Financial Development, Corruption and Shadow Economy: Evidence from MENA Countries

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Abstract

In this paper we examine the relationship between the financial development, corruption, and the size of shadow economies in the MENA region over the period from 1996 to 2018. An important contribution is the study how financial development and corruption can interplay to affect informality. Several pooled regressions are run on the entire sample and various subsamples in order to understand the heterogeneity that might exist among countrie. Even after addressing the potential endogeneity problem of the variables, we find robust results showing the following: increases in corruption and financial development reduce the size of the informal sector. Corruption is, hence, playing the role of "*grease of the wheels*" in MENA region. Moreover, these two dimensions are substitutable in relationship with the unofficial economy; the marginal impact of increasing along one dimension is higher when the other dimension is low. The subsample analysis reveal that the impacts of financial development and corruption can be remarkably different between lowly corrupt and highly corrupt countries. Interestingly, the statistical significance of these two factors vanishes for the high-income countries. Obviously, the efforts against informality in the MENA region are multidimensional and dynamic and at each stage of economic, financial, and institutional development, new factors may appear and gain importance.

Keywords: Financial development, Corruption, Shadow economy
JEL classification: G20, O17

1. Introduction

Informality, the shadow economy,[1] is a common issue that countries face all over the world, particularly developing countries. In 2015, the ILO Recommendation n°204 concerning the transition from the informal to the formal economy describes the "informal economy" as referring to all economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements.[2]

The shadow economy presents a formidable policy challenge for policy setting not only in emerging and developing economies but also present in developed countries. (Schneider and Enste, 2000; Torgler and Schneider, 2009). Previous research has generally concluded that informal activities can have a negative impact on an economy[3] .

In identifying the causes of informality, the literature has largely focused on the roles of the taxes and social security complexity and fairness, the burdens of bureaucracy, regulations, and corruption (Schneider, 1994; Loayza et al., 2005; Johnson et al., 1998; Friedman et al., 2000; Schneider, 2007). Also, the literature has investigated how the level of financial development can affect the size of the shadow economy.

Theoretically, it is expected that as a country becomes able to control corruption by improving the quality of its governance and institution and as the access to loanable funds increases, as the incentives of entrepreneurs to operate in the official economy increases. Nevertheless, several studies have shown that the relationship between financial development and informality is still ambiguous.

In the context of the Middle East and North Africa (MENA) region informal economy stands at the heart of the region's key political and economic challenges. It absorbs a large share of the region's youth unemployment, exemplifies the inability of the state to promote inclusive development, and puts marginalized individuals at the mercy of the police and security services.

[1] In this paper the terms: Informality, informal economy, shadow economy, underground economy, unofficial economy will be used interchangeably.

[2] OECD/International Labour Organization (2019), "Definitions of informal economy, informal sector and informal employment", in Tackling Vulnerability in the Informal Economy, OECD Publishing, Paris.

[3] Some literature have attempted to show some positive effects of the informality in reducing unemployment and enhancing entrepreneurial activity (Blanchflower (2000), Thurik et al. (2008), Bacchetta et al. (2009) and Perry et al. (2007)).

The informal economy directly connects to key themes of the 2011 uprisings: economic inequality, accountability, dignity, and social justice. However, very little has been written about the region's informal economy. Moreover, very little has changed for the over 50 million people making a living in the region's informal economy.

While financial development and corruption impacts on shadow economy have been studied extensively, the effect of their interaction has not. Accordingly, in addition of examining the direct effect of two major determinant of informality; i.e., corruption and financial development on the shadow economy in MENA region, this study tries fill the gap in the literature by investigating how these two factors interact with each other in relationship with the shadow economy. A priori, we expect that the development of the financial system in MENA countries can moderate the negative effect of corruption on the economy by attracting entrepreneurs to operate officially.

This paper aims to provide an initial analysis of the determinants of the informal economy in the MENA region. Principally, two factors motivate us to take MENA countries as a case study. In addition to the fact that the presence and prevalence of the informal economy in many countries in this region is a concerning issue for their economic development, we observed that when some MENA countries find difficulties to tackle unofficial activities (Tunisia, Egypt, Morocco) others, have succeed in having levels of shadow economy like those recorded in developed economy (Bahrain, Iran, Qatar, Jordan).

The rest of the paper is structured as follows; the next section exhibits a brief literature review on the relationships between corruption, financial development, and shadow economy. Section 3 details the methodological framework of our empirical work. Section 4 presents the empirical results. Sections 5 and 6 provide robustness checks of our results baseline and extends the empirical work to a subsample analysis, respectively. Section 6 concludes.

2. Literature Review

This obscure and complex side of the economy; namely, the shadow economy, is a subject that has attracted the intention of many economists and that in order to understand better its causes and consequences on growth and development. One of the main topics in this literature is about the relationship between the corruption phenomenon and the shadow

economy and that despite the difficulties that researchers have found in collecting data.[4] For example, on the basis of a theoretical and empirical framework, Johnson et al. (1997) studied the unofficial economy in the countries of Eastern Europe and the former Soviet Union in transition from communism to capitalism and found that during the transition the consequence of the political control of the economy has been the growth of the unofficial economy in which entrepreneurs can avoid taxes, regulation and bribes payment. They show that a one-point decrease in corruption reduces the share of the unofficial economy by 5 to 6 percentage points. Friedman et al. (2000) working on a data of 69 countries confirm this finding and assert that corruption is associated with more unofficial economy. They point out that Entrepreneurs go underground not to avoid official taxes but to reduce the burden of bureaucracy and corruption. Conversely, Choi and Thum (2005) and Dreher et al. (2008) predict negative (substitution) relation between corruption and the shadow economy. Dreher and schneider (2010) studies a data of a cross section of 98 countries and argue that the relationship between corruption and the shadow economy is sensitive to the measure of corruption used in the regression; namely, perception- or structural model- based. When the latter is employed both, corruption and shadow economy become complements in low-income income countries and not in high income ones.

Another no less important theoretical determinant of unofficial economy is the accessibility to loanable funds. Entrepreneurs and workers operating unofficially are often credit-constrained and unable to access credit markets. A large number of papers have investigated the relationship between the shadow economy and the financial development in a country *(Bose and al (2012), Antunes and Cavalcanti (2007), Straub (2005)*. Blackburn et al. (2012) prove theoretically, that lack of financial development expands the size of the informal sector. Capasso and Jappelli (2013) argue that a well-established and functioning financial system reduces the cost of credit and discourages economic agents from engaging informal activities, impeding, hence, informality. Bittencourt et al. (2014) study a panel data of 150 countries over the period (1980–2009) and find that higher levels of financial development and lower inflation reduce the shadow economy. Berdiev and Saunoris (2016) using a panel data of 161 countries during the period (1960–2009) find evidence of a negative association between Financial Development (hereafter, FD) and Informality. Liu-Evans and Mitra (2019) confirm further the previous results.

[4] Early studies have mostly worked on small samples.

Several theoretical studies develop the channels through which the financial development can influence firms' choice to operate, totally or partially, informally. These modelling efforts rely on financial market imperfections, especially information asymmetries, and regulatory and tax compliance costs. The typical model setup assumes that firms weigh the access to finance, or the cost of funding –that is only available to formal activity with compliance cost. Greater financial development reduces the cost of finance, and/or expands access to finance, and therefore entices firms to operate formally.

Nevertheless, the literature reveals also that the relationship between financial development and the informal economy is complex. Sirisankanan (2017) argue that the relationship between financial development and informal employment is ambiguous; in fact, this relationship can be positive or negative. On the one hand, financial development can ease the liquidity constraints of individuals who want to set up their enterprises, thus encouraging informal employment. On the other hand, it can reduce informality by stimulating economic growth and therefore contributes positively to employment in the formal sector, by reducing informal employment. Sirisankanan (2017) using the economic growth–informality nexus and using several empirical specifications, found that financial development can indeed reduce informality in the job market, but this relationship depends on the level of economic growth and development. Akçay, & Karabulutoğlu, (2021), Employing pool mean group (PMG)/panel ARDL approach and a panel data set over the period 1980–2015 finds that the effects of financial development on the informal economy in North Africa countries depends on the levels of remittances. They find that remittance can moderate the negative relationship between financial development informal economy in the North African region. Finally, Njangang et al. (2020) study a sample of 41 sub-Saharan countries using a panel data during the period (1991–2015). They find a nonlinear U-shaped relationship between financial development and the informal economy, suggesting, accordingly, that in low-income countries the development of the financial system, at a first stage, decreases the informal economy then at a second stage and after a certain threshold any development in finance would be associated with an increase in informality.

Some studies have also underscored the importance of the interaction between financial development and corruption, shown that financial development reduces corruption, (Altunbas and Thornton, 2012; Jha, 2019), suggesting that looking at the relationship between financial development and corruption may provide valuable insights on the global effect of financial

development on informal economy. Yet, there are no studies investigating the link between the three.

Besides their relationship with the shadow economy, the literature has also examined the relationship between corruption and financial development. Ahlin and Pang (2008), based on a cross-country analysis between 1960 and 200, study the effect of corruption and financial development on growth, and notably their interactive effect. The empirical framework shows that the interaction term coefficient is negative and significant. This result points out that financial development and corruption to be substitutes in relationship with growth. The marginal impact of improving is higher when the other dimension is less advanced.

Guiso et al. (2004) show that financial development leads to an increase in market competition by promoting entrepreneurial activity. They find that financial development is positively associated with the probability an individual starts his own business and the entry of new firms. Since efficiency concerns become crucial with increases in both, the number of firms and an increase in market competition, financial development is likely to reduce the scope of paying bribes for the latter translates into a higher cost of production. Indeed, it has been shown that corruption is lower in countries where firms operate in highly competitive markets (Ades and Di Tella, 1999).

By combining different strands of literature, this paper's idea, notably inspired to certain extent from Ahlin and Pang (2008), aims to investigate the effects of corruption and financial development and their interaction on the MENA region's unofficial economies. This paper has two principal objectives: first, contributing to enrich the literature on the shadow economy on the MENA region by uncovering its determinants; in fact, the literature is very meager when it comes to the impact of financial development on shadow economy in MENA countries – we start from the hypothesis that policies to tackle informality in some MENA countries could be impeded by the development delay of their financial sector. Second, since and to the best of our knowledge researchers have not yet examined interactive effect of corruption and financial development on informality, this paper aims to fill this gap in the literature – our hypothesis is that financial development can alleviate the theoretical positive role of corruption in feeding the unofficial economy.

3. Data and Model:

We collect data on twenty MENA countries during the period from 1996 to 2018.[5]As emphasized in the literature on Informality, by its nature the shadow economy is very difficult to measure. Besides being evaluated through surveys in the fields, some economists employed some sophisticated methods to estimate the size of the shadow economy. Our first data on the size of shadow economy as a percentage of the GDP are estimated based on Multiple Indicators Multiple Causes (MIMIC) approach. According to this approach, the level of an unobservable, latent variable (such as a nation's shadow economy as a percentage of GDP) is estimated by using two sets of equations linking the size of the shadow economy to its "indicators" and "causes." The principal advantage of this approach is that the obtained estimates are based on several measures reducing, consequently, the problem of measurement errors. The second set of data on the shadow economy is estimated using the Dynamic General Equilibrium (DGE) approach. Both data are obtained from Informal Economy Database of the World Bank as provided by Elgin et al (2021).

To measure the level of corruption, three indicators are employed. The first measure is the Corruption Perception Index (CPI), as provided by *Transparency International* (TI). It is the most widely used global corruption ranking in the world and it measures how corrupt each country's public sector is perceived to be, according to experts and businesspeople. The second measure is the index provided by the *International Country Risk Guide* (ICRG). This indicator is based on the analysis of a world-wide network of experts. The third measure of corruption is provided by the World Bank (Kaufmann et al. (2010)) and called the *Control of Corruption Index* (WB). It captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. All these three measures are rescaled so that 0 represents no corruption and 1 highest corruption.

The macroeconomic and development data, notably those related to the financial development, are from the World Bank databases. The regulation index data is taken from the *Economic Freedom of the World* (Gwartney et al. (2021))

Using the data detailed above, we use the following pooled model to estimate the effects of the financial development (hereafter, FD), Corruption and their interplay on the share of the shadow economy (hereafter, SE) on MENA countries:

$$SE_i = \beta_0 + \beta_1 FD_i + \beta_2 Corr_i + \beta_3 FD_i \times Corr_i + \sum_{j=1}^{m} \alpha_j X_{ji} + \varepsilon_i \qquad (1)$$

[5] Only Iraq is not included in the sample because the lack of the shadow economy's data on this country.

Where:

SE: is the share of the shadow economy as a percentage of the GDP.

FD: is the level financial development as represented by the percentage of private credits in the GDP.

$Corr$: the level of corruption in the economy.

X: is the vector of control variables.

i and j : are subscripts for the country i and the variable of control j, respectively.

ε: is an error term.

We employ some control variables in accordance with the literature. Alm and Embaye (2013), Autio and Fu (2015) and Gërxhani (2004) argue that economic conditions and income might give the incentives to operate underground. For this reason we employ the logarithm of the GDP per capita as a control variable. We employ an indicator for a country's openness to international trade. This indicator is the sum of the exports and imports as percentage of the GDP. In fact, Schneider and Enste (2000), Were (2015) and Cahn et al (2020 argue that openness to international trade affect not only the official side of the economy but also its unofficial side. Also a measure of the regulation burden is included in equation (1). Neck et al. (2012), Johnson et al., (1998), and Friedman et al. (2000) point out that excessive government and labor regulations and taxes are associated with a large shadow economy. To account for the labor market characteristics, we include the proportion of a country's population that is employed; the greater the unemployment rate, the greater the pressure on labor markets to absorb new entrants and the greater is the incentives to work in the informal economy. We also consider the proportion of the urban population to measure the pressure on the urban labor market. To control for education, we use the percentage of secondary education completion. The higher the education level of the population, the lower the informal economy. This data is provided by the World Development Indicators database of the World Bank.

Finally, since MENA countries are principally divided into two categories; namely oil exporters and oil importers, we add a dummy variable for oil exporting countries to control for the effect of the level of economic diversification on the size of informality in the economy.

Table 1 exhibits the summary statistics of the data described above.

Table 1. Summary statistics

	N	Mean	Median	Std. Dev.	min	max
SE (mimic)	435	26.306	26.698	7.366	16.694	39.009
SE (DGE)	437	24.141	22.127	7.06	14.536	40.742
Credits to GDP ratio (%)	446	68.506	59.402	44.078	8.579	260.618
Corruption (TI)	353	.611	0.640	.156	.23	.89
Corruption (ICRG)	380	.627	0.667	.133	.167	.917
Corruption (WB)	483	.558	0.559	.149	.187	.833
lngdp capita	476	8.851	8.509	1.162	6.859	11.084
Openness	464	79.395	77.359	33.714	.027	191.873
Regulation	361	6.388	6.464	1.231	3.054	8.746
Urban pop. (%)	483	69.66	71.589	19.934	24.249	100
Unemp. Rate (%)	483	9.312	9.604	5.612	.11	29.77
Second. Education Completion (%)	368	21.457	19.315	9.351	3.58	41.4

The ordinary least square method is employed to estimate the pooled model (1).

Of particular interest for us is whether financial development, in addition to its direct effect, acts as a potential *moderator* in the corruption–informal economy relationship. CK Jha (2019) argues that continuous financial liberalization can impact corruption in several ways: first, Beck et al. (2006) points out that by mandating banks to reveal precise information about their finance the obstacle to credits that firms face in an environment of a corrupt banking sector can be extenuated The entry of private and foreign banks in the market would stimulate the competition in the banking sector pressurizing them to be more efficient and be able to offer better financial services and low-cost and corruption-free loans. Second, financial development leads to an increase in market competition by promoting entrepreneurial activity. Guiso et al. (2004) show that the financial development increases the probability of starting new businesses and for new firms to enter markets. The resulting stimulation of the competition would reduce the scope of paying bribes demanded by officials because it translates into a higher cost of production. Hence, markets competition lowers corruption. In light of this theoretical background stands the contribution of this paper and, accordingly, an interaction term between financial development and corruption is added into the model (1).

The marginal effects of financial development and corruption can be measured simply by taking the partial derivative of Equation (1) with respect to corruption control as follows:

$$\frac{\partial SE_i}{\partial\, Corrup_{\,i}} = \delta + \gamma \times FD_i \qquad (2)$$

If γ is significant, then we can say that the impact of corruption on informal economy depends on financial development. From Equation (2) if $\delta, \gamma > 0$ then higher the FD and more corruption would spread the informal economy. On the other hand, if δ, γ have different signs, it means that there is a threshold effect, suggesting that the effect of corruption on the informal economy differs with the levels of FD. For instance, if $\delta > 0$ and $\gamma < 0$, the marginal impact of corruption control would be positive for low values of FD, and negative for high values of FD. Hence, to verify this, it is essential to gauge the marginal effects within the sample.

4. Results

These measures are the International Country Risk Guide (ICRG) corruption indicator[6] and the World Bank's control of corruption index.[7]

4.1. Baseline Model Results

The baseline model in equation (1) is estimated and the results are given in Table 2. At this stage of the empirical work, we do not control for potential endogeneity problem and estimate the model using the ordinary least square. Two sets of shadow economy data (hereafter, SE)– the dependent variable, are employed; the first is the MIMIC-based data as estimated in Schneider (2005)[8] and the second set is the data as estimated in Elgin and Oztunali (2012). The results of the MIMIC-based SE measure are given in columns (1), (2) and (3). Columns (4), (5) and (6) show the results based on the second set of SE data.

The estimation results in in all SE regressions and for all three measures of Corruption show that the financial development (hereafter, FD) coefficients are negative and highly statistically significant. It appears then that in the MENA region and in accordance with the theory as the financial system develops its efficiency and eases further the accessibility of entrepreneurs to loanable funds as more firms get incentives to transit from the unofficial economy to the official one.

All direct Corruption coefficients the three MIMIC-based SE regressions are also negative and highly statistically significant revealing that as the level of corruption in a country increases as the share of informality in the economy shrinks. The negative sign of this

[6] Measures corruption in the political system as a threat to foreign investment based on the analysis of a worldwide network of experts. Rescaled so that the greater this indicator, the greater is the level of corruption in a country.

[7] Kaufmann et al. (2003). This index is also rescaled so the greater it becomes, the greater is the level of corruption in a country.

[8] We are very grateful to Professor Schneider for providing us with the recent data on MIMIC-based shadow economy data.

coefficient supports the substitutability view between Corruption and SE, as opposite to the Complementarity view.

Seemingly, and unlike in many low-income countries, Corruption in the MENA region provide incentives for entrepreneurs to operate and stay in the formal sector instead of the informal one. Two possible reasons can explain the substitutability view in MENA region: the first, is that to stay in the formal sector and escape paying the due amounts of taxes, entrepreneurs pay bribes to public officials to get their protection from regulatory and judiciary punishment. The second, is based on the *"grease of the wheels"* effect; in fact, as argued by (Kaufmann and Wei, 1999; Méon and Sekkat, 2005) Corruption can compensate for the poor quality of public services and speed up inefficient and lengthy bureaucratic processes, that face daily entrepreneurs. By playing this role, Corruption can, inadvertently, attract more informal entrepreneurs to the official economy. In other words, paying bribes becomes a means for firms and self-employed individuals to smooth the burden of complex regulation and inefficient public services, to accelerate the red tapes underlying stressful and lengthy processes and plays, hence, the role of *"greasing the wheels"* for formal operations. The operative ease that Corruption is able to provide firms in the MENA region is significant to the level that makes the opportunity cost of the formal economy very low producing, consequently, an incentive to seek and stay in the formal economy. Obviously, in the MENA region, formality is contingent to Corruption.

On the other hand, the coefficients of the interaction terms in all regressions are positive and statistically significant. This evidence demonstrates that the corruption effect (the financial development) effect on shadow economy depends on the level of financial development (the level of corruption) in MENA countries. Financial development and corruption appear to be substitutes in reducing informal economic activities; that is, the marginal impact of increasing along one dimension is higher when the other dimension is low. Clearly, the efficiency of the financial sector in MENA economies reduces the corruption-induced advantages that encourage firms to seek and stay in the formal sector.

The effect of FD the marginal impact of Corruption on the SE can happen in various ways; the first way is, as asserted by Beck et al. (2006), through the reforms-induced banking transparency. As a matter of fact, the promotion of financial reforms and banking supervision and the stimulation of banking competition, by allowing the entry to the market of new private and foreign banks, would compel banks, notably public financial institutions, to eliminate any source of inefficiencies such as their own corruption. The second way is through the stimulation of competition in markets. Guiso et al. (2004) assert that further liberalization of financial

systems enhance competition and as markets become competitive, as bribery becomes a cost burden to firms facing harsh market conditions. The third way is through the financial development effect on corporate governance; since creditors in a developed financial sector have the task to regularly monitor debtors, borrowers become mandated to disclose their financial information and submit to transparency. Consequently, the reduction in bankers' corruption, notably in the public sector, the stimulation of entrepreneurs' competition and the obligation of firms to meet transparency requirements are likely to increase the opportunity cost of seeking and staying in the formal sector for some firms. Evidently, and despite the corruption-induced advantages (such as tax evasion) detailed earlier, financial reforms in the MENA region can wipe them out for some firms and incentivizing them, hence, to choose to leave, partially or entirely the official economy and, go underground.

Table 2. Baseline Model

	MIMIC-based SE data			DGE-based SE data		
	(1)	(2)	(3)	(4)	(5)	(6)
	SE	SE	SE	SE	SE	SE
Private credits ratio (GDP %)	-7.938***	-0.311***	-0.375***	-9.094***	-0.308**	-0.432***
	(1.204)	(0.0887)	(0.0675)	(1.180)	(0.101)	(0.0680)
Corruption_TI	-76.46***			-85.70***		
	(10.88)			(10.20)		
Corruption_ICRG		-43.05***			-41.35***	
		(10.63)			(12.31)	
Corruption_WB			-74.68***			-83.97***
			(10.63)			(10.49)
Private credits ratio × Corruption_TI	8.316***			9.508***		
	(1.259)			(1.235)		
Private credits ratio × Corruption_ICRG		0.654***			0.632***	
		(0.149)			(0.177)	
Private credits ratio × Corruption_WB			0.787***			0.858***

			(0.124)			(0.128)
ln (gdp per capita)	4.118***	7.107***	4.544***	3.059**	5.808***	2.770***
	(0.894)	(0.707)	(0.660)	(0.944)	(0.697)	(0.573)
Openness	0.0348**	0.0319***	0.0312***	0.00155	0.00103	-0.00351
	(0.0108)	(0.00953)	(0.00798)	(0.0120)	(0.00996)	(0.00755)
Regulation	0.161	1.282**	0.486	0.341	1.343***	0.499
	(0.532)	(0.415)	(0.341)	(0.501)	(0.385)	(0.311)
Urban pop. (%)	-0.472***	-0.517***	-0.488***	-0.399***	-0.441***	-0.408***
	(0.0385)	(0.0490)	(0.0295)	(0.0361)	(0.0506)	(0.0287)
Unemp. rate (%)	0.781***	0.846***	0.767***	0.762***	0.738***	0.631***
	(0.111)	(0.0789)	(0.0661)	(0.131)	(0.0823)	(0.0591)
Secondary education completion	-0.265***	-0.311***	-0.287***	-0.225***	-0.295***	-0.255***
	(0.0327)	(0.0388)	(0.0293)	(0.0294)	(0.0379)	(0.0267)

Dummy oil	0.923	-0.372	0.177	0.266	-1.373	-0.852
	(0.844)	(0.833)	(0.697)	(0.739)	(0.815)	(0.641)
Constant	60.82***	8.858	50.99***	70.50***	16.22	69.14***
	(12.10)	(7.947)	(9.259)	(12.17)	(8.268)	(8.303)
Observations	213	217	261	209	215	257
R^2	0.739	0.643	0.704	0.756	0.638	0.727
F	106.0	71.41	110.7	125.6	59.48	143.8

Standard errors in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As for the control variables, most coefficients' signs in all regressions are consistent with the theoretical predictions. The positive and statistically significant coefficients of the GDP per capita in all regressions reveal that in the MENA region any upward shift of the aggregate demand, following an improvement of the income per capita, nurtures the shadow economy as the aggregate demand shifts upward.[9] Also, the positive and significant Openness coefficients in the MIMIC-based SE regressions show that international trade is another reinforcing factor of Informality. Carr and Chen (2002) and Goldberg and Pavcnik (2003) argue that after facing harsher competition from foreign firms, less efficient and less productive local formal firms escape to the unofficial economy to boost their survival probability.
The oil-dummy coefficients are not statistically significant in all regressions. Overall, the level of economic diversification does not have a significant effect of the informal activities in the MENA region.

5. Robustness checks

5.1. Addressing endogeneity

Endogeneity may be a concern in our data as financial development and shadow economy can determine each other. In many countries, the public sector plays a dominant role in the financial system. To make up for the lost revenue arising from the hidden activities, the public sector often chooses to foster inefficiency in the banking sector by imposing additional taxes, fees and other costs (Giovannini and De Melo, 1993; Gupta and Ziramba, 2009). In addition, by lowering agents' ability to put up collateral, informality could adversely affect the depth of the banking sector (De Soto, 2000; Dabla-Norris and Feltenstein, 2005; Dabla-Norris and Koeda, 2008; Gatti and Honorati,2008).

Note that finding instruments is a challenging task especially when it comes to macroeconomic settings. Bose et al. (2012) points out that the literature on the informal economy has more ignored the endogeneity issue (Loayza, 1996; La Porta and Shleifer, 2008).

In order to solve the endogeneity problem and check further the robustness of our results we estimate the following specification (2) where the financial development variable is replaced by its lagged one. We can assert that a one-year time difference is not long enough to change

[9] According to ILO report (2019), it is not growth itself but the type of growth that shapes the trajectory of informality. The same report documents that "in countries where the growth performance is largely driven by manufacturing and agriculture, informality may persist or even increase" pp. 50

the effect of financial development on the informal sector. Moreover, using a lagged financial development variable is a typical and safe way to cope with the problem of endogeneity without facing the challenging and tedious task of finding the suitable instruments.[10]

$$SE_i = \beta_0 + \beta_1 lagFD_i + \beta_2 lagCorr_i + \beta_3 lag(FD_i \times Corr_i) + \sum_{j=1}^{m} \alpha_j X_{ji} + \theta_i \qquad (2)$$

Where : $lagFD$ and $lagCorr$ are the lagged percentage of private credits to GDP and the lagged indicator of corruption, respectively. θ is an error term.

The OLS estimations are given in Table 3. Qualitatively, the results do not change with respect to our benchmark results in Table 1 for both shadow economy measures. By solving the potential problem of endogeneity of the financial development variable, the results given by model (2) confirm the robustness of our benchmark model findings.

[10] Note that in this work we tried to use several instruments variables for the financial development that were given by the literature, particularly Bose et al. (2012) such as British and French legal origins and average value of the banking sector indicator in the previous period but the quality of these instruments as given by several tests were not satisfactory.

Table 3. Model with lagged FD and Corruption variables

	MIMIC-based SE data			DGE-based SE data		
	(1)	(1)	(1)	(1)	(1)	(1)
	SE	SE	SE	SE	ELGIN	ELGIN
Lag. Private credits ratio (GDP %)	-9.069***	-0.309***	-0.419***	-9.572***	-0.310**	-0.447***
	(1.124)	(0.0862)	(0.0675)	(1.125)	(0.0951)	(0.0662)
Lag. Corruption_TI	-80.81***			-87.82***		
	(9.972)			(9.475)		
Lag. Corruption_ICRG		-41.16***			-40.55***	
		(10.16)			(11.51)	
Lag. Corruption_WB			-76.61***			-85.46***
			(10.41)			(9.988)
Lag.(Private credits ratio × Corruption_TI)	9.501***			10.01***		
	(1.174)			(1.177)		
Lag.(Private credits ratio × Corruption_ICRG)		0.654***			0.643***	
		(0.142)			(0.164)	
Lag.(Private credits ratio × Corruption_WB)			0.880***			0.894***
			(0.123)			(0.124)

ln (gdp per capita)	4.785***	6.898***	5.031***	3.263**	5.700***	2.829***
	(0.870)	(0.690)	(0.668)	(0.977)	(0.671)	(0.598)
Openness	0.0454***	0.0369***	0.0382***	0.00930	0.00682	0.000715
	(0.0112)	(0.00957)	(0.00896)	(0.0118)	(0.0102)	(0.00815)
Regulation	-0.114	1.191**	0.362	0.0573	1.225**	0.389
	(0.555)	(0.441)	(0.358)	(0.509)	(0.411)	(0.326)
Urban pop. (%)	-0.462***	-0.501***	-0.477***	-0.385***	-0.426***	-0.400***
	(0.0385)	(0.0478)	(0.0315)	(0.0356)	(0.0492)	(0.0299)
Unemp. rate (%)	0.912***	0.861***	0.840***	0.830***	0.765***	0.668***
	(0.110)	(0.0793)	(0.0708)	(0.140)	(0.0810)	(0.0638)
Secondary education completion	-0.272***	-0.303***	-0.290***	-0.224***	-0.285***	-0.249***
	(0.0322)	(0.0384)	(0.0299)	(0.0294)	(0.0372)	(0.0271)

Dummy oil	0.733	-0.278	-0.0418	0.205	-1.172	-0.828
	(0.868)	(0.830)	(0.722)	(0.761)	(0.809)	(0.671)
Constant	56.29***	8.109	46.29***	69.11***	14.80	68.27***
	(11.79)	(7.799)	(9.354)	(12.51)	(7.964)	(8.371)
Observations	207	222	256	203	219	252
R^2	0.738	0.635	0.691	0.747	0.623	0.714
F	112.1	67.10	104.6	127.8	63.15	133.7

Standard errors in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.2. Nonlinearity of Financial Development

$$SE_i = \beta_0 + \beta_1 FD_i + \beta_2 Corr_i + \beta_3 FD_i \times Corr_i + \beta_4 FD_i^2 + \sum_{j=1}^{m} \alpha_j X_{ji} + \vartheta_i \qquad (3)$$

Where ϑ is an error term.

On the basis of some studies showing that there is a non-linear effect of Financial Development on the official economy given by an inverted U-shape Njangang et al. (2020) conjectured the shadow economy may have a non-linear relationship with the financial development, in a reverse order (U-shape), compared with the official economy. We test this possibility for the MENA region and the results are given by Table 4.[11]Overall, the results do not change significantly with respect to the linear relationship in Tables 2 and 3. On the other hand, as revealed by the coefficients of determination, adding the square of the financial development to the baseline model improve the goodness-of-fit of the model only very slightly. Moreover, the magnitudes of the new coefficients are very small compared to the financial development coefficients indicating the dominance of the linear component of the financial development over the non-linear one. We can assert then that the hypothesis of non-linearity (U-shape) between the shadow economy and the financial development does not stand on strong evidence in the MENA region.

[11] In Table 3 we show only the main results of the estimation.

Table 4. Nonlinearity of Financial Development

	MIMIC-based SE data			DGE-based SE data		
	(1)	(2)	(3)	(1)	(1)	(1)
	SE	SE	SE	SE	SE	SE
Private credits ratio (GDP %)	-6.164***	0.229*	0.0577	-7.367***	0.193	-0.0455
	(0.785)	(0.101)	(0.0839)	(1.043)	(0.100)	(0.0917)
Squared Private credits ratio (GDP %)	-0.00288***	-0.00290***	-0.00237***	-0.00204***	-0.00274***	-0.00193***
	(0.000433)	(0.000461)	(0.000392)	(0.000458)	(0.000491)	(0.000380)
Corruption_TI	-65.18***			-74.36***		
	(7.830)			(8.691)		
Corruption_ICRG		-37.56***			-37.07***	
		(8.135)			(9.149)	
Corruption_WB			-67.29***			-73.58***
			(7.088)			(8.079)
Private credits ratio × Corruption_TI	6.962***			8.055***		
	(0.788)			(1.066)		

Private credits ratio × Corruption_ICRG		0.507***			0.511***	
		(0.112)			(0.128)	
Private credits ratio × Corruption_WB			0.688***			0.706***
			(0.0718)			(0.0978)
Observations	213	217	261	209	215	257
R^2	0.779	0.691	0.737	0.776	0.683	0.749
F	161.9	85.97	133.7	116.8	66.92	139.4

Standard errors in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6. Heterogeneity Analysis

6.1. High Income Countries versus Middle- and Low- Income Countries

In this section we analyze the effect of Financial Development and Corruption on the shadow economy based on the heterogeneity of the sample. First, we study how these factors affect the informal economies among low/middle- and high-income countries. The categorization between middle/low- and high- income countries is done according to the World Bank country classification. Table 5 presents the estimation results of the baseline model and show that for both subsamples the coefficients' signs do not change substantially with regard to the entire sample's results, shown in Table 2. Interestingly, the coefficients of the variables of interest; namely, the coefficients of FD, corruption indications and the interaction terms are statistically significant only in the regressions of the low/middle-income countries. For the high-income countries' regressions, these coefficients are mostly non-significant. Obviously, informal activities in the high-income countries of the MENA region are rather derived by other factors rather than corruption and financial development. Clearly, in the MENA region there is a level of development (i.e., GDP per capita) beyond which these factors' effects on informality vanishes. We can assert, then, that the financial development and the level of briberies, in MENA countries, affect only the informality in the low/middle- income. Moreover, the substitutability between FD and corruption exists only in this group of countries. Obviously, as these countries succeed in controlling the level of corruption of its public officials, as their official economies benefit from the financial reforms.

The coefficients of the GDP per capita are for both subsamples positive and statistically significant showing that economic development drives up the informality in MENA countries. This income effect is more important in low/middle- income countries since its magnitude is at least as twice as in the high-income countries. This result points out the correlation between the official and unofficial activities in the MENA region.

Moreover, there are strong evidence that openness to international trade seems to play an important role in intensifying informal activities in high-income countries rather than low/middle-income countries. In fact, the openness coefficients are positive and significant only in the regressions of the group of high-income countries. This result confirms our previous finding that for the high-income countries in the MENA region, the determinants of the shadow economy are not the FD and corruption anymore but extend to other factors. Clearly, the

struggle against the unofficial economy in the MENA region is multidimensional and these dimensions change from a development level to another.

The secondary education's coefficients are negative and significant only in the regressions of the low/middle income countries. These results point out that theoretically positive effect of education on the informal economy is strong only in the less developed countries of the MENA region.

Another no less important result is given by the subsample analysis based on the level of development that is the effect of oil dummy variable on the shadow economy. The coefficients of this variable are negative and non-significant in the low/middle- income countries but are positive and significant in the high-income countries. Clearly, the shadow economy in the lowly diversified economies of the MENA region, the fossil energy-based development nurtures the shadow economy. We can conjecture from these results that a more diversification of the economy in the MENA region can be beneficial to the official economy.

Table 5.

	Middle-Income			High-Income		
	(1)	(1)	(1)	(1)	(1)	(1)
	SE	SE	SE	SE	SE	SE
Private credits ratio (GDP %)	-10.94***	-0.235*	-0.584***	-2.225	0.0254	-0.0933
	(1.712)	(0.104)	(0.111)	(1.206)	(0.128)	(0.0651)
Corruption_TI	-133.2***			-14.47		
	(12.76)			(11.46)		
Corruption_ICRG		-41.72***			-8.613	
		(12.22)			(17.07)	
Corruption_WB			-129.0***			-34.02*
			(14.24)			(14.98)
Private credits ratio × Corruption_TI	11.41***			2.412		
	(1.779)			(1.269)		
Private credits ratio × Corruption_ICRG		0.574**			0.142	
		(0.188)			(0.226)	
Private credits ratio × Corruption_WB			1.105***			0.345*
			(0.191)			(0.153)

ln (gdp per capita)	13.81***	24.67***	16.58***	5.206***	5.896***	2.608
	(3.239)	(2.762)	(2.639)	(1.190)	(1.384)	(1.679)
Openness	0.0137	-0.151***	0.0219	0.0827***	0.0486***	0.0590***
	(0.0355)	(0.0381)	(0.0304)	(0.0128)	(0.0131)	(0.0113)
Regulation	0.506	0.630	-0.375	-0.0792	-0.370	-0.152
	(0.871)	(0.768)	(0.533)	(0.461)	(0.221)	(0.226)
Urban pop. (%)	-0.645***	-0.385***	-0.638***	-0.119	-0.288**	-0.154
	(0.0528)	(0.112)	(0.0517)	(0.0734)	(0.0945)	(0.0839)
Unemp. rate (%)	0.383**	0.865***	0.623***	0.755***	0.378**	0.509***
	(0.141)	(0.0968)	(0.0783)	(0.120)	(0.118)	(0.0951)
Secondary education completion	-0.392***	-0.716***	-0.504***	0.111	0.0486	0.0437
	(0.0913)	(0.0644)	(0.0717)	(0.0576)	(0.0702)	(0.0512)

Dummy oil	2.952	-10.71***	-2.154	2.664**	2.644**	2.652**
	(2.095)	(2.236)	(1.886)	(0.930)	(0.993)	(0.842)
Constant	37.78	-114.8***	9.975	-35.31*	-22.90	8.454
	(26.51)	(20.13)	(23.26)	(14.54)	(18.52)	(19.29)
Observations	130	136	160	83	81	101
R^2	0.839	0.703	0.804	0.768	0.726	0.730
F	131.5	44.23	116.9	39.86	34.15	54.97

Standard errors in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.2. Highly Corrupt Countries versus Lowly Corrupt Countries

Table 6 presents the regressions' results for two groups of countries in the MENA region; namely, the highly corrupt and the lowly corrupt countries.[12][13]It appears from the table that the coefficients of the variables of interest; i.e., FD and corruption, are mostly statistically significant but with opposite signs – negative in the regressions of the highly corrupt subsample and positive in the regressions of the lowly corrupt subsample. Moreover, the coefficients of the interaction terms are statistically significant in both groups' regressions but with opposite signs too; positive in the former group – like the entire sample's results, and negative in the latter group. Clearly, the results of the lowly corrupt countries are the opposite of those given by the entire sample's regressions revealing that FD and corruption have different effects on the shadow economy in the countries with better control of corruption mechanisms than the highly corrupt countries.

Noticeably, the sign of FD coefficients in the regressions of the lowly-corrupt countries are in contradiction with the theory. In these countries, further financial reforms are, unexpectedly, associated with wider sizes of the shadow economy. This result confirms the theoretical analysis emphasizing the ambiguity and complexity of the relationship between the financial development and the informal sector. In light of the literature background, it is very likely that the development of the financial system in the lowly corrupt countries of the MENA region has eased the liquidity constraints of self-employed individuals who want to set up their enterprises encouraging, accordingly, informal employment (Sirisankanan, 2017). It is very likely that the low unemployment rate in this group of countries, which is 4.8 percent compared to the 10.2 percent in the group of highly corrupt countries is largely attributed to these self-employed individuals working informally and not covering their employment status by formal arrangements.

On the other hand, the estimations results reveal also that when a MENA country succeeds in significantly controlling the corruption of its public officials by bringing it to a level below 0.5, the "*grease of the wheels*" effect of bribery loses its role as an incentive for entrepreneurs to stay in the formal sector. This improvement in the transparency and

[12] We assume that highly corrupt countries are those having a corruption level greater than or equal to 0.5.
[13] We do not mention the results of the ICRG-based corruption measure regression for the lowly corrupt sample because the number of observations is very low and does not satisfy the statistical criteria needed for a regression

accountability of public officials is, evidently, the main reason behind the positive sign, in accordance with the theory, of the direct impact of corruption on the shadow economy.

However, since the coefficient of the interaction term is negative and significant in the regressions of the lowly corrupt sample of countries, we can claim that, despite the change in the signs of their direct impacts on the shadow economy with respect to the entire sample's results, the substitutability between FD and corruption persists in this group of countries.

The estimations results show also that economic development, openness to international trade, and unemployment rate boost the level of the shadow economy in the highly corrupt countries since the coefficients of these variables are positive and, unlike the group of lowly corrupt countries, statistically significant. Also, the level of secondary education has negative and significant coefficient only in the highly corrupt countries' regressions.

Table 6.

	Highly corrupt (index >= 0.5)			Lowly corrupt (index < 0.5)	
	(1)	(2)	(3)	(4)	(5)
	SE	SE	SE	SE	SE
Private credits ratio (GDP %)	-9.598***	-0.604***	-0.496***	11.82***	0.179**
	(1.810)	(0.118)	(0.132)	(2.571)	(0.0652)
Corruption_TI	-109.0***			75.96**	
	(13.76)			(22.40)	
Corruption_ICRG		-85.49***			
		(16.63)			
Corruption_WB			-124.0***		12.97
			(17.70)		(15.54)
Private credits ratio × Corruption_TI	10.05***			-12.62***	
	(1.880)			(2.743)	
Private credits ratio × Corruption_ICRG		1.119***			
		(0.196)			
Private credits ratio × Corruption_WB			1.008***		-0.570**
			(0.207)		(0.174)

ln (gdp per capita)	5.065***	5.717***	7.014***	1.100	-0.601
	(1.259)	(0.761)	(1.312)	(1.235)	(0.693)
Openness	0.0540*	0.0380***	0.0791*	0.00281	0.0154*
	(0.0219)	(0.0109)	(0.0356)	(0.00868)	(0.00720)
Regulation	-0.506	0.563	0.113	1.730*	0.413
	(0.803)	(0.427)	(0.441)	(0.738)	(0.319)
Urban pop. (%)	-0.563***	-0.481***	-0.624***	-0.516***	-0.379***
	(0.0691)	(0.0503)	(0.0826)	(0.0877)	(0.0342)
Unemp. rate (%)	0.884***	0.738***	0.875***	0.333*	0.0891
	(0.143)	(0.0875)	(0.0872)	(0.129)	(0.0815)
Secondary education completion	-0.294***	-0.286***	-0.276***	-0.0513	-0.164**
	(0.0434)	(0.0513)	(0.0596)	(0.0620)	(0.0540)

Dummy oil	3.322	0.408	1.567	1.157	0.554
	(2.085)	(1.078)	(2.064)	(1.579)	(0.975)
Constant	80.51***	49.67***	65.54***	15.91	58.50***
	(15.02)	(11.59)	(13.81)	(15.29)	(8.988)
Observations	149	193	145	64	116
R^2	0.763	0.684	0.719	0.879	0.821
F	107.2	67.54	81.10	46.28	61.21

Standard errors in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.3. High FD Countries versus Low FD countries

Now, based on the median of the FD data, we divide our sample into two subsamples: the first, is composed of countries with high FD levels and the second, is composed of countries with low FD levels.[14]Table 7 shows that estimation results in both sub-samples are qualitatively similar to the results of the entire sample; in fact, the signs of the coefficients of interests in both subsamples do not change with respect the regression results of the entire sample. The only difference we can observe is that the magnitudes of these coefficients; namely the coefficients of FD, corruption and interaction terms, variables are higher in absolute terms in the regressions related to the MENA countries with relatively low financial development. The reducing effects of FD and corruption on the shadow economy are more remarkable in this group of countries compared to the countries with high FD levels. Clearly, as a MENA country develops its financial services as their separate reducing effects on the shadow economy decrease. There are, hence, other more important factors that appear to gain importance in controlling the shadow economy over the financial development. This finding conforms again that the struggle against informality in MENA region is multi-dimensional and is not limited on the development of the financial sector only.

Other no less important results are given by the regressions over the two subsamples; in fact, the coefficients of the GDP per capita are positive and statistically significant in the high FD sample regressions only. This finding shows that the official activities in the economies with better financial services in the MENA region contribute to boosting the unofficial activities. Moreover, if these economies are based on the oil exporting sector, the reinforcement of the shadow economy by the official economy intensifies since the oil-dummy coefficients are positive and statistically significant in this sub-sample. These two results confirm our claim that the struggle against the shadow economy in the MENA region is multi-dimensional and focusing on one or two dimensions, such as financial development and/or the control of the corruption of public official, all the time is not sufficient. Other factors start to gain importance and should then be taken into consideration in order to restrain the capacity of the official economy to strengthen the unofficial economy.

[14] The median of the FD data is around 59.4%.

Table 7.

	High FD (% >= median)			Low FD (% < median)		
	(1)	(1)	(1)	(1)	(1)	(1)
	SE	SE	SE	SE	SE	SE
Private credits ratio (GDP %)	-0.321***	-0.395***	-0.389***	-0.761**	-1.198***	-0.704**
	(0.0868)	(0.102)	(0.0875)	(0.231)	(0.260)	(0.245)
Corruption_TI	-49.07***			-77.05***		
	(14.29)			(15.89)		
Corruption_ICRG		-69.05***			-86.19***	
		(14.81)			(15.47)	
Corruption_WB			-73.39***			-93.62***
			(15.77)			(16.21)
Private credits ratio × Corruption_TI	0.549***			1.158***		
	(0.154)			(0.323)		
Private credits ratio × Corruption_ICRG		0.772***			1.836***	
		(0.172)			(0.364)	
Private credits ratio × Corruption_WB			0.766***			1.195**
			(0.174)			(0.379)

ln (gdp per capita)	6.243***	7.030***	5.050***	0.659	1.849	-0.100
	(0.921)	(0.896)	(0.776)	(1.501)	(1.786)	(1.617)
Openness	0.00761	0.0154	0.0183*	0.161***	0.104*	0.0732*
	(0.0109)	(0.00876)	(0.00816)	(0.0219)	(0.0417)	(0.0314)
Regulation	2.287***	1.123**	1.041**	0.653	1.626**	1.569***
	(0.599)	(0.390)	(0.390)	(0.543)	(0.541)	(0.416)
Urban pop. (%)	-0.623***	-0.626***	-0.560***	-0.138**	-0.0799	-0.177**
	(0.0414)	(0.0438)	(0.0292)	(0.0429)	(0.0948)	(0.0584)
Unemp. rate (%)	0.903***	0.725***	0.718***	1.382***	0.986***	1.089***
	(0.107)	(0.0892)	(0.0881)	(0.189)	(0.161)	(0.108)
Secondary education completion	-0.269***	-0.229***	-0.230***	-0.340***	-0.361***	-0.212***
	(0.0355)	(0.0486)	(0.0387)	(0.0470)	(0.0784)	(0.0516)

Dummy oil	2.404*	4.262***	2.682**	1.536	-3.384	-3.214
	(1.098)	(1.020)	(0.940)	(1.704)	(2.512)	(2.314)
Constant	27.03*	34.51**	49.49***	55.71**	52.97**	72.91***
	(13.61)	(12.03)	(11.64)	(17.77)	(15.63)	(14.12)
Observations	163	145	189	50	72	72
R^2	0.768	0.764	0.747	0.958	0.840	0.896
F	180.9	150.4	177.8	166.8	41.39	82.29

Standard errors in parentheses* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Conclusion

Exploiting recent panel data on informality of 21 MENA countries during the period from 1996 to 2018, and on the basis of several pooled regressions we find that financial development and corruption have, overall, negative direct impacts on the size of the shadow economy in this region. An important contribution of this paper is that it demonstrates the substitutability between these two factors; that is the marginal impact of increasing along one of these two dimensions is higher when the other dimension is low. These results are robust even after addressing the potential endogeneity that can exist between the shadow economy variable, on the one hand, and FD and corruption variables, on the other hand.

The heterogeneity analysis shows that the impacts of both FD and corruption play significant roles only in the low/middle- income countries of the MENA region. Obviously, informal activities in the high-income countries of the MENA region are rather derived by other factors rather than the level of development of the financial market and corruption. The empirical evidence shows that in this category of countries, openness to international trade and the low level of diversification of their economies play more significant roles.

When the sample is divided into lowly-corrupt countries and highly corrupt countries, the results show that signs of FD and corruption coefficients change to positive in the former group. Interestingly, these findings show that in lowly-corrupt countries of the MENA region, financial developments, as suggested by the literature, is nurturing informality through probably encouraging informal employment. The low unemployment rate in these countries can be a proof of this conjecture. Nevertheless, the substitutability between FD and corruption found in the entire sample does not disappear when we work on the lowly-corrupt sample of countries.

When we compare the countries with high FD to the countries with low FD, the empirical results show that the reducing effects of FD and corruption on the shadow economy are more remarkable in the latter group of MENA countries.

In conclusion we can assert that the struggle against the shadow economy in the MENA region is multi-dimensional and dynamic and not restrained in only the dimensions of financial development and corruption. Nevertheless, these two dimensions seem to play significant roles in low/middle-income and financially lowly-developed, countries. As a MENA country realizes more economic and financial development and succeeds further in restraining the corruption incentives of its administrative apparatus, other dimensions seem to gain importance in the fight against informality; like the openness to international trade, the level of diversification of the economy and the mechanisms through which developed financial systems promote informality like informal employment.

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Appendix

Table A. Data definition and sources

Variable	Definition	Data Source
GDP-capita	Official GDP per capita, PPP (constant 2005 international $)	WDI – World Bank
Urb Pop	Percentage of urban population in the total population	WDI – World Bank
Unem. ratio	unemployment to population ratio, 15+, total (%). It is the proportion of a country's population that is unemployed.	WDI – World Bank
Taxes	Taxes on income, profits, and capital gains are levied on the actual or presumptive net income of individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets. (Current LCU) divided to GDP (current LCU)	WDI – World Bank
regulation	Index on the basis of an unweighted) average of the sub-indices on "Hiring regulations and minimum wage, Hiring and firing regulations, Centralized collective bargaining, Hours regulations, Mandated cost of worker dismissal, Conscription	Fraser Institute, Economic Freedom of the World (2008)
Openness	Sum of exports and imports as a share of GDP	International Monetary Fund,
lsc	Measure of education level: Percentage of secondary	Barro & Lee Data base
Corrupt.control	Control of corruption:	WGI Database
CPI	Corruption Perception index	transparency international Database
M2	the ratio of M2 to GDP	WB database
credit	the ratio of private domestic credit to GDP,	WB database
DGE	Informal Economy size	Elgin et al. (2019).
MIMIC	Informal Economy size	Schneider (2018