2025

The Impact of the Informal Sector on Firm Performance:

New Evidence for MENA Firms

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Abstract

This study investigates the impact of the informal sector on firm performance for over 10.000 nonfinancial firms operating in the 8 MENA countries covering 1997-2020 periods. Using a Panel Dynamic Generalized Method of Moments (GMM), we find that the effect of the informal sector on firm performance is negative. These estimates seem strong according to robustness check. We also do the analyses for SMEs and non-SMEs and find that SMEs are more sensitive to the informal sector. In terms of its findings, the study sheds new light on the MENA region by analyzing the relationship between informal economy and firm performance in a highly heterogeneous manner.

Keywords: Informal sector, firm performance, MENA, GMM

JEL Codes: C33; E26; L25

1. Introduction

The informal sector significantly influences firm performance and economic development, especially in emerging markets and developing economies. It represents a substantial portion of these economies, serving as a critical source of employment and entrepreneurial potential. Accounting for nearly half of economic activities in developing countries (Sultana et al., 2022), the informal sector includes a wide range of labor and business operations outside formal regulatory frameworks. While it contributes to job creation, income generation, and poverty reduction, it also faces challenges such as low productivity, limited financial access, and poor working conditions, which can impede firm performance and broader economic growth.

Informal sector is characterized by firms that typically operate with much lower productivity levels compared to their formal counterparts, often being only one-quarter as productive on average. Informal firms are often small, resource-constrained, and operate with outdated technologies, which limits their productivity (Chacaltana et al., 2022). These firms typically target lower-quality market segments, reducing direct competition with larger, more productive formal firms. The uneven technological adoption and firm size exacerbate this heterogeneity, resulting in a segmented market structure where high-productivity firms do not necessarily compete with their lower-productivity counterparts. This segmentation reinforces structural inequalities within the economy, as informal firms lack the capacity to compete effectively in high-productivity markets, perpetuating their marginalization and limiting their contribution to overall economic growth.

Informal firms often operate under financial and regulatory constraints, which limit their access to resources like capital, skilled labor, and infrastructure. Informality is associated with a lack of legal protections and market access, inhibiting the firm's ability to expand operations or compete effectively with formal businesses (Moyo, 2022). The informal sector's impact on firm performance highlights critical areas for intervention, such as creating an enabling regulatory environment, improving enforcement mechanisms, and fostering access to financial and technological resources.

The impact of informal sector competition on firm performance can be analyzed through modernization theory and the structuralist perspective. Modernization theory posits that informal enterprises are inherently unproductive, low-quality, and indicative of underdevelopment. These enterprises are seen as detached from the formal economy, operating in low-value markets and hindering economic modernization. The structuralist perspective argues that informal enterprises are deeply intertwined with the formal economy, serving as a cost-cutting mechanism for formal firms through outsourcing and subcontracting. Both perspectives agree that informal enterprises undermine formal firms' competitiveness through cost advantages like tax evasion and regulatory avoidance (Williams & Bezeredi, 2018). Therefore, there is a need for tailored policies to mitigate the adverse effects of informality on economic growth and equitable firm performance.

This study investigates the question: How do informal sector activities impact firm performance in the MENA region? To answer this question, the study employs a panel dynamic GMM approach, providing a rigorous and pioneering analysis tailored to the MENA region, which has seen limited exploration of this topic in the existing literature.

This study examines the relationship between informal economy and firm performance for nonfinancial firms operating in 8 different MENA countries. Using the GMM methodology, which accounts for firm dynamics in a real-world based way, the informal economy-firm performance relationship is examined both in the short-run and in the long-run by considering firm dynamics such as firm-level heterogeneity and firm experience. The results show that the informal economy has a negative and significant impact on firm performance both in the short run and in the long run.

The rest of the paper is structured as follows: The second section presents detailed literature review and research questions. The third section details the dataset used and the methodological approach employed in the study. The empirical results of the analysis including robustness check and long-term analysis and heterogeneity analysis are presented in the fourth section. The fifth section provides a discussion of the findings and the final section concludes.

2. Literature Review and Research Questions

Firm performance is an important catalyst for economic development and is one of the determinants of development at the micro level since more profitable firms are eager to give investment and production decisions (see Doruk, 2023). While the literature on firm performance is extensive on developed economies (see George et al.2023; Doruk, 2023; Weinzimmer et al., 2023) the literature on emerging markets and developing economies is rather limited.

Dang and So (2018) find that political turmoil risk is effective for firm performance for Egypt, while Hanousek and Kochanova (2016) consider bribery for Central European firms and emphasize the importance of bribery for firm performance. Mathur and Banchuenvijit (2007) find that the relationship between public privatization policy and firm performance is valid for emerging markets. Gaviria (2002) finds that the effect of corruption and crime on firm performance is also negative. Chauvet and Jacoline (2017) find that corruption is an important

factor affecting firm performance at the global level.

The existing literature on the impact of informal competition on formal firms' performance in emerging economies reveals mixed results. Heredia et al. (2017), Williams & Bezeredi (2018) and Alvarez et al. (2021) all find a negative effect, with Heredia (2017) attributing this to the quality of governance and labor market rigidities, and Alvarez et al. (2021) noting a negative impact on the decision to engage in innovation. However, Pisani (2015) and Amin and Okou (2020) present a more nuanced picture, with Pisani (2015) highlighting the influence of various factors on the impact of informal competition, and Amin and Okou (2020) suggesting that while informal competition can erode market share and resources, it may also spur innovation. These findings emphasize that the relationship between informal competition—businesses that operate without official registration—and the performance of formally registered firms is not straightforward. Instead, it is complex and involves multiple factors. Traditionally, it has been assumed that unregistered start-ups, often perceived as operating in a grey or black market, typically underperform compared to their formally registered counterparts.

Studies like Elgin and Birinci (2016) further add to this complexity by showing that the size of the informal economy interacts with GDP per capita, primarily through its impact on total factor productivity growth. Similarly, Atesagaoglu et al. (2017) find that structural transformation reduces informality in both the industry and services sectors, demonstrating how broader economic shifts influence the informal sector. This is consistent with Mishra (2022), who notes that while the output share of the informal sector may decrease due to economic growth, its employment share often remains significant, partly due to low skill levels and human capital among workers in the informal economy.

Financial and social dynamics significantly influence firm performance in the informal economy. Engström and McKelvie (2017) emphasize that financial literacy and the presence of role models are critical predictors of financial performance, even though they do not directly contribute to growth among micro-enterprises. Similarly, Danquah and Sen (2022) highlight the role of informal institutions, such as social networks and relational contracting, in enabling firms to take risks, which in turn enhances their productivity. These findings suggest that in environments where formal institutional support is weak or absent, informal institutions can effectively substitute for formal mechanisms, playing a crucial role in firm resilience and success.

Traditionally, it has been assumed that unregistered start-ups underperform compared to formally registered firms. However, recent evidence challenges this notion. Studies like Williams and Kosta (2020) and Williams and Kedir (2017a, 2017b, 2016) show that formal firms that began as unregistered tend to exhibit higher annual sales growth, especially in weak institutional environments such as Albania, Turkey, India, and Africa. Escobar (2021) finds that sourcing from the informal economy can provide a cost-related competitive advantage, leading to increased export likelihood and performance. De Castro et al. (2014) support this, emphasizing the dynamic nature of informality and entrepreneurs' strategic decisions in navigating these environments.

This view is complemented by the findings of Kosta and Williams (2020), who argue that

formal enterprises competing with informal businesses experience lower sales and productivity growth. Meanwhile, Atesagaoglu et al. (2018) shed light on the determinants of informality, noting that unemployment and low per capita income contribute to the persistence of shadow economies, particularly in MENA countries.

Moreover, the interplay between formal and informal institutions is crucial for firm profitability. Kafouros et al. (2022) demonstrate that while formal institutional quality, such as efficient judicial systems and property rights protection, disproportionately benefits SMEs, trust—a key informal institution—tends to favor larger firms. This substitution effect between formal and informal institutions underscores the dynamic and context-dependent nature of informality.

Lastly, Fajnzylber et al. (2011) explore whether formalization improves firm performance across dimensions like revenue, employment, and capital stock. Their findings indicate that the channels through which formalization operates are varied, suggesting that transitioning from informality is not uniformly beneficial and depends on specific firm and contextual characteristics.

The literature shows that the relationship between informality and formal sector performance is multifaceted, influenced by structural, institutional, and strategic factors. The dynamic interaction of these elements calls for more nuanced analyses to understand the broader implications of informality on firm performance. The study seeks to answer the following research questions based on the literature review above:

RQ1: What is the short- and long-term impact of informal economy on firm performance?

RQ2: Does the impact of informal economy on firm performance differ for firms with financial constraints?

3. Dataset and Methodology

The effect of informal activities on firm performance is investigated for 10207 non-financial firms operating in 8 MENA countries. The data set employed in the study is obtained from two separate sources. The first source is the Thomson Reuters Refinitiv/LSEG database from which firm-level data are obtained. Between 1997 and 2020, a sample of nonfinancial firms operating in the MENA region was created. The second database is Elgin et al. (2021), where the informal economy is obtained for the 8 MENA countries considered in this study. Thus, this study examines the impact of the informal economy on firm performance at the micro level for non-financial firms operating in 8 MENA countries covering 1997-2020 periods. Since information on the informal economy is not available for the period after 2020, the cutoff date of the sample was chosen as 2020. The number of observations at country level and countries are presented in Table 1.

Table 1. Number of observations at country level

Economy	Freq.	%.
Egypt	1,977	19.37
Kuwait	758	7.43
Morocco	644	6.31
Oman	863	8.45
Qatar	305	2.99
Saudi Arabia	1,706	16.71
Tunisia	551	5.40
Turkey	3,403	33.34
Total	10,207	100.00

This study employs a panel dynamic GMM methodology. The rationale for using this methodology is quite rational and can reflect real-word-world based firm dynamics, which is consistent with the main objective of the study. First of all, in standard regression models, adding the lagged value of the dependent variable (P/A in our study) as the independent variable in the econometric model as a right-hand variable raises the endogeneity problem. The endogeneity problem that arises when there is a right-hand side variable associated with the error term needs to be corrected when the panel data econometrics has a large cross section plane (N) and a relatively shorter time horizon (T) than the cross section, which leads to cross-sectional autocorrelation (especially first order) and heteroscedasticity problems. The panel GMM method, which addresses these issues by using a panel dynamic structure using an instrumental variable matrix (as well as allowing for the separation of endogenous and exogenous variables) to better reflect firm dynamics, is used in this study to address these issues (see Arellano and Bond, 1991). The GMM method is also used because it is robust to firm-level endogeneity and first-order autocorrelation. At the same time, GMM minimizes the measurement errors due to the omitted variable bias problem through the instrumental variables it uses, while taking firm dynamics into account by considering the experience of firms.

The econometric model based on GMM is as follows:

$$P/A_{i,t}=\beta_0+ \beta_1 P/A_{i,t-1}+ \beta_2 LEV_{i,t}+ \beta_3 SIZE_{i,t} +\beta_4 Age_{i,t}+ \beta_5 GSALES_{i,t}+\beta_6 INFORMAL_{i,t}+YEAR+\varepsilon_{i,t}$$
(1)

In this equation, P/A indicates firm performance and is calculated as the ratio of net operating profit to total assets, LEV shows financial leverage calculated as the ratio of liabilities/total assets, SIZE stands for firm size as the logarithm of total assets, Age denotes firm age, GSALES shows firm sales growth rate and is used to control for future growth opportunities. INFORMAL is the informal economy as of GDP in the country where the firm operates. YEAR indicates year dummies and ε denotes the error term.

Since firm-level differences (differences in firm scale, technology, etc.) are common in the MENA region, econometric estimations are made by minimizing firm-level differences using the difference-GMM method.

Please note that the GMM method uses three diagnostic tests. The first one is the Arellano-Bond m tests which test for first and second order autocorrelation. First order autocorrelation is expected in these tests (m1<0.05). However, it is desirable that m2, which denotes second-order autocorrelation, or higher order autocorrelation should not exist. At the same time, the instrument matrix used should not be overidentified. Sargan-Hansen J Test, which tests the non-overidentification of this matrix, is used as the second diagnostic test in this study. The third diagnostic test used in this study is the Wald Test. It tests the significance of the model as a whole.

The descriptive statistics of the variables are presented in Table A1. The descriptive statistics in Table A1 indicate that the variables have a heterogeneous distribution, which is the main objective of this study.

4. Findings

GMM model results are presented in Table 2 below. When we analyze the results in Table 2, we find that firm leverage has a negative effect on firm performance and this effect is statistically significant at 5% statistical significance level. This result indicates that firms' debt has a dampening effect on firm performance in the MENA region. Firm size has a negative effect on firm performance and this effect is significant at 5% statistical significance level. It is found that as firm size increases, firm performance decreases and economies of scale is a disadvantage for firm performance in the MENA region. The SIZE variable, which expresses the growth rate of sales, has a negative effect on firm performance and this effect is statistically significant. Firm performance decreases as firm age (age variable), which refers to firm experience, increases. As firms reach a saturation point in the market, their performance decreases. This effect is also statistically significant at 5% statistical significance level. The effect of the informal economy variable (informalecon), which is the main variable of interest for the research question in the study, on firm performance is negative and this effect is statistically significant at the 5% statistical significance level. The one-year-lagged value of firm performance ($P/K_{i,t-1}$), which controls the dynamic effect in the study, is positive and statistically significant at the 5% statistical significance level. The positive coefficient in front of this variable indicates that firm performance continues to accumulate in the MENA region. Therefore, long-term firm performance is very important for the development dynamics of this region. The extension part of the study already tests the effect of informal economy on this long-term firm performance. The GMM model is also free of second order autocorrelation [AR(2)]. Usually, first order autocorrelation is expected in GMM models because of the large cross-sectional depth (see Roodman, 2009), but not in our AR(2) model. Hansen-Sargan J Test indicates that the arc variable matrix is not overidentified. The Wald Test, which tests the significance of the model as a whole, is significant.

Table 2: GMM Model findings

	(1) P/A$_{i,t}$
P/A$_{i,t-1}$	0.529***
	(9.85)
LEV$_{i,t}$	-0.0841*
	(-2.25)
SIZE$_{i,t}$	-0.00838***
	(-3.78)
GSALES$_{i,t}$	0.0398***
	(3.33)
Age$_{i,t}$	-0.00170***
	(-4.32)
informalecon$_{i,t}$	-0.00524***
	(-3.34)
Time fixed effects	Yes
N	10207
AR(1)	0.00
AR(2)	0.01
AR(3)	0.93
Hansen J Test, p-val.	0.12
Wald Test, p-val.	0.00

Note: *t* statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Robustness check results by employing $\log(\pi)$ as a dependent variable is presented in Table 3. The results in Table 3 actually confirm the main model of the study (see Table 2). First of all, the main variable of interest in this study, informal economy (informalecon), has a negative effect on firm performance and this effect is significant at 5% statistical significance level. The financial leverage variable affects firm performance negatively as in the main model and this effect is also statistically significant. In this model, the effect of firm size (SIZE variable) on firm performance is positive but statistically insignificant. Firm age (age variable in the model) again has a positive effect on firm performance. At this point, the effect of firm age on the logarithmic firm performance variable is positive. This is thought to be due to the firm performance variable having negative values in the sample in this robustness

check, since taking the logarithmic value led to the exclusion of the loss-making firms from the sample. Therefore, firm age is found to be positive for firm profitability and this effect is statistically significant at 5% statistical significance level. The GSALES variable, which expresses the future growth opportunities of the firm, has a positive effect on firm performance and this effect is statistically significant at the 5% statistical significance level. As in the other model, firm performance is positively affected by the lagged value of the firm's performance, albeit on a logarithmic scale, as in the main model. If the diagnostic tests of the estimated GMM model are evaluated, according to the Hansen-Sargan test result, the instrumental variable matrix used in the model is not overidentified. According to the Wald Test, the estimated model as a whole is significant. It is concluded that both GMM models are consistent and the instrumental variables used are valid.

Table 3: Robustness Check : log(π) as a dependent variable

	(1)
	$Log(\pi)_{i,t}$
$Log(\pi)_{i,t-1}$	0.312^{***}
	(8.67)
$LEV_{i,t}$	-0.886^{**}
	(-3.12)
$SIZE_{i,t}$	0.00204
	(0.06)
$GSALES_{i,t}$	0.721^{***}
	(7.31)
$Age_{i,t}$	0.0502^{***}
	(6.77)
$informalecon_{i,t}$	-0.113^{***}
	(-5.66)
Time fixed effects	Yes
N	7409
AR(1)	0.00
AR(2)	0.90
AR(3)	-
Hansen J Test, p-val.	0.11
Wald Test, p-val.	0.00

Note: *t* statistics in parentheses. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

The impact of informal economy on firm performance in the long run is also analyzed. As one of the important advantages of the GMM method, it is possible to analyze the effect of informal economy on firm performance in both short and long term. In the long-run, the

GMM model results are found to be higher than the short-run informal economy-firm performance relationship. In other words, it is concluded that in the long run, informal economy has a worse impact on firm performance and seriously deteriorates the business environment. Since profitability, which expresses firm performance, is also seen as the barometer of the economy, it is found that the informal economy seriously distorts the barometer of the economy and harms development dynamics in the long run. Long-term effects in the GMM model are based on the $\beta/(1-\lambda)$ estimation, where β represents the coefficient of informal economy, $1-\lambda$ represents the long-run path of firm performance.

The long-term informal economy-firm performance relationship results is presented in Table 4.

Table 4: The long-term informal economy-firm performance relationship

Dependent variable	Coefficient	p-val.	Decision
$P/A_{i,t}$	-0.01	0.00	In the long run, the effect of informal economy on firm performance is greater than the short run effect.
$Log(\pi)_{i,t}$	-0.16	0.00	In the long run, the effect of informal economy on firm performance is greater than the short run effect.

The results in Table 4 show that the effect of informal economy on firm performance is long term. According to the results of the analysis with both the main model and the firm performance variables discussed in the robustness check section, informal economy has a statistically significant effect on firm performance in the MENA region, which is higher than the short-term effect. Therefore, informal economy is found to be an important long-term wedge for firm performance in the MENA region. This confirms that the informal economy is an important wedge for development in the MENA region. These findings suggest to policy makers that the informal economy needs to be addressed in the long run. Finally, the relationship between informal economy and firm performance needs to be addressed heterogeneously in the MENA region. In heterogeneously addressing the firm performance-informal economy relationship, both firm size and firm age are important and access to finance through firms' financial constraints should also be addressed within the framework of firm size and firm age. This study addresses such a novelty. Using the Hadlock-Pierce index, firms with financial constraints are treated in a time-varying manner as follows and the impact of the informal economy-firm performance relationship on firms with time-varying financial constraints is analyzed. The HP index is defined as follows:

$$HPIndex = (-0.070 \times SIZE) + (0.043 \times SIZE^2) - (0.040 \times age) \qquad (2)$$

The HP index is an index of financial constraints based on the age and scale of firms and coefficients based on the size and age of firms by Hadlock and Pierce (2010). HP index of firms with financial constraints generated according to the HP index is calculated as 4 separate quantiles and interacted with the informal economy. In this framework, the informal economy-firm performance relationship is analyzed by taking financial constraints into account in four different time-based quantiles.

Table 5. The informal economy-firm performance relationship under the moderating role of financial constraints

	(1) $\text{Log}(\pi)_{i,t}$	(2) $P/A_{i,t}$
$\text{Log}(\pi)_{i,t-1}$	0.307*** (8.80)	
$\text{Lev}_{i,t}$	-0.848** (-3.09)	-0.0572 (-1.48)
$\text{gsales}_{i,t}$	0.716*** (7.30)	0.0389** (3.16)
INF*Q1	-0.118*** (-5.93)	-0.00447** (-2.75)
INF*Q2	-0.114*** (-5.70)	-0.00482** (-2.93)
INF*Q3	-0.113*** (-5.73)	-0.00516** (-3.17)
INF*Q4	-0.112*** (-5.63)	-0.00586*** (-3.65)
$P/A_{i,t-1}$		0.551*** (10.43)
Time fixed effects	Yes	Yes
N	7409	10207
AR(1)	0.00	0.00
AR(2)	0.93	0.01
	-	0.92
AR(3)	0.17	0.16
Hansen J Test,		0.00
p-val.	0.00	
Wald Test, p-		

Note: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5 presents the findings of these calculations. To evaluate the findings in Table 5, the informal economy-firm performance relationship is analyzed in models where both P/A and $\log(\pi)$ are dependent variables. In this framework, it is found that even if financial constraints change over time and even if they change in terms of quantiles, the informal economy almost homogeneously affects firm performance through financial constraints. In other words, informal economy is found to be a very serious problem in 8 different countries in the MENA region. These findings can be counted as quite interesting and novel for the MENA region.

If we consider the long-term effects again under the moderating role of financial constraints, we again find a higher average effect of the informal economy on firm performance than the short-term results obtained in the GMM model. However, these effects do not differ much at the quantile level in the long run as in the short run.

Table 6. The long-term informal economy-firm performance relationship under the moderating role of financial constraints

Dependent variable	Coefficient	p-val.
P/A for INF*Q1	-0.009	0.00
P/A for INF*Q2	-0.010	0.00
P/A for INF*Q3	-0.011	0.00
P/A for INF*Q4	-0.013	0.00
Log(π) for INF*Q1	-0.1696	0.00
Log(π) for INF*Q2	-0.1639	0.00
Log(π) for INF*Q3	-0.1635	0.00
Log(π) for INF*Q4	-0.1616	0.00

Table 6 analyzes the long-run informal economy-firm performance relationship within the framework of financial constraints. In the long run, the effect of the informal economy on firm performance is almost identical at the quantile level for firms with financial constraints (there are very slight and negligible differences).

5. Discussion

Our findings suggest that informal economy has a significant effect on firm performance in both the short- and long-run. This effect of the informal economy on firm performance is obtained by controlling for future growth opportunities, financial leverage, and firm size and age. The study provides robust evidence that informal economic activities negatively impact firm performance in the MENA region. This analysis aligns with and expands upon existing literature by examining the nuanced effects of informality on firms in diverse contexts.

Consistent with findings by Heredia et al. (2017) and Alvarez et al. (2021), the study confirms

that informal competition erodes formal firms' profitability and growth potential. However, it provides a more detailed account of how financial constraints and firm size influence these dynamics. These findings complement research by Amin and Okou (2020), who noted that informality's impact varies by firm characteristics, including financial capacity.

Previous studies, such as Alvarez et al. (2021), suggest that informal competition discourages innovation among formal firms. While this study focuses primarily on profitability and growth, its findings indirectly highlight how the pressures of informal competition may limit the resources available for innovation, further undermining long-term competitiveness.

The results emphasize that SMEs are more vulnerable to informal competition compared to larger firms, consistent with Pisani's (2015) observations. Pisani's insights into the role of institutional rules of the game and regional disparities resonate with the study's findings. For instance, firms operating in regions with weaker institutional enforcement or away from economic hubs face greater challenges in managing informal competition. This mirrors the study's conclusion that informal activities have a homogeneous negative effect across firms but intensify under conditions of limited regulatory scrutiny and financial strain.

By analyzing the long-term impacts of informality, the study complements De Castro et al.'s (2014) call for more cross-level research. It illustrates how meso-level norms can perpetuate informality, undermining broader economic development over time. Policy measures aimed at addressing informality must therefore account for these meso-level dynamics, which promotes norm shifts that encourage formalization while mitigating the systemic disadvantages faced by formal firms.

6. Conclusion

This study analyzes the informal economy-firm performance relationship for more than 10.000 nonfinancial firms operating in 8 MENA countries between 1997-2020 using GMM methodology. The findings obtained as a result of GMM models can be very instructive for nonfinancial firms operating in the MENA region. First of all, the results show that the informal economy-firm performance relationship has a homogeneous effect that affects all firms, even if firm-level heterogeneity is taken into account. At the same time, this effect has a negative structure that increases in the long run. At the same time, if we take into account time-based financial constraints, we find that the effect of the informal economy on firm performance affects firm quantiles with financial constraints at almost the same level.

The findings of this study, therefore, suggest that the informal economy is a serious problem in the MENA region. This makes it necessary for policy makers in the MENA region to take measures and design a set of policies to prevent the informal economy for the long-term sustainability and improvement of economic development dynamics.

These results have policy implications by focusing on how firms can develop a strategy to cope with this problem. At the same time, it is also planned to determine how much more firms with financial constraints are likely to be affected by the informal economy (relative to their peers without financial constraints). At this point, it is planned to identify and provide policymakers in the MENA region with important policy recommendations on the role of informal economy in improving the performance of firms and enhancing development.

The limitations of the study include the use of publicly held firms in this study. Since it is very difficult to obtain samples or information on private firms in MENA over a long period of time, we have used publicly held firms in this study. Therefore, caution should be taken in generalizing the findings. For further studies, it is recommended that future studies should address the informal economy in depth and at the country level, such as case studies.

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Appendix

Table A1. Descriptive Statistics

Variable		Mean	Std. dev.	Min	Max	Observations
$P/A_{i,t}$	overall	.0655596	.081364	-.2336992	.3444863	N = 10207
						n = 847
						T-bar = 12.0508
$LEV_{i,t}$	overall	.4759409	.2405187	4.49e-07	1.397277	N = 10207
	between		.2145659	.0129122	1.38595	n = 847
	within		.1314425	-.2904574	1.6342	T-bar = 12.0508
$SIZE_{i,t}$	overall	19.87766	2.263155	14.99115	32.67669	N = 10207
						n = 847
						T-bar = 12.0508
$GSALES_{i,t}$	overall	.013702	.2752199	-1.295746	1.354355	N = 10207
						n = 847
						T-bar = 12.0508
$Age_{i,t}$	overall	30.59577	17.17923	1	116	N = 10207
						n = 847
						T-bar = 12.0508
INF_t	overall	27.75778	7.041605	16.81	38.57	N = 10207
						n = 847
						T-bar = 12.0508
$Hpindex_{i,t}$	overall	14.59518	3.941764	6.990242	42.50658	N = 10207
						n = 847
						T-bar = 12.0508
$Log(\pi)_{i,t}$ (in the robustness checks)		17.37938	2.122288	11.2083	22.19921	N = 7409
						n = 795
						T-bar = 9.3195

Table A2. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) $P/A_{i,t}$	1.000							
(2) $LEV_{i,t}$	-0.166*	1.000						
(3) $SIZE_{i,t}$	-0.074*	0.095*	1.000					
(4) $GSALES_{i,t}$	0.123*	0.072*	0.035*	1.000				
(5) $age_{i,t}$	0.042*	0.025*	0.088*	-0.063*	1.000			
(6) INF_t	0.051*	0.198*	0.072*	-0.049*	0.263*	1.000		
(7) $hpindex_{i,t}$	-0.092*	0.067*	0.973*	0.047*	-0.114*	0.017	1.000	
(8) $Log(\pi)_{I,t}$	0.335*	0.144*	0.749*	0.082*	0.132*	0.046*	0.668*	1.000

*Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.*