, offering insights and reflections on the subject under investigation. Finally, Section 6 elucidates the contributions and limitations of this study and critically examines the value and potential shortcomings of our research.

2. Literature review and proposals development

North (1986) emphasized the importance of modern economic institutions for economic growth and prosperity. These include a legal system, judicial system to protect property rights and settle disputes, and trading system to reduce firms' transaction costs. However, many institutions in emerging and developing countries are weak, leading to macroeconomic volatility and negative effects on economic growth and prosperity (Acemoglu 2003; Acemoglu and Robinson 2012; Hnatkovska and Loayza 2005).

The quality of institutions determines the institutional framework, which can be either inclusive or extractive. Inclusive institutions foster inclusive markets, whereas extractive institutions are designed to transfer wealth and income from one group to another (Acemoglu and Robinson 2012).

According to Graham and Naim (1998), there are three types of institutional functions. The first is creating rules and laws by institutions such as legislative bodies, government departments, and local councils. The second function is enforcing and implementing these rules, which are performed by institutions such as courts, administrative boards, and regulatory agencies. The third function is the provision of public services, which is the responsibility of institutions to ensure the availability of various types of public goods and services.

Several explanations for institutional quality can be broadly categorized into three groups for analysis (Graham and Naim 1998): resource conditions, quantity, quality, and allocation of available resources. Political conditions: related to co-optation, corruption, and politicization in resource allocation. Systemic conditions: related to clarity in setting long-term goals, the concentration of power in economic agents, and external state intervention.

The relationship between informality and institutional factors has been extensively studied. In general, it has been identified that weak institutions are related to higher levels of informality (Dabla-Norris, Gradstein, and Inchauste 2008; Torgler and Schneider 2009). In addition, institutional quality interacts with factors such as inequality because individuals with limited access to resources may be produced in the informal sector with lower levels of productivity but higher returns (Chong and Gradstein 2004; Dell'Anno and Solomon 2014). This is consistent with previous studies showing the relationship between informality and tax burden and labor regulations documented by Johnson, Kaufmann, and Zoido (1998) and Schneider and Enste (2000) and the stronger relationship between private contracting institutions and informality reported by Dabla-Norris, Gradstein, and Inchauste (2008). By contrast, Friedman et al. (2000) argue that it is not taxes, as market functioning conditions affect informality, but factors such as corruption are directly linked to institutional quality.

Exploring informality in emerging and frontier economies remains an important research area that reflects the multifaceted impact of informality. Recent studies have revealed the detrimental role of the informal sector in sustainable development in developing countries. Additionally, the inverted-U relationship between informal sector size and GDP growth highlights complex informality-economy interactions. Such findings reinforce the study of informality's ongoing significance and intricacies, requiring nuanced understanding (Elgin and Birinci 2016; Loayza 2016; Sultana, Rahman, and Khanam 2022).

The impact of informality extends beyond growth and sustainability, and affects management practices,

regional variations, and poverty. New frameworks examine informal sector management styles and formal-informal firm links. Regional studies map informality patterns, citing drivers like regulations, human capital, and social protection. Research also finds a complex, bidirectional informality-poverty relationship, with heterogeneous pathways across economies (Bolarinwa and Simatele 2023; Ohnsorge, Okawa, and Yu 2022; Özgür, Elgin, and Elveren 2021; Vorisek et al. 2022).

Therefore, we aim to investigate how institutional quality dimensions affect informality. Formality can provide benefits such as contract enforcement and market access. However, burdensome regulations and fees incentivize informality when legal frameworks are onerous and state monitoring is limited (Almenar, Sánchez, and Sapena 2020; Dabla-Norris, Gradstein, and Inchauste 2008; Loayza, Serven, and Sugawara 2009; Schneider and Enste 2013; Simonović and Bošković 2016). High informality can result from weak institutions, as firms avoid burden and enforcement. This leads to the proposal that greater institutional quality reduces informality by lowering burden and improving state effectiveness. Institutional context shapes firms' formal–informal tradeoffs. Policies to enhance property rights, contract enforcement, and monitoring could incentivize formalization. The above arguments led to our first proposal.

P1. A higher degree of institutional quality reduces informality.

However, this relationship is complex, as informality and institutions can complement each other. Elgin and Oztunali (2014) find that the development-informality relationship depends on institutional quality. With weak institutions, GDP and informality are positively associated, whereas the reverse is true for strong institutions. Similarly, Callais, Jahan, and Pavlik (2021) shows that informality can promote growth given robust institutions, especially where informal networks facilitate local activities. Thus, the impact of informality differs based on institutional context.

Individual property rights and property-based capitalism are essential entrepreneurship components. However, when private property is less prevalent or concentrated in a small elite, it becomes more extractive and hinders overall economic growth (Acemoglu and Johnson 2003; Acemoglu, Johnson, and Robinson 2001). Moreover, the lack of political constraints results in a pattern of captured democracy in which the rules of the game are skewed in favor of the elite (Acemoglu and Robinson 2008).

A country's legal infrastructure, with its ability to resolve disputes and enforce contracts, encourages firms to rely on it (Li 2009). According to Kramer (1999), rules are based on the ability to predict institutional actions. 'At the country level, trust in a country's laws is reflected in confidence in their country's legal system' (Lin and Wang 2008; Muethel and Bond 2013). Depending on the specific context, rule-based trust is expected to decrease transaction costs, shape strategic organizational decisions, and promote formalization (Araujo and de Souza 2010; J. Li et al. 2008; Meyer 2001; Prado 2011; Ulyssea 2010). We thus, propose that:

P2. The lack of structural systemic conditions increases informality.

The proposed model is illustrated in Figure 1.

As previously mentioned, the institutional framework is shaped by the quality of the institutions, which can be

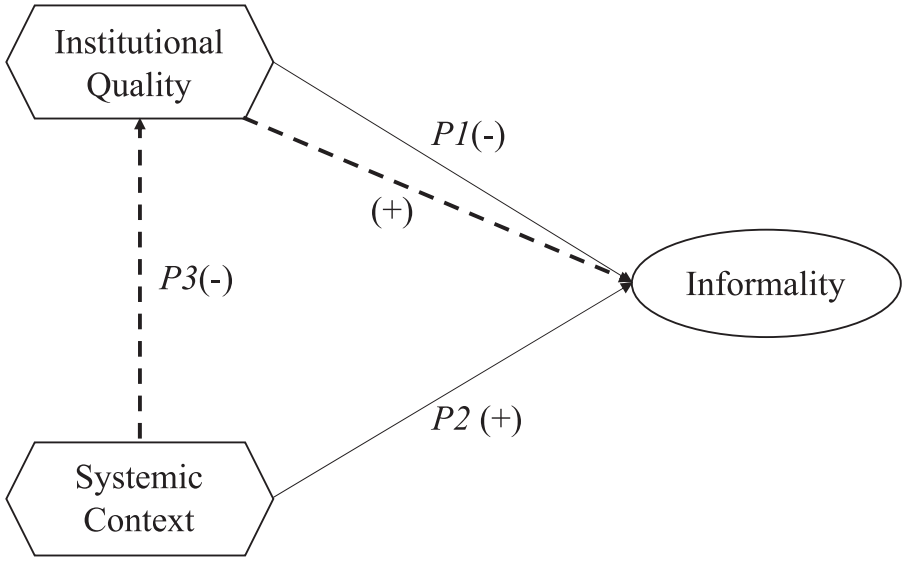


Figure 1. Proposed Model Institutional Quality and Informality. Source: Authors' elaboration.

inclusive or extractive. Extractive economic institutions (i.e. systemic conditions) erode institutional quality, leading to increased informality (Elgin and Oztunali 2014; Williamson 2009). The dotted line shows the third proposition:

P3. Lack of structural systemic conditions reduces institutional quality and increases informality.

The following equations summarize the proposals and research goals:

$$\text{INFO} = \gamma_1.\text{INST} + \gamma_2.\text{SYS} + \zeta_1$$

$$\text{INST} = \gamma_2.\text{SYS} + \zeta_2$$

Where:

- γ represents the path coefficient between the constructs.
- ζ is the error term for the structural model.

3. Data and methodology

3.1. Countries

Frontier economies, often considered a subset within the broader category of developing nations, are characterized by smaller, less accessible, and less developed capital markets than are emerging economies. Emerging economies are more stable, accessible, and integrated into the global financial system; frontier economies offer higher growth potential, but come with greater investment risks and market limitations. This distinction is crucial, as emerging economies are more mature and engage in high-value activities, whereas frontier economies are in earlier developmental stages with higher volatility.

This research used a cross-validation of four categorization sources to analyze data from 48 EMFEs, between 2013 and 2018 (see Table 1). These economies have undergone institutional revolutions that have introduced transparent rules for the game that apply equally to all market participants (Buitrago, Torralba Barreto, and Reyes 2022).

Table 1. Countries included in this study.

Region	Countries
Latin America and the Caribbean (LAC)	Argentina, Brazil, Chile, Colombia, Jamaica, Mexico, Peru, and Venezuela
Europe	Bulgaria, Croatia, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia, Serbia, and Ukraine
Asia	Bangladesh, China, India, Indonesia, Kazakhstan, Malaysia, Pakistan, the Philippines, Sri Lanka, Thailand, Türkiye, and Vietnam
Africa	Kenya, Nigeria, Namibia, South Africa, Uganda, and Zambia
Middle East – North Africa (MENA)	Egypt, Jordan, Kuwait, Morocco, Qatar, Tunisia, and the United Arab Emirates

Source: Authors' elaboration, based on International Monetary Fund 2020; Morgan Stanley Capital International 2020; Standard & Poors 2020.

3.2. Data sources

Indicators for institutional quality were extracted from the Global Competitiveness Index (Sala-I-Martin et al. 2007). Three key aspects were considered: property rights, public fund diversion, and government transparency.

For the systemic context, the Fragile States Index is used, which measures the pressures a country faces and its capacity to control exogenous pressures (The Fund for Peace 2020). State legitimacy, economic inequality, and factionalized elites are the selected indicators.

Informality was measured using an indicator computed using the multiple indicator multiple causes (MIMIC) method. This well-established tool quantifies the size of informal economic activities, including employment levels and productivity within the informal sector (Medina and Schneider 2018; Schneider, Buehn, and Montenegro 2010).

These varied data sources provide a thorough framework for examining the connections between institutional quality, systemic context, and informality, each chosen for its relevance and reliability in capturing key indicators.

3.3. Indicators and constructs

The three constructs of our proposed model are composite variables measured using multiple indicators. Constructs can be viewed as artifacts or theoretically justifiable human-made creations (Buitrago, Caraballo, and Roldán 2019; Henseler 2017). The construct's nature links the indicators to theory. Design constructs are treated as composites, whereas behavioral constructs are typically modeled as common factors. By modeling design constructs as composites, we acknowledge that all artifacts and abstractions consist of more fundamental elements (Henseler 2017).

However, according to Sarstedt, Ringle, and Hair (2022), artifacts are especially prevalent when analyzing secondary and archival data, as they lack a comprehensive measurement theory-based justification. Thus, these constructs have been modeled as composites that are linear combinations of their respective manifest variables (Henseler, Hubona, and Ray 2016; Kock 2019; Sarstedt et al. 2020).

Table 2. Constructs, indicators, and sources.

Constructs	Indicators	Source
Institutional (INST)	Property rights (PR) Diversion of public funds (DPF) Transparency of government policy-making (TGP)	Global Competitiveness Index
Systemic (SYS)	State Legitimacy (SL) Economic Inequality (EI) Factionalized Elites (FE)	Fragile States Index
Informality	MIMIC	Elgin et al. (2021)

Source: Authors' elaboration.

As this is an exploratory model, epistemic relationships between concepts, dimensions, and indicators must be specified (Edwards and Bagozzi 2000; Hulland 1999; Jarvis, Mackenzie, and Podsakoff 2003). The nature and direction of the links require conceptual justification prior to the empirical evidence.

Based on the literature review, we assigned the indicators we found relevant and supported by the theory to each construct. Table 2 shows the constructs, their respective indicators, and the information sources.

3.4. Method

This study chose structural equation modeling (SEM) because of its ability to simultaneously model all possible paths. For the following reasons, we prefer partial least squares (PLS-SEM) over covariance-based SEM (CB-SEM): (a) it identifies which element can cause the type of effect within the variables under study; (b) it tolerates small samples; (c) it does not require validation of the most robust statistical assumptions, such as normality, homoscedasticity, and non-linearity; (d) statistically, it enables the measurement of correlations; and (e) it uses secondary or archival data (Chung and Liang 2020; Hair et al. 2017; 2019; Kock 2019; Palos-Sanchez, Saura, and Ayestaran 2021; Rigdon 2013; Sarstedt et al. 2016). We used Smart-PLS (version 4.0; Ringle, Wende, and Becker 2022) for all calculations.

Thus, PLS will allow us to meet various research purposes: (a) explanatory and descriptive, in order to understand relationships between variables and their importance and performance; and (b) exploratory, using secondary data to identify potential links between constructs in different contexts (Hair et al. 2021; Henseler 2018).

This study employs mediation analysis and Importance-Performance Map Analysis (IPMA) to deepen our understanding of informality determinants. Mediation analysis explores how systemic context indirectly impacts informality via institutional quality. The IPMA guides policy focus by highlighting high-importance, low-performance areas. These techniques collectively unravel the intricate links among systemic issues, institutions, and informality, offering enriched policy insights for emerging economies.

3.5. Model specification

Our model consists of seven indicators (DPF, PR, TGP, EI, FE, SL, and MIMIC) and three latent variables: one exogenous SYS (γ_2), and two endogenous INST, INFO (γ_1, γ_3). Latent variables γ_1, γ_2 influence γ_3, and additionally, γ_2 influences γ_1, the measurement model is specified as follows:

For Institutional Quality (INST):

$$\mathrm{DPF} = \lambda_{11}.INST + \in_1$$

$$PR = \lambda_{12}.INST + \in_2$$

$$TGP = \lambda_{13}.INST + \in_3$$

For Systemic Conditions (SYS):

$$EI = \lambda_{21}.SYS + \in_4$$

$$FE = \lambda_{22}.SYS + \in_5$$

$$SL = \lambda_{23}.SYS + \in_6$$

For Informality (INFO):

$$MIMIC = \lambda_{33}.SYS + \in_7$$

The structural model, which defines the relationships among the latent variables, can be expressed as follows:

$$INFO = \gamma_1.INST + \gamma_2.SYS + \zeta_1$$

$$INST = \gamma_2.SYS + \zeta_2$$

Where:

- λ represents the factor loading of each indicator on the respective constructs.
- γ represents the path coefficient between the constructs.
- $\in$ and ζ are the error terms for the measurement model and the structural model, respectively.

4. Results

The PLS-SEM evaluation was conducted in two steps: measurement model evaluation and structural model evaluation. Using the holdout samples, we assessed the prediction accuracy of the model. In addition, we conducted a mediation analysis of institutional quality. Finally, importance-performance map analysis (IPMA) was conducted to prioritize policy-making actions. All calculations were performed in SmartPLS4 (Ringle, Wende, and Becker 2022)

4.1. Measurement model

As suggested by Henseler et al. (2014), we evaluated the model using confirmatory composite analysis to test the composites' nomological validity (Henseler 2017). We used the widely accepted standardized root mean square residual (SRMR) index to validate the model fit criterion. As a result, the proposed model achieves an SRMR value of 0.079, which is less than the 0.08 cutoff value generally accepted (Hu and Bentler 1999). With this result, the composite model appears to be supported, and composites appear to act within a nomological net rather than as individual indicators (Buitrago, Caraballo, and Roldán 2019; Henseler 2017).

We conducted traditional measurements of internal consistency, reliability, and validity (Henseler, Ringle, and Sarstedt 2015). The model evaluated the reliability, validity, and accuracy of the results. These metrics are all strongly associated with the structures they are supposed to measure (Table 1). The construct indicators scored higher than the cut-off of 0.708, indicating that they all reflected the construct (Busu and Busu 2021; Chung and Liang 2020; Palos-Sanchez, Saura, and Ayestaran 2021). The PLS-SEM analysis results are presented in Table 3.

To assess internal consistency, Cronbach's alpha and Heterotrait-Monotrait Ratio (HTMT) composite reliability were used (Henseler, Ringle, and Sarstedt 2015). Cronbach's Alpha coefficients were greater than the minimum score of 0.7; Rho A also exceeded that value. The composite reliability was over 0.7, and it passed the minimum level of adequacy. This shows consistency within the data. The results of Average Variance Extracted (AVEs) were greater than the suggested minimum of 0.5; see Table 4 (Busu and Busu 2021; Chung and Liang 2020; Hair et al. 2019; Kock 2019; Palos-Sanchez, Saura, and Ayestaran 2021).

Finally, each variable achieved discriminant validity. This is accomplished by employing the Fornell and Larcker (1981) criterion as well as the strictest Heterotrait-Monotrait Ratio (HTMT) of 0.85 (Henseler, Ringle, and Sarstedt 2015), as shown in Table 5. This means that each variable is distinct from the other variables (Figure 2; Table 6).

Table 7 displays the model testing, examining the direct and indirect effects between systemic conditions (SYS), institutional quality (INST) and informality (INFO). As expected, the negative coefficient for the INST -> INFO path (−0.235) indicates that higher institutional quality is associated with lower informality. SYS has a positive total effect on INFO (0.483) but a negative direct effect when controlling for INST as the mediator (−0.270). This change in direction of the SYS → INFO path is consistent with competitive mediation, meaning that SYS ultimately increases INFO, but this effect is masked by mediation through INST.

Critically, the indirect effect of SYS on INFO through INST is significant (0.064), confirming INST's mediating role. The indirect effect accounted for 13.25% of the total effect of SYS on INFO. All paths were significant at the $p < 0.001$ level. The confidence intervals also demonstrated a precise estimation of these effects.

The structural VIF coefficients should not exceed 4.0 in a well-fitting model and less than 5.0 in a more moderate criterion (Garson 2016); as shown in Table 8, the inner model is well-fitted.

Table 4. Construct validity and reliability.

	Cronbach's alpha[a]	Composite reliability (rho_a)[b]	Composite reliability (rho_c)[c]	Average variance extracted (AVE)[d]
INST	0.91	0.968	0.942	0.843
SYS	0.814	0.823	0.891	0.733

Source: Results from SmartPLS4.
[a]Cronbach's alpha: This measures the internal consistency and reliability of a composite scale. It ranges from 0 to 1, with values above 0.7 indicating good consistency.
[b]Rho_A: This is a reliability measure similar to Cronbach's alpha but better suited for PLS-SEM. It is an estimate of the composite reliability based on the loadings.
[c]Rho_C: This estimates the consistency of the construct indicators in PLS-SEM based on their correlations. Values above 0.7 demonstrate good reliability.
[d]Average variance extracted (AVE): This represents the amount of variance captured by a construct from its indicators relative to random error. An AVE of 0.5 or higher indicates sufficient convergence.

Table 3. Indicators and constructs loadings.

	Constructs		
Indicators	INFO	INST	SYS
MIMIC	1		
EI			0.750
FE			0.904
SL			0.906
DPF		0.929	
PR		0.929	
TGP		0.897	

Source: Results from SmartPLS4.

Table 5. Discriminant validity – HTMT – Fornell and Larcker.

	Heterotrait-Monotrait Ratio (HTMT)[a]			Fornell and Larcker		
	INFO	INST	SYS	INFO	INST	SYS
INFO				1		
INST	0.345			−0.349	0.918	
SYS	0.536	0.294		0.483	−0.27	0.856

Source: Results from SmartPLS4.
[a]Heterotrait-Monotrait Ratio (HTMT): This assesses discriminant validity by comparing correlations between indicators across constructs to those within constructs. HTMT values below 0.85 confirm distinct constructs.

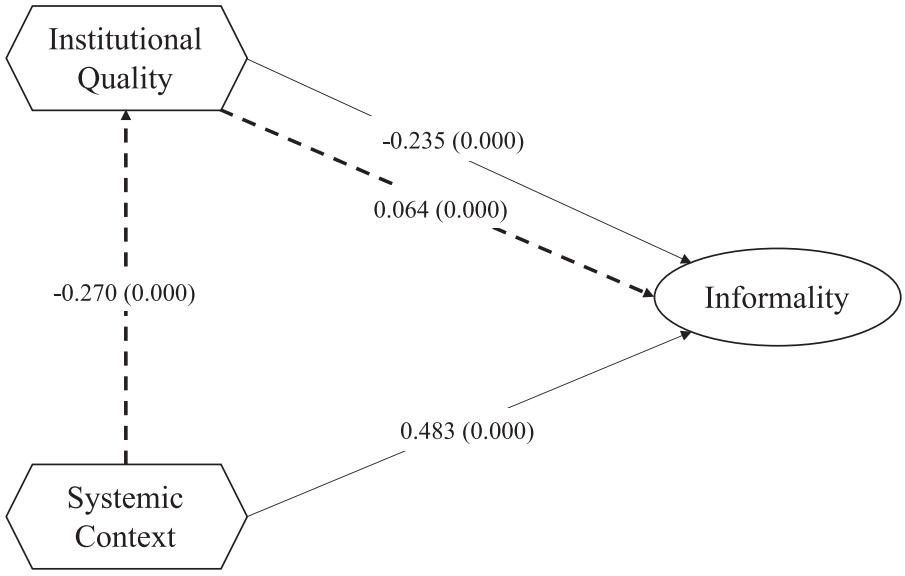


Figure 2. Model's results. Source: Authors' elaboration based on the results from SmartPLS4 – See Table 7.

Table 6. Path coefficients.

	Path coefficients	Standard deviation	*T* statistics	*P* values
INST -> INFO	−0.235	0.04	5.957	0.000
SYS -> INFO	0.419	0.045	9.246	0.000
SYS -> INST	−0.270	0.043	6.227	0.000

Source: Results from SmartPLS4.

4.2. Predictive assessment

Before initiating the $PLS_{predict}$ procedure, we confirmed that all constructs' measurement models met the relevant quality standards, as shown in the previous section. Regarding predictive accuracy, the coefficient of determination (R^2) and the exogenous constructs (INST, SYS) explain 28% of the endogenous construct INFO, which is considered a low effect (Chin, 1998; Henseler and Sarstedt 2013). Q^2 statistics are used to measure the PLS path model's quality; this criterion recommends that the conceptual model predict the endogenous constructs. In our model, the value for INFO is 0.227 and for INST is 0.067; values greater than zero for a particular endogenous latent construct are considered relevant (Hair et al. 2017). Assessing the effect sizes (f^2) showed that the effect size on INFO of INST (0.072) was small and SYS (0.228) was moderate. The effect of SYS on INST (0.079) is small, as shown in Table 9 (Chin and Dibbern 2010; Hair et al. 2017).

To understand the $PLS_{predict}$ results, we first analyzed the endogenous constructs. Once we identified that the $Q^2_{predict}$ statistic outperformed the most naïve benchmark (Evermann and Tate 2016), we identified the prediction error distribution, which in our model is highly non-symmetric (see Figure 3), as stated by (Shmueli

Table 8. Structural VIF coefficients.

	INFO	INST	SYS
INFO			
INST	1.079		
SYS	1.079	1	

Source: Results from SmartPLS4.

Table 9. f^2 effect sizes.

	INFO	INST
INFO		
INST	0.072	
SYS	0.228	0.079

Source: Results from SmartPLS4.

Table 7. Model testing (Total direct and indirect effects).

	Path coefficients	Standard deviation	T statistics	*P* values	Confidence Intervals Lo	Up
INST -> INFO	−0.235	0.040	5.957	0.000	−0.313	−0.158
SYS -> INFO	0.483	0.041	11.802	0.000	0.404	0.563
SYS -> INST	−0.270	0.043	6.227	0.000	−0.354	−0.185
SYS -> INST -> INFO*	0.064	0.014	4.413	0.000	0.038	0.094

Source: Results from SmartPLS4.
* These results correspond to indirect effects in the model.

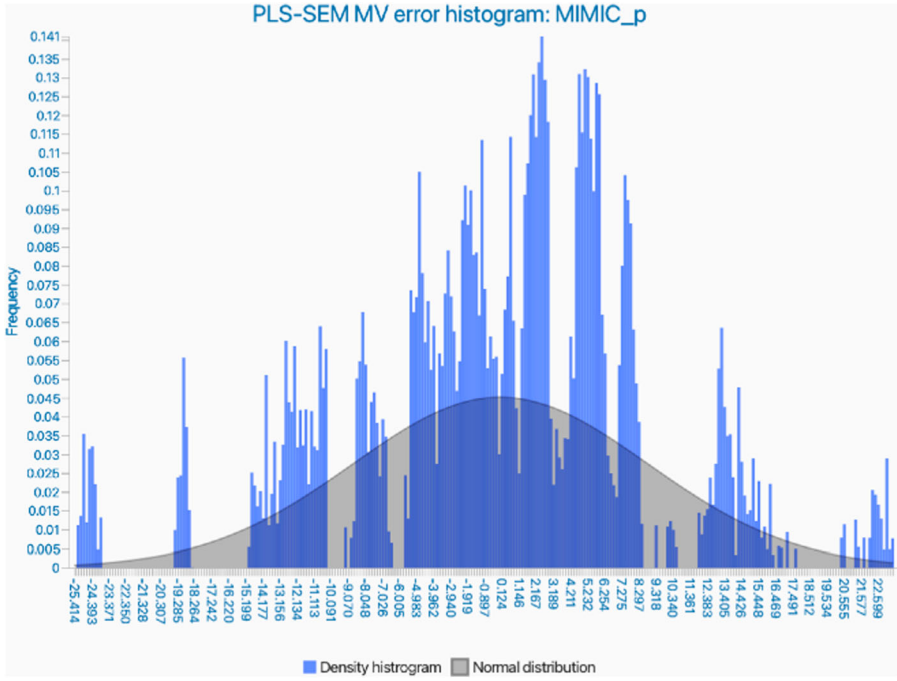


Figure 3. Prediction error distribution. Source: Results from SmartPLS4.

et al. 2016; 2019), the MAE is the more appropriate prediction in this case.

Continuing with the prediction analysis, we compared the indicators and found that most of them were PLS-SEM < LM MAE, which indicates a medium predictive power, as shown in bold in Table 10.

4.3. Control variables

In a more stable economy, businesses are more inclined to hire legally. The availability of full-time jobs is greater when the economy is expanding than when contracting. When it comes to extracting a larger proportion of resources, the poor are at a disadvantage because of their limited endowments. As a result, they often find it advantageous to shift to the informal sector, where they can keep all of the profits from their work, although they are less productive. There is a positive correlation between inequality and the extent of the informal sector, which is aggravated when institutional quality is inadequate and there is high inequality (Chong and Gradstein 2007; Loayza, Serven, and Sugawara 2009). Consequently, we decided to control GDP growth (GDPgr) and GDP per capita in the Purchase Power Parity (GDPpc_ppp). Table 11 presents the results for the controlled model.

Table 10. $PLS_{predict}$ results.

	$Q^2_{predict}$ [a]	PLS-SEM RMSE[b]	PLS-SEM MAE[c]	LM RMSE[d]	LM MAE
MIMIC	**0.227**	**8.827**	**6.728**	8.86	6.788
DPF	**0.069**	0.921	**0.702**	0.915	0.705
PR	**0.072**	0.746	**0.562**	0.74	0.562
TGP	**0.009**	0.619	0.478	0.618	0.462

Source: Results from SmartPLS4.
[a]This cross-validated measure assesses the model's predictive relevance for an endogenous construct. Values above zero indicate predictive relevance.
[b]Root Mean Square Error. RMSE is a measure of the differences between the values predicted by a model and the actual values.
[c]Mean Absolute Error. MAE is a measure of prediction error, but it calculates the average absolute differences between predicted and actual values.
[d]LM RMSE, LM MAE are the localized version of the RMSE and MAE, focused on evaluating the prediction accuracy within specific subgroups or segments of the data in the PLS-SEM context.

4.4. Mediation analysis

Mediation analysis was performed to assess the mediating role of INST on the linkage between SYS and INFO, as shown in Figure 1 (*P3*). The results (see Table 11) revealed that the total effect of SYS on INFO was significant (*P2*: $p = 0.000$), with a magnitude of −0.270. With the inclusion of the mediating variable (INST), the impact of SYS on INFO remained significant ($p = 0.006$), but it changed direction. This phenomenon is known as competitive mediation, as explained by Zhao, Lynch, and Chen (2010). The findings on competitive mediation align with the hypothesized model, in which there is an association between poorer systemic conditions, reduced institutional quality, and higher levels of informality.

Table 11. Model 2 testing (Total direct and indirect effects).

	Path Coefficients	Standard deviation	T statistics	*P* values	Confidence Intervals	
					Lo	Up
INST -> INFO	−0.137	0.045	3.02	0.003	−0.230	−0.049
SYS -> INFO	0.496	0.035	14.168	0.000	0.429	0.567
SYS -> INST	−0.270	0.043	6.227	0.000	−0.354	−0.185
GDPpc_ppp	−0.130	0.052	2.498	0.013	−0.230	−0.020
GDPgr	−0.346	0.067	5.157	0.000	−0.456	−0.194
SYS -> INST -> INFO*	0.037	0.014	2.724	0.006	0.013	0.066

Source: Results from SmartPLS4.
* These results correspond to indirect effects in the model.

4.5. Importance-performance map analysis (IPMA)

PLS-SEM's IPMA compares the mean latent variable scores to total effects, which measures the importance of precursor constructs in shaping a target construct. The goal is to identify precursors that are low-performing but highly important for the target construct, that is, a high total effect (Ringle and Sarstedt 2016).

We followed the five steps suggested by Ringle and Sarstedt (2016) to conduct the IPMA analysis: (1) requirement check, (2) computation of the performance values, (3) computation of the importance values, (4) importance–performance map creation, and (5) extension of the IPMA on the indicator level.

In the first step, we rescaled the SYS indicators so that the lowest value represented the worst outcome and the highest value represented the best outcome. We also ensured that all outer weight estimations were positive (see Figure 4), and that all indicators in the PLS path model were measured on a metric scale with a consistent orientation. The remaining steps were performed using SmartPLS 4. The results for the complete sample are shown in Tables 12 and 13 and Figure 4.

The IPMA method evaluates not only the performance of an item, but also its importance. This analysis aims to determine the (non-standardized) total effect of predecessor construct importance (e.g. INST, SYS) in anticipating a specific target endogenous construct (e.g. INFO).

The total effect reveals the importance of perceptible variables, whereas the mean score (ranging from 0 – lowest to 100 – highest) reflects their performance (Höck, Ringle, and Sarstedt 2010). According to the IPMA, a 1-unit increase in the performance of the predecessor (e.g. INST, SYS) increases the performance of the target construct (INFO) by the size of the predecessor's unstandardized total effect (Ringle and Sarstedt 2016). The objective was to determine the significance of

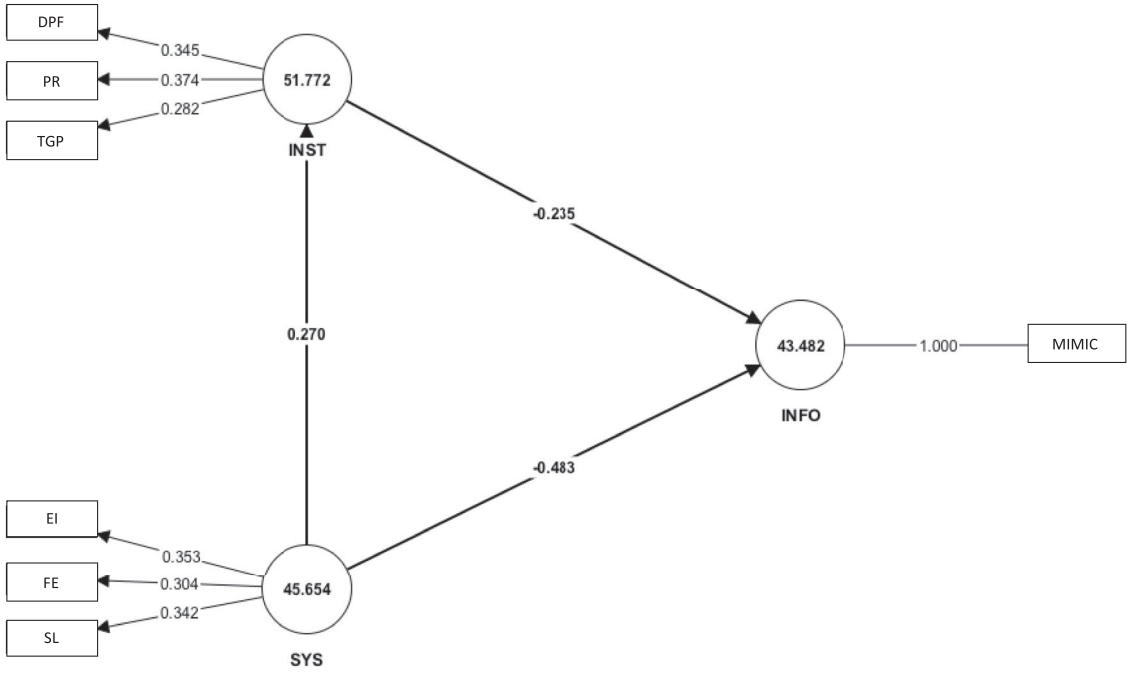


Figure 4. IPMA results complete sample. Source: Results from SmartPLS4.

Table 12. Constructs and indicators – Total effects – Complete sample.

Constructs	INFO	INST	SYS
INFO			
INST	−0.235		
SYS	−0.483	0.270	
Indicators			
MIMIC	1		
EI	−0.173	0.097	0.358
FE	−0.201	0.112	0.416
SL	−0.190	0.106	0.392
DPF	−0.106	0.449	
PR	−0.093	0.396	
TGP	−0.056	0.239	

Source: Results from SmartPLS4.

Table 13. Constructs and indicators Importance-Performance.

Constructs	Importance	Performance
INST	−0.235	51.772
SYS	−0.483	45.654
Indicators		
EI	−0.173	50.386
FE	−0.201	43.320
SL	−0.190	42.842
DPF	−0.106	40.188
PR	−0.093	59.132
TGP	−0.056	56.180

Source: Results from SmartPLS4.

each predecessor construct in terms of its total effect (importance) on each target's endogenous construct (performance).

When examining the final target construct INFO, the path coefficient for INST was −0.235, whereas that for SYS was −0.483. The path coefficient, represented by arrows, indicates the relative importance, while the performance values, represented by circles, are the average values of the latent variable scores on a scale from 1 to 100. The closer the score is to 100, the higher the performance of the latent variable.

Because the proposal is better institutional (INST) and systemic (SYS) conditions reduce informality, in Figure 5 is easier to identify that SYS is more important than INST but has lower performance.

Finally, the IPMA identifies areas requiring improvement at the indicator level. Using outer weights, we gauged the contribution of each indicator to the composite variable. Figure 6 maps the indicators' importance and performance, divided into four quadrants by mean values. This highlights priority areas needing performance gains to effectively address informality.

Although these are the results for the complete sample, we found diverse behaviors by region (see Appendices 1 and 2). Regional analysis or comparison is not within the scope of this exploratory analysis; these regional differences will be discussed in depth in future studies.

5. Discussion

To understand the connection between informality and institutional quality, it is essential to distinguish between

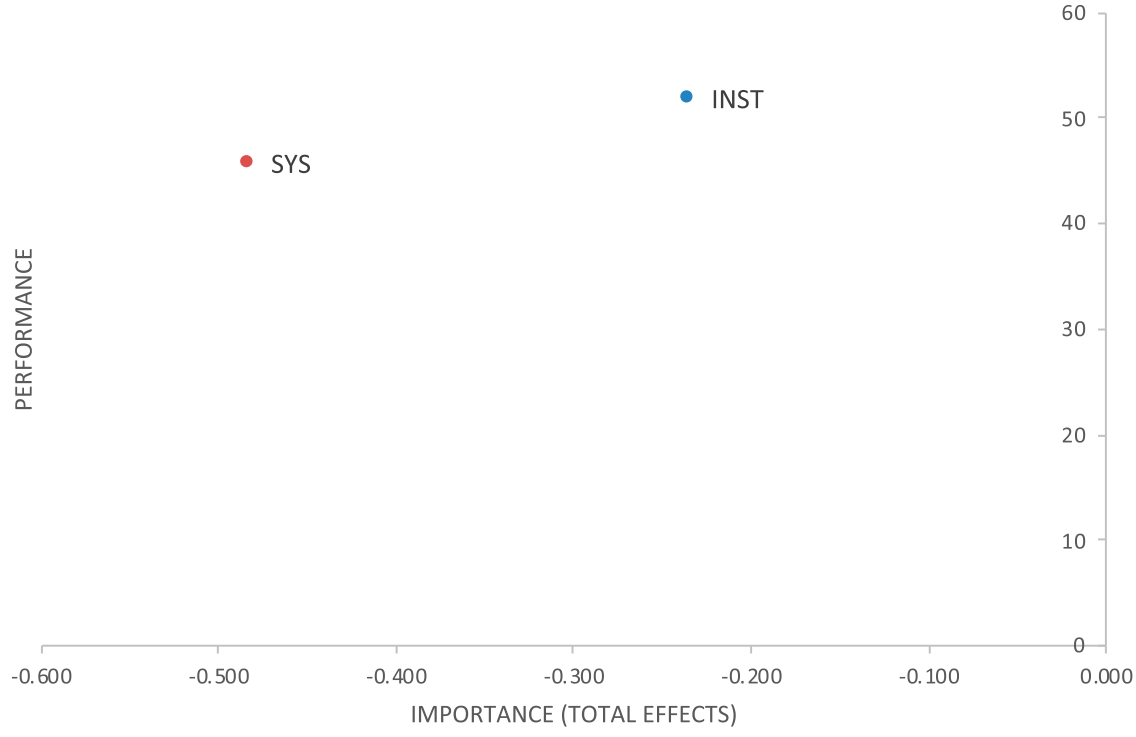


Figure 5. Importance-Performance Map. Source: Authors' elaboration based on the results from SmartPLS4.

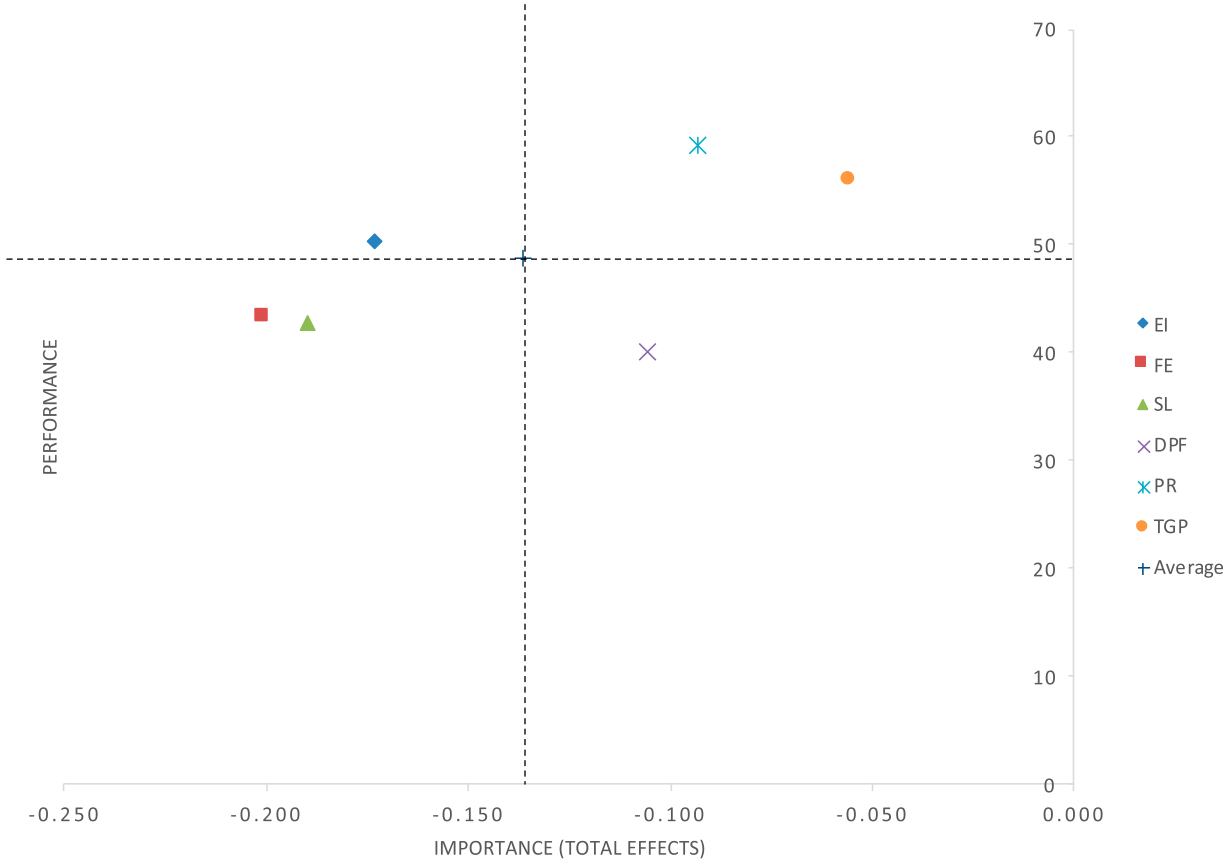


Figure 6. Indicators' Importance-Performance Map. Source: Authors' elaboration based on the results from SmartPLS4.

correlation and causation. This study uses PLS-SEM to uncover correlations between these constructs. PLS-SEM is a powerful tool for uncovering intricate interrelations and patterns in data, enabling the modeling of latent constructs and their connections. The current methodology does not prove causality; therefore, the findings are only suggestive of associations and potential causal pathways. This analysis emphasizes the importance of institutional quality in informality and encourages further causal studies.

The estimated coefficients were consistent with the model's propositions. The path coefficient from institutional quality to informality is −0.235, which is statistically significant ($p < 0.001$). This negative coefficient aligns with our first proposition (P1) that higher levels of institutional quality, as measured by property rights protection, a lack of public fund diversion, and government transparency, reduce the size of a country's informal sector. This finding corroborates previous studies showing that strong institutions discourage informal economic activities (Dabla-Norris, Gradstein, and Inchauste 2008; Loayza, Serven, and Sugawara 2009).

Comparatively, the path from the systemic context to informality has a larger coefficient of 0.419 ($p < 0.001$), indicating that systemic conditions may play an even greater role than institutional factors in driving informality. This supports our second hypothesis (P2) regarding the impact of state legitimacy, inequality, and factionalized elites.

The analysis found a stronger association between systemic factors and informality levels than between institutional quality and informality. For example, a 1 unit increase in systemic context was associated with a 0.419 unit increase in informality, while a 1 unit increase in institutional quality was associated with a −0.235 unit change in informality. This suggests that systemic conditions such as state legitimacy, inequality, and factionalism may have a greater relationship with the size of the informal sector.

The competitive mediation result is consistent with our proposal (P3) that systemic conditions have an association with informality levels through their relationship with institutional quality. The analysis found associations between poorer institutional quality and higher rates of informal activities. The latter is consistent with Elgin and Oztunali (2014), showing that institutional quality shapes the impact of other factors on informality. Notably, all the estimated parameters are statistically significant. This indirect effect of systemic context on informality corresponds to 13.25% of the total effect.

Our analysis offers insights into informalities in emerging economies. Systemic conditions like state legitimacy and inequality are key drivers, so improving them could reduce informality. Although public fund diversion signals weak institutions, it has the lowest performance, which merits attention. Tackling these systemic and institutional factors may help to reduce entrenched informality.

Regional variations were not the focus but were notable, with differences in how indicators impact informality. Limited and unequal country representation may explain this finding. Further studies on geography-specific drivers are needed. The Appendix illustrates the preliminary regional findings.

6. Contributions and limitations of this study

This study makes several key contributions to the literature on informality. First, it applies quantitative techniques, such as PLS-SEM, mediation analysis, and IPMA, which have been underutilized in this domain. This methodological innovation provides a foundation and benchmark for future modeling-based research on informality. Second, the findings reveal nuanced differences between the impacts of institutional and systemic factors on informality levels. This granularity significantly advances the understanding of the multidimensional drivers of informality.

Third, the analysis highlights institutions' specific mechanisms for fostering equitable property rights, accountability, and fairness to combat informality. The results elucidate the concrete institutional channels that policies could target for greater formalization. Fourth, the focus on Emerging Markets and Frontier Economies, where informality is most entrenched, provides context-specific insights where they are most needed. Finally, the initial disaggregation of the results by region reveals geographical variations in informality dynamics that warrant future location-specific studies.

However, a longitudinal analysis cannot support definitive causal claims, which would require other methods. The sample covers only 48 countries and is skewed towards certain regions, restricting the generalizability of the findings. Reliance on secondary data risk measurement inconsistencies compared to purpose-built primary indicators. Quantitative relationships should be complemented by qualitative analyses to add nuances and context. The statistical significance testing further validated the IPMA results. Incorporating additional institutional and systemic factors beyond those modeled may reveal supplementary dynamics. Nonetheless, this exploratory analysis provides a starting point for guiding future research and policy.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This research is funded by the Colombia Científica-Alianza EFI Research Program, with code 60185 and [contract number FP44842-220-2018], funded by The World Bank Group through the call Scientific Ecosystems, managed by the Colombian Ministry of Science, Technology and Innovation.

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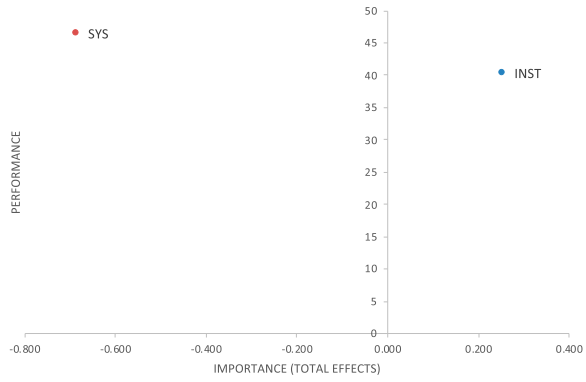
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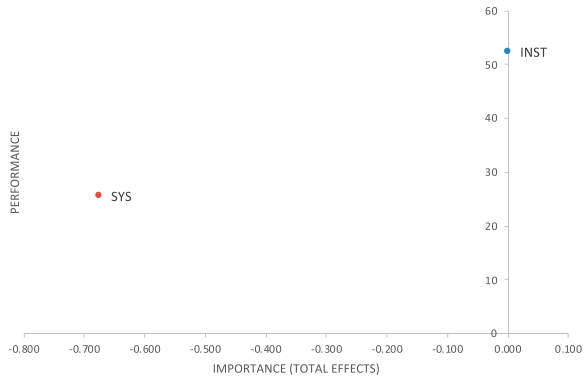
Appendices

Appendix 1: IPMA by region – Constructs

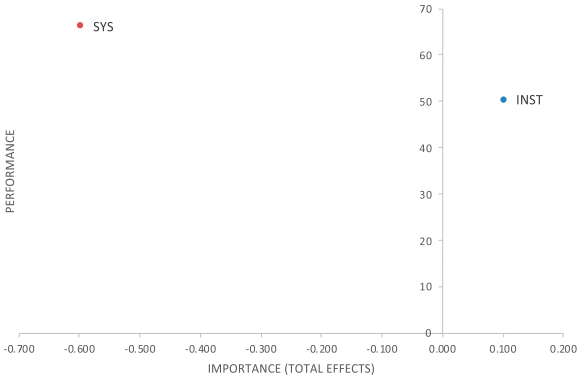
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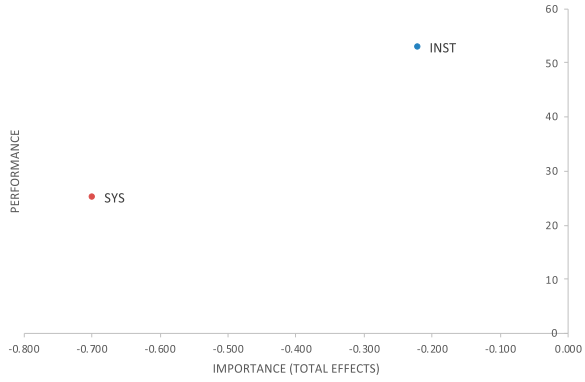
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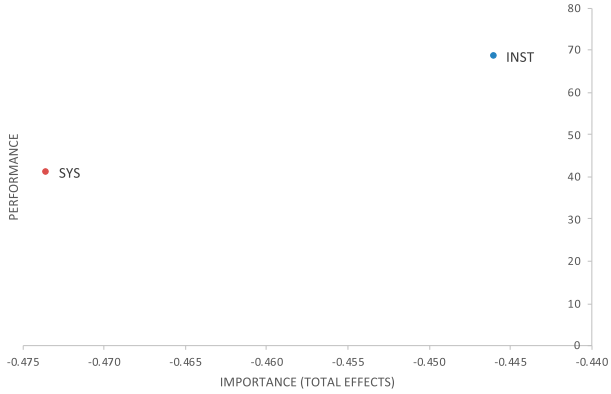
Asia (3)



Africa (4)

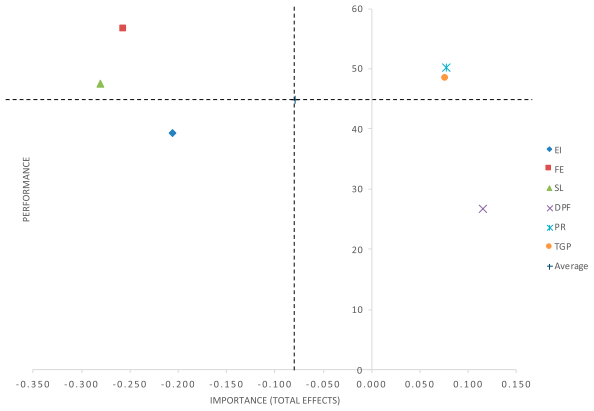


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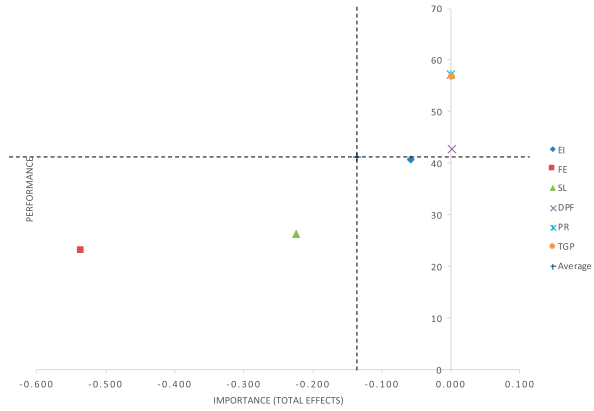


Appendix 2: IPMA by región – Indicators

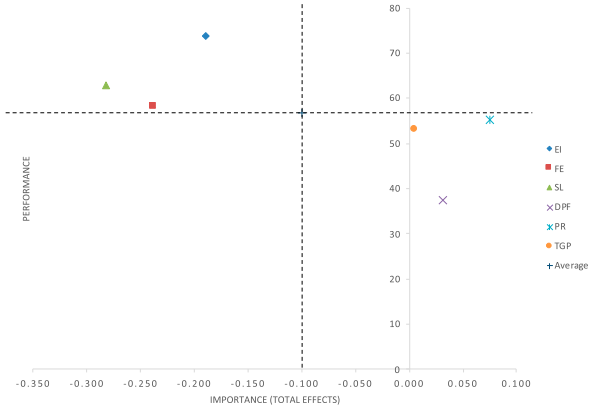
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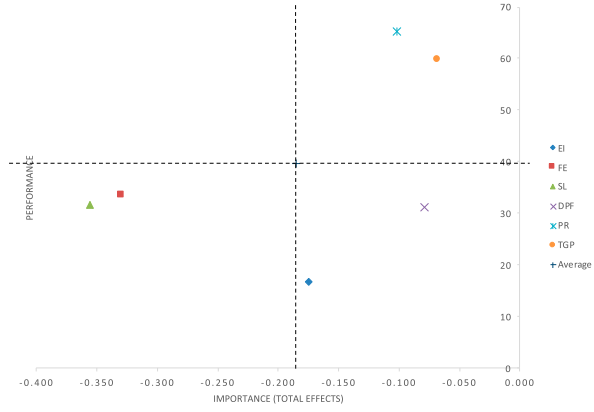
Europe (2)



Asia (3)



Africa (4)



MENA (5)

