

The Determinants of the Informal Sector in Developed and Developing Countries

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محددات القطاع غير الرسمي في الدول المتقدمة والنامية

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Abstract

The informal economy has become a globally widespread phenomenon in developed and developing countries, with two billion workers, roughly 60% of the world population, working in the shadow. Understanding the determinants and causes of the shadow economy's (SE) existence is crucial to sustainable development, as it is critically related to countries' growth, poverty, and inequality. This study examines the determinants of the informal sector in 79 developing and developed countries, by applying a multinomial logit model during the period 1999–2013. The overall results confirm that the informal sector determinants are heterogeneous both in significance and size of impact in developed and developing countries. Furthermore, the results reveal that government effectiveness is the most significant determinant for both developed and developing countries, while the agriculture value-added is the primary determinant in the developed ones. Moreover, GDP growth, freedom from corruption, unemployment, and democracy are more effective in determining SE's size in developed countries than in developing countries. Accordingly, the study concludes with presents recommendations for policymakers to focus on implementing policies that help reduce informality gradually by tackling the determinants of informality in each country through implementing a comprehensive policy package tailored to the country's circumstances.

Keywords: Informal sector determinants, Multinomial Logistic Regression, GMM, developing countries, developed countries, sustainable development

Introduction

The informal economy has long been at the center of academic and policy debates because of its pervasiveness and complex links with development outcomes. The size of the informal economy is nearly one-third of the global economy (IMF, 2021). Although mostly widespread in emerging and developing economies, it is also an essential part of advanced economies. According to the International Labor Organization, ILO (2018), about two billion workers, or 60% of the total employed population aged 15 years and older, operate in the informal sector. The size of the informal sector varies significantly within regions and countries; the average size is 36% in developing countries and 14% in developed countries. Latin America, the Caribbean, and sub-Saharan Africa have the most significant informal sector (Medina and Schneider, forthcoming).

The term “*Informal sector*” is often used interchangeably with other terms like a shadow, grey, underground, hidden, black, parallel economy, and agorism. The concept finds its origins back in the 1970s with the emergence of heterogeneous goods and service production activities out of the usual framework of the economy (Hart, 1973). Since then, the informal economy concept has sparked debates on its definition, determinants, and links to economic development. Informality is a multidimensional phenomenon, with many definitions leading to discrepancies in analysis and significant policy failures (Kanbur, 2009). Hart (2008) defines informality as a “set of economic activities that take place outside the framework of bureaucratic public and private sector establishments.” The current study adopts the most used definitions by Schneider and Enste (2000) “informality is all economic activities that contribute to the officially calculated (or observed) gross national product but are currently unregistered”, and by Schneider et al. (2010) “a set of market-based economic activities that are consciously covered up from government in order not to face with regulation and taxation.” The way of defining the informal economy depends on how informality is measured. Yet, one common denominator in all the definitions is that the informal sector is generally low productive, labor-intensive, small-scale production compared to the formal sector (IMF, 2021).

A large informal economy hinders the country's efforts toward achieving sustainable development, which is why policymakers are keen to reduce the informalities in their countries. Furthermore, informality has been designated as a thematic area in the UN Sustainable Development Goals (SDGs), SDG 8.3, and SDG 10.2. Informal firms create a low gross value added to the economy and do not contribute to the tax base, obstructing economic growth (La Porta and Schleifer, 2014). In addition, workers in the informal sector, especially women, are usually less educated, socially unsecured, and earn less income, increasing poverty and widening inequality (UN Women, 2016).

Designing and executing effective policies to contain the informal sector requires measuring it and figuring out its determinants. However, measuring informal activities is intrinsically problematic because it is difficult to find or reach the members of the informal economy. Moreover, they can take different forms within and across countries. Therefore, the estimation of the informal sector could be classified into three approaches; direct, indirect, and the multiple indicators multiple causes (MIMIC) approach (Schneider and Klinglmair, 2004; Schneider, 2005).

The current study investigates the determinants of the informal economy in 79 developing and developed countries and assesses the reasons for the variations in the size across countries over time. The author follows the (Dreher and Schneider, 2009; Jajkowicz and Drobniszova, 2015; Schneider and Buehn, 2016) approach and uses regression analysis to measure the effects of different economic, political, social, and institutional factors on the size of the SE. The investigation is extended to account for endogeneity and model the dynamical evolution of the economy through GMM panel models (Arellano and Bond, 1991; Hsiao, 2014; Roodman, 2009).

This study is more pertinent in the context of the COVID-19 pandemic, which has hit particularly hard vulnerable informal workers and firms in developing countries. Also, the rapid digital transformation context has created more opportunities for individuals to engage in informal/casual jobs. On the other hand, developing effective policies to combat informality is complicated by various causes and facets within and across countries. Each country's informality is viewed as a response to distinctive features and institutions, and no one-size-fits-all remedy exists (Delechat and Medina, 2020).

The contribution of this research comes in two main ways. First, it analyzes the drivers of the informal economy over time and across countries. Second, while recognizing that there is no one-size-fits-all solution, it suggests policies that can effectively reduce informality. The results are helpful for government officials, researchers, and practitioners interested in designing policies to create more inclusive growth and sustainable development for all. The rest of the paper is organized as follows: Section 2 reviews the relevant literature. Section 3 describes the data and methods. Section 4 exposes the empirical results. Section 5 provides a discussion of the results. Finally, section 6 concludes the study with a broad range of policy implications and avenues for future work.

Literature Review

The informal activities, by definition, are hidden from official authorities for monetary, regulatory, and institutional reasons (Medina and Schneider, 2021). They develop for wide-ranging reasons such as poverty, inequality, education, legal and regulatory environment, unemployment, taxing and social protection systems, and quality of institutions. On the one hand, people may go to the informal sector driven by the lack of opportunities in the formal sector; too poor and less educated people opt for the informal sector as a safety net. Conversely, people may deliberately choose to be outside the formal sector and "cheat" on the system for tax evasion, avoiding social contributions, or compliance with regulations requirements (Hassan and Schneider 2016; Williams and Schneider 2016). Accordingly, the informal sector takes many forms and can be occupied by poor or non-poor alike.

Consequently, measuring and analyzing the informal sector is difficult (Deléchat and Medina, 2021). Its drivers remain multifaceted, which can be best understood as a reaction to a broad set of institutions. Literature has largely explored the determinants of the SE, covering institutional and macroeconomic factors. Empirical studies have categorized these determinants into three main categories: economic, political, and institutional determinants. Economic determinants of a SE range from access to finance, taxes burden, and unemployment rates to economic growth, inflation, international trade, and financial development. Political determinants encompass factors such as democracy and government size, whereas institutional determinants are such as labor,

product, different markets government regulations, the rule of law, property rights, and corruption.

The Economic Determinants of The Informal Sector

There are different views of looking into the issue of why the informal sector exists. From an economic standpoint, some authors still argue that the size of the informal economy sector and its development is due to the will to escape from the heavy *tax burden and regulations* (Loayza, 1996; Loayza et al., 2005). In addition, the increase in the gap between the informal economy labor cost and the after-tax earnings stimulates the incentive to work in the SE (Schneider, 2005; Dell'Anno, et al., 2007; Dell'Anno, 2007). By applying MIMIC and ARDL modeling approaches, Hosseini et al. (2014) concluded that the effective tax rate significantly influences the SE size in Iran. Similarly, Mara and Popa, 2013 argued that, based on panel data techniques (fixed and random effects), the tax burden is among the most statistically significant determinants of the informal economy in the EU context.

Meanwhile, the unemployment rate, tax burden, and inflation are the main determinants of the informal sector size in Nigeria (Ogbuabor and A. Malaolu, 2013). Furthermore, studying a panel of 152 countries, Elgin and Oyvatt (2013) concluded that the level of taxes and trade openness is among the main determinants of the SE. Moreover, the increasing tax burden, whether direct or indirect, was reported as a significant driving force that undermined the growth and the size of the SE (Schneider et al., 2010; Dell'Anno et al., 2004; Schneider, 2002; Schneider and Enste, 2000).

Also, the *unemployment rate* is regarded as a critical determinant of SE size. The higher the unemployment rate, the larger the size of the SE (Schneider and Williams 2013; Williams and Schneider 2016; Dobre et al. 2010). According to Davidescu (2015), the unemployment rates have a significant negative impact on the size of the SE negatively in the short run, whereas they have a positive effect in the long run. Similarly, using data from the USA over the period (1980–2009), Alexandru et al. (2011) found that a rise in the formal sector unemployment rate leads to an increase in the number of people who work in the SE. Similarly, Pirae and Rajae (2015) investigated the nature of the relationship between the unemployment rate and the size of the informal economy during 1973-2012, and they found a uni-directional causality

running from the unemployment rate to the informal economy. Alexandru (2009) also investigated the impact of the unemployment rate on the informal economy size in Spain. The results showed that there is a positive relationship between the two variables. Hassan and Schneider (2016) similarly found that the tax burden, the relative importance of the agriculture sector, and the unemployment rate are the main economic determinants of the SE in Egypt.

Another vital determinant of the informal sector size is *trade openness/liberalization*. There is a widely held belief among researchers on the positive relationship between trade openness and the informal sector size. A considerable amount of literature pointed out that trade openness increases informality in different contexts (Birinci, 2013; Gosh and Paul, 2008; Acosta and Rojas, 2013; Fugazza and Fiess, 2010). In studying the Lithuanian shadow economy determinants during 2000–2011, Remeikiene and Gaspareniene (2015) reported that volume of the international trade is among the leading economic determinants.

The *financial development* of the official economy is another key determinant of the SE size. According to Capasso and Jappelli (2011), the informal economy is negatively correlated with financial development in Italy. In another study by Blackburn et al. (2012), on a panel consisting of 114 countries, both developed and developing countries over the period (1999–2005), found that the lower the stage of financial development, the higher the incidence of tax evasion and the greater is the size of the informal economy. Furthermore, Bayar and Ozturk (2016) examined the exact relationship between 2003 and 2014 in EU transition economies. Their results suggested that the financial development and institutional quality affected the SE negatively in the long term. Similarly, Capasso and Wurm (2008) pointed to the improvement in the development of the banking sector are associated with a smaller SE.

Additionally, *monetary policy* is reported to undermine the formal sector activities while increasing the informal size. For example, Kolev and E. Morales P. (2005), in their study of the UK economy, reached that an increase in the interest rate causes an expansion of informal sector activity while the official sector contracts. Another study by Ariyo and Bekoe (2012) confirmed that both inflation and interest rate are among the main determinants of the Nigerian informal economy.

The Political Determinants of the Informal Sector Size

A large amount of literature has investigated the relationship between the informal sector and political environment/factors. For instance, Teobaldelli and Schneider (2012) examined the influence of direct democratic institutions on SE development to conclude a nonlinear effect of direct democracy on the shadow economy. In their study on the determinants of the Lithuanian SE, Remeikiene and Gaspareniene (2015) found that both corruption and business freedom indices had statistically significant effects on the SE in Lithuania. Additionally, Razmi and Jamalmanesh (2014) studied the impact of political indices on informal economy size. Their study revealed a positive relationship between fiscal freedom indices, the rule of law, and the informal economy's size. On the other hand, their results also showed a negative relationship between the indices of government effectiveness, property rights, control of corruption, political stability, regulation quality, voice and accountability, the growth rate of the labor force, and the informal economy's size.

Moreover, the political environment in a particular country influences the institutional settings and can lead to the development of, or a reduction in, the informal economy (Devine, 2021). For instance, countries with low political turnover have been found to have a higher tax burden and a smaller informal economy (Elgin, 2010).

The Institutional Determinants of The Informal Sector Size

The quality of public institutions is another crucial driver of the informal sector size (Hassan and Schneider 2016; Williams and Schneider 2016; Schneider 2010; Teobaldelli 2011). Notably, the government's efficient and discretionary application of the tax code and regulations plays a crucial role in the decision to work informally, even more important than the actual burden of taxes and regulations (Medina and Schneider, 2021). A study by Jamalmanesh (2013) on the institutional governance effect on the SE in Asia for the period (2002–2007) showed that an improvement in the indices of institutions (governance) had a negative effect on the SE's size. Similarly, Elgin and Oztunali (2013) found that institutional quality strongly interacted with the relationship between economic development and SE's size. They further found a higher GDP per capita associated with a larger informal sector size in countries with low institutional quality and vice versa. Using the panel regression analysis on a sample of 92 developed and developing countries, Torgler and Schneider (2007) found that an increase in the

level of both institutional quality and tax morality reduce the SE's size. Manolas et al. (2013) also found that the SE's main determinants included the quality of governance and the regulatory framework in the product, labor, and credit markets in some 19 OECD countries.

Moreover, Ogbuabor and Malaolu (2013) argued that government regulation is one of the main informalities driving forces in the Nigerian economy in a sample of 35 developed OECD countries and South-eastern European transformation countries. Using the MIMIC model, Schneider et al. (2010) found that labor market regulations and public goods and services quality significantly affected the SE's size. Another study by Dreher et al. (2005) on the relationship between institutional quality, the shadow economy, and corruption reported that an improvement in institutional quality directly reduces the SE and corruption both directly and indirectly (through its effect on the shadow market).

Friedman (2014) studied the relationship between six dimensions of effective governance and the SE's size across 149 countries over the period 2002–2007. He concluded that the perception of a country's population that corruption is not controlled was associated with larger national informal economies and vice versa. On the microeconomic level and based on data from 20 Indian states, Dutta et al. (2011) study results showed that higher corruption increases employment in the informal sector. Eventually, Dell'Anno and Teobaldelli (2012) investigated the decentralization impact on the relationship between corruption and SE. They found that there is a positive relationship between corruption and the shadow economy, and this relationship tends to be lower in decentralized countries.

In the same vein, Mara (2011) studied the SE's causes. The study results showed that corruption and tax morality are the main determinants of the shadow economy in a sample of 27 European Union countries. Schneider (2002), in studying the causes of the SE in 22 transition and 21 OECD countries over the year 2001–2002, revealed that rising state regulatory activities are considered primary determinants for the SE's growth and size. Using the Multiple-Indicators Multiple-Causes model (MIMIC), Schneider and Enste (2000) argued that the extent of state regulatory activities and rising corruption positively impact the SE's growth.

The Informal Economy Determinants in Developed Vs. Developing Countries

Table I, in appendix, illustrates the literature review of the main determinants of SE's size in developed countries. According to the literature that applied MIMIC methodology; the unemployment rate is the most significant determinant that positively affects the SE size. The second pivotal factor is taxes or tax burden, which also positively impacts the size of SE. Then the third important determinant is government regulations, which also positively impact the SE size; the more governmental regulations in labor, product, and credit markets, the greater the size of the SE in developed countries. Meanwhile, social security contributions are also one of the main determinants of SE in developed countries. Such contributions will increase the individuals' incentives to work in the SE to avoid these payments. Furthermore, according to the MIMIC model, other essential determinants of the SE include some factors related to tax burden represented in tax types, direct or indirect taxes, the complexity of tax systems, and tax morality. However, following the regression analysis approach, other important factors may affect the SE size in developed countries; the economic factors include the inflation rate, GDP per capita, level of financial development, and economic openness. At the same time, the non-economic or institutional factors include corruption, institutional quality, and the quality of public sector goods and services. Table II, in appendix, provides a literature review on the determinants of SE's size in developing countries. Using the MIMIC model. It reveals that tax burden, tax type (direct or indirect), unemployment rate, and governmental regulations are the most significant factors affecting the SE's size in developing countries; that is, besides other factors, including trade openness, self-employment, GDP per capita, economic development level, inflation, and corruption. Meanwhile, several determinants are added by studies that apply the regression analysis, such as urbanization, level of financial development, economic growth, human development, and government size.

Table III, in appendix, shows a literature review of SE's size determinants in developed and developing countries. According to studies using the MIMIC model, the most critical determinants of the SE size are tax burden, regulations, government size, economic freedom, and the unemployment rate. Nevertheless, according to those using regression analysis, the SE's determinants are GDP per capita, tax morale, the relative

importance of the agriculture sector in the economy, education, population size, institutions regulations (governance), urbanization, foreign direct investment inflows, trade openness, and Globalization.

Among various informality determinants examined in the literature, we test the impact of several economic, political, social, and institutional factors on developed and developing countries. We fill in the literature gap by finding out if the state of the country's development matters for the impact size.

The Informal Economy: Stylized Facts. Informal activities employ between 50 to 90% of the non-agricultural workforce in the developing world (Gutiérrez-Romero, 2021). It employs 62% of the world's working population (2 billion), with 90% in low-income countries, 67% in middle-income countries, and 18% in high-income countries (ILO, 2020).

As shown in Table (1), the informal sector accounts for a large portion of the developing world's economy. When compared to developed countries, the sector contribution in all developing economies sectors exceeds the global average. More so, poverty and development, which lead to resource depletion and environmental degradation, must be addressed for developing countries to achieve sustainable development. The informal sector is linked to both of these cycles in developing countries due to its association with low income, low productivity, unfair competition, and environmental degradation. As a result, it is thought that sustainable development is thought to be based on a thorough understanding of the informal sector (Sultana et al., 2022).

Table 1.

Share of Informal Employment (total and sectoral) by Country Groupings, 2016 (%)

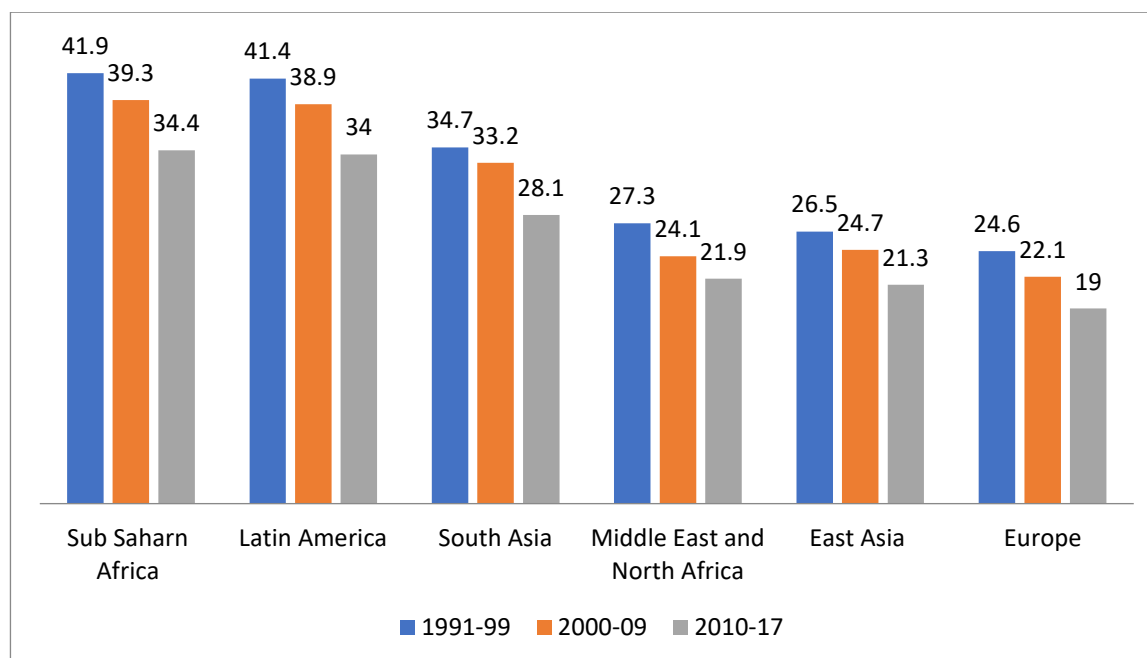
Informal sector	Global	Developed	Developing
Informal employment	61	18	90
Rural	80	22	90
Urban	44	17	79
Agriculture	94	59	98
Rural	95	64	98
Urban	87	49	98
Industry	57	16	73
Rural	69	17	87
Urban	49	15	65
Services	47	18	74
Rural	65	19	79
Urban	39	17	70

Source: Women and Men in the Informal Economy—A Statistical Brief (2019); ILO calculations based on national labor force data.

Within context, figure (1) shows that, despite declining across all regions between 1990 and 2017, informal output as a percentage of GDP remained high in Sub-Saharan Africa and Latin America, averaging around 34% between 2010 and 2017.

Figure 1.

Informal Economy by Region

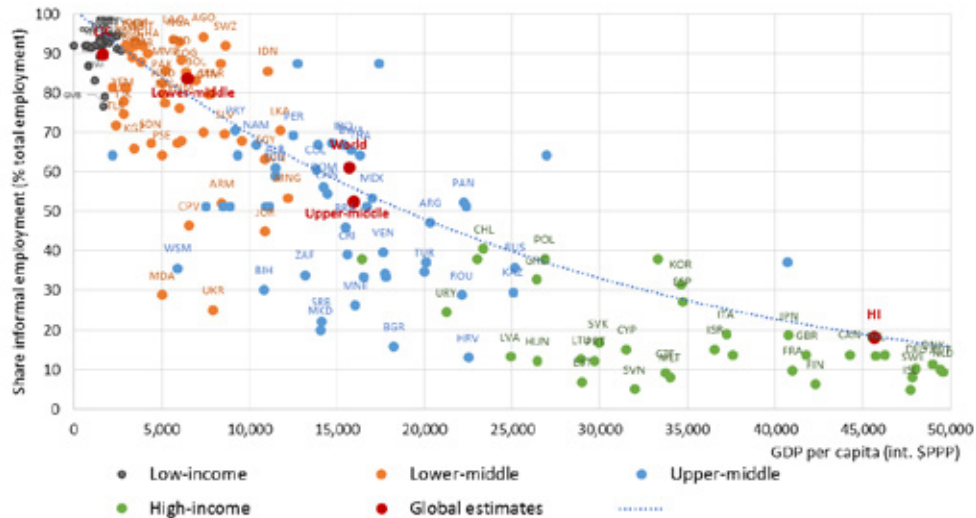


Source: Medina, L. & Schneider, F. (2019).

Figure (2) sheds more light on the fact that the informality share of economic activities decreases as income level rises.

Figure 2.

Informal Employment and Level of GDP Per Capita, by Country Income Level, 2016



Source: Chacaltana et al., (2022).

Data and Methods

The current research investigates the main explanatory factors which contribute to the existence of an informal economy and assesses the reasons for the variations in its size across countries over time. We measure the effects of different economic, political, social, and institutional factors by building on Dreher and Schneider, 2010; Jajkowicz, 2015; Schneider and Buehn, 2016) using regression analysis. The study estimates the following equation (1) by running a panel data regression using the within transformation (fixed effect) or random effects models. Further, the study compares these models with more robust models that account for endogeneity and dynamics of the economy, through estimating dynamic panel data models using GMM panel estimators (Arellano and Bond, 2002; Hsiao; 2014; Roodman, 2017).

The Generalized Methods of Moments (GMM) approach is well suited to our empirical setting as its estimator is designed for small T, and large N panels; linear functional relationships; a dependent variable that is dependent on its past values; non-strictly exogenous independent variables; fixed individual effects; heteroskedasticity and autocorrelation within individuals. The GMM estimators are expected to be consistent and asymptotically normal; it is also assumed to exploit all available information in the sample to construct efficient estimates (Arellano and Bond, 1991).

$$ie_{it} = \beta_0 + \beta_3 X_{jit} + \eta_i + \varepsilon_{it} \quad (\text{equation 1})$$

where *i* and *t* denote the country and year respectively, β_0 is the fixed coefficient of the model, *ie* represents the dependent variable; the share of the informal economy in country's GDP estimated by Schneider's (2016). X_{jit} represents a vector of economic, political, social, and institutional independent (*j*) variables listed in table (2) below, η_i is a term denotes the fixed and random effect in panel data model.

Table 2.

Variables Description

Variable name	Variable label	Variable name	Variable label
<i>country</i>	Country	<i>urb</i>	Urban population %
<i>year</i>	Year	<i>unemp</i>	Unemployment rate
<i>fdi</i>	Foreign direct investment % of GDP	<i>agr</i>	Agriculture value added% GDP
<i>ie</i>	Informal economy (% GDP)	<i>ffi</i>	Fiscal freedom index (taxes)
<i>fc</i>	Freedom of corruption	<i>openess</i>	Trade % GDP
<i>hdi</i>	Human development index	<i>fi</i>	Domestic credit % GDP
<i>bfi</i>	Business freedom index	<i>goveff</i>	Government effectiveness (-2.5: +2.5)
<i>pcgdp</i>	GDP per capita	<i>gdi</i>	Democracy index
<i>ggdp</i>	Economic growth annual %	<i>type</i>	State of country development

Source: Constructed by the author.

We employ a strongly balanced panel data information of 79 countries, both developed and less developed, for the period 1999 to 2013. A list of the countries and a list of the definitions and sources of the variables are provided in the appendix (Tables IV and V). The analysis starts with the panel data descriptive examination then, we apply some robustness checks and other tests to determine the suitable model estimation for equation 1.

Results and Discussion

Descriptive Results

Table (3) displays the main descriptive statistics (Number of observations, mean value, standard deviation, minimum and maximum values). The summary statistics are presented both by the type of development status of the country and by the total observations. The informal sector dominates 38.5% of the GDP in developing countries

on average during the period 1999–2013, which is nearly twice its share in the developed countries. The standard deviation of the informal sector is 13.6% in the developing countries, while only 5.6% in the developed countries during the same period.

Table 3.

Main descriptive statistics

Type	Variable	Mean	SD	Min	Max
Developed Countries	<i>ie</i>	17.81314	5.581502	8.443599	32.0225
	<i>fdi</i>	4.610139	6.302659	-14.9914	46.00126
	<i>fc</i>	75.40952	15.18196	37	100
	<i>hdi</i>	0.903929	0.045387	0.565	0.97
	<i>bfi</i>	80.02143	10.01329	57.8	100
	<i>pcgdp</i>	34877.97	10259.16	9933.779	55377.82
	<i>ggdp</i>	1.859817	2.53229	-6.38444	10.97129
	<i>infl</i>	2.131602	1.262407	-4.47994	6.350986
	<i>urb</i>	76.48565	10.34176	53.741	97.5148
	<i>unemp</i>	7.029048	3.336612	2.1	25.2
	<i>agr</i>	1.92566	0.883884	0.577304	4.30736
	<i>ffi</i>	53.42619	12.98834	29.8	82
	<i>openess</i>	91.11149	38.76682	36.5677	191.3684
	<i>fi</i>	126.8161	45.90875	29.56647	233.5488
	<i>goveff</i>	1.579578	0.459696	0.213577	2.358699
<i>gdi</i>	1.064286	0.167762	1	1.5	
Developing countries	<i>ie</i>	38.51242	13.62845	11.95449	81.4492
	<i>fdi</i>	4.212031	5.21039	-14.369	45.28993
	<i>fc</i>	33.20536	14.48244	4	94
	<i>hdi</i>	1.52239	26.13692	0.262	783
	<i>bfi</i>	62.02857	12.13301	24.9	100
	<i>pcgdp</i>	3594.838	4962.441	235.8849	34378.92
	<i>ggdp</i>	4.789934	4.02757	-14.8	34.5
	<i>infl</i>	7.691547	14.33882	-9.61615	293.6788
	<i>urb</i>	52.09193	22.19373	10.5908	100
	<i>unemp</i>	9.33817	6.323477	0.7	38.7
	<i>agr</i>	15.7746	11.23662	0.034203	56.71846
	<i>ffi</i>	76.80993	10.58525	43	99.7
	<i>openess</i>	85.72034	52.98277	20.22716	444.1004
	<i>fi</i>	37.64587	31.03985	2.215312	167.536
	<i>goveff</i>	-0.22788	0.598226	-1.59483	2.431312
<i>gdi</i>	3.58817	1.481368	1	7	
Total	<i>ie</i>	34.58218	14.90956	8.443599	81.4492
	<i>fdi</i>	4.287621	5.433829	-14.9914	46.00126
	<i>fc</i>	41.21881	22.08415	4	100
	<i>hdi</i>	1.40496	23.52383	0.262	783
	<i>bfi</i>	65.44494	13.71282	24.9	100

Type	Variable	Mean	SD	Min	Max
	<i>pcgdp</i>	9534.673	13803.05	235.8849	55377.82
	<i>ggdp</i>	4.233583	3.958944	-14.8	34.5
	<i>infl</i>	6.633949	13.09677	-9.61615	293.6788
	<i>urb</i>	56.72365	22.6008	10.5908	100
	<i>unemp</i>	8.899729	5.942539	0.7	38.7
	<i>agr</i>	13.14506	11.48663	0.034203	56.71846
	<i>ffi</i>	72.36998	14.38215	29.8	99.7
	<i>openess</i>	86.74397	50.62026	20.22716	444.1004
	<i>fi</i>	54.57694	49.02241	2.215312	233.5488
	<i>goveff</i>	0.115308	0.912582	-1.59483	2.431312
	<i>gdi</i>	3.108951	1.662365	1	7

Source: constructed by author bases on Stata output

Preliminary Check Tests

First, we test the stationarity in panel data by applying Levin, Lin, and Chu test (2002) to check the unit root. The results in a table (VI), in appendix, indicate that we reject the null hypothesis of unit root for all cases except for *pcgdp* and *urb*. All variables are stationary in levels and follow I (0) processes, *pcgdp* is stationary in the first differences and follows I (1) process, *urb* remains non-stationary after the first and second differences. Thus, to escape spurious regression results we exclude *urb* from our analyses and use *pcgdp* with the first differences. Second, we test whether to treat the dataset as panel data and employ panel data models or if all individual specific effects are 0. The estimation can be done with pooled OLS approach. The test results are given in table (VII), in appendix, and show that we should reject the null hypothesis and employ a panel data approach. Third, we estimate an initial panel data model with fixed effects and check whether the variances of the error terms are homoscedastic and whether the error terms are autocorrelated. The test results in tables (VIII and IX), in appendix, indicate rejecting the null hypothesis of constant variance and no first-order autocorrelation. Thus, both problems exist in our case.

The test results are given in table (X), in appendix. As we can see, we reject the null hypothesis and conclude that the fixed effects model should be employed.

Also, the fixed effects model partially eliminates the endogeneity. Considering the heteroskedasticity and autocorrelation in the model, we estimate two additional models, one with heteroskedasticity and autocorrelation robust standard errors, which only solve the problems connected with incorrect statistical inferences. The second model we employ is from the family of GLS, Prais-Winsten Feasible GLS regression, which also makes the model with the most efficient estimators. Table (4) presents a comparison of the estimation outputs of the four models.

Table 4.

Summary of the models

	FE Coeff./se	RE Coeff./se	Robust Coeff./se	FGLS Coeff./se
Dependent variable is ie				
fdi	0.0149 (0.04)	0.0468 (0.04)	0.0149 (0.07)	-0.0165 (0.03)
fc	0.1246*** (0.03)	0.0316 (0.03)	0.1246*** (0.04)	-0.0566* (0.03)
hdi	-0.0011 (0.01)	-0.0002 (0.01)	-0.0011 (0.00)	-0.0007 (0.00)
bfi	-0.0107 (0.02)	-0.0082 (0.02)	-0.0107 (0.05)	-0.0460* (0.02)
dpcgdp	0.0005 (0.00)	-0.0002 (0.00)	0.0005 (0.00)	-0.0003 (0.00)
ggdp	-0.2216*** (0.06)	-0.1697*** (0.06)	-0.2216*** (0.08)	-0.0799 (0.05)
infl	-0.0114 (0.02)	-0.0082 (0.02)	-0.0114 (0.03)	-0.0085 (0.02)
unemp	0.1271 (0.08)	0.1282 (0.08)	0.1271 (0.14)	0.0628 (0.07)
agr	-0.2886*** (0.07)	-0.1450** (0.07)	-0.2886* (0.16)	0.0743 (0.05)
ffi	-0.0345 (0.04)	0.0686* (0.04)	-0.0345 (0.05)	0.0696* (0.04)
openess	0.0003 (0.01)	-0.0092 (0.01)	0.0003 (0.03)	-0.0182*** (0.01)
fi	0.0785*** (0.01)	0.0243* (0.01)	0.0785*** (0.02)	-0.0100 (0.01)
goveff	4.2755*** (1.11)	-1.9085* (1.04)	4.2755 (3.42)	-5.2635*** (0.94)
gdi	-0.1214 (0.41)	0.3617 (0.39)	-0.1214 (0.64)	0.4801 (0.35)
_cons	31.7307*** (3.67)	28.7928*** (3.93)	31.7307*** (5.07)	35.9123*** (3.50)
N	1027	1027	1027	1027

Standard errors are in the parenthesis

* p<0.1, ** p<0.05, *** p<0.01

Source: constructed by author bases on Stata output

The results of the four estimated models show an insignificant impact on most variables. The GLS model¹ results report a statistically significant effect of *fc*, *bfi*, *ffi*, *openess* and *goveff* on the size of the informal sector. However, the positive impact of the fiscal freedom index (taxes) does not seem reasonable. That could result from multicollinearity shown in the variance inflator factors (VIF) presented in table (XI), in appendix. Obviously, we see that *bfi*, *ffi*, *is* highly correlated with all the other variables.

Stepwise Regression Estimation. Considering the multicollinearity problem, we start with the simpler Feasible Generalized Least Squares (FGLS) model and, with stepwise regression, try to control most of the critical factors. We initially start with a model that includes only the initial significant variables consistent with the literature. Then in model 2, we add variables *ggdp* and *fi*. Further, in model 3, we add *unemp* and *infl*. The results of the estimated models are presented in table (5), where model 2 appears to be the best possible.

The results of Model 2 indicate that government effectiveness has the highest impact on reducing the informal sector; a 1-unit increase in government effectiveness decreases the share of the informal economy by about 5.91 percentage points. Other significant variables are freedom from corruption, business freedom index, trade, GDP, and financial intermediary negatively affecting the size of informality, where 1 unit increase in any variable decreases the informality size by 0.075, 0.022 percentage points,² 0.011, 0.11, and 0.021 percentage points, respectively. Accordingly, we can state that for the period 1999–2013, the share of the informal economy is less in the countries with more freedom from corruption, higher business freedom index, more trade openness, higher government effectiveness, higher GDP growth, and more developed financial intermediary.

¹ That solves both problems of heteroskedasticity and autocorrelation.

² Although the statistical significance of business freedom index is marginal case, its sign is correct.

Table 5.

Summary of the step-wise models

	Model1 Coeff./se	Model2 Coeff./se	Model3 Coeff./se	Model4 Coeff./se
Dependent variable is ie				
fc	-0.0701*** (0.03)	-0.0745*** (0.02)	-0.0807*** (0.02)	-0.0566* (0.03)
bfi	-0.0318 (0.02)	-0.0219 (0.02)	-0.0236 (0.02)	-0.0460* (0.02)
openess	-0.0145* (0.01)	-0.0110** (0.01)	-0.0157** (0.01)	-0.0182*** (0.01)
goveff	-6.2581*** (0.82)	-5.9106*** (0.79)	-5.8211*** (0.78)	-5.2635*** (0.94)
ggdp		-0.1092*** (0.04)	-0.1020** (0.04)	-0.0799 (0.05)
fi		-0.0207*** (0.01)	-0.0146 (0.01)	-0.0100 (0.01)
infl			-0.0095 (0.01)	-0.0085 (0.02)
unemp			0.0489 (0.07)	0.0628 (0.07)
fdi				-0.0165 (0.03)
hdi				-0.0007 (0.00)
dpcgdp				-0.0003 (0.00)
agr				0.0743 (0.05)
ffi				0.0696* (0.04)
gdi				0.4801 (0.35)
_cons	42.0007*** (1.85)	42.4394*** (1.69)	42.4898*** (1.85)	35.9123*** (3.50)
r2	0.7882	0.8299	0.8297	0.7851
N	1106	1106	1106	1027

Standard errors are in the parenthesis

* p<0.1, ** p<0.05, *** p<0.01

Developing and Developed Countries. We check whether there is any heterogeneity in the estimated coefficients across developed and developing by including the interaction term of a dummy variable to Model 2. The dummy variable equals one if the country is developing, and 0 if it is developed. The estimation outputs and initial Model 2, are presented in table (6).

The coefficient of the interaction terms shows the difference in the impact of variables between the developed and developing countries. Thus, the sum of the variable's coefficient and its interaction term indicates the effect on the informal sector in developing countries.

By looking at Model 2_1 in Table (6), we can state that freedom from corruption has a higher impact on the informal sector in developed countries (-0.2) than in developing countries (-0.04).³ One unit increase in Trade in the developed countries decreases the

³ -0.2011+0.1576= -0.04

share of the informal economy by about 0.03 percentage points, but only a decrease of 0.01⁴ in the developing countries. The government effectiveness variable is the most critical factor for developing countries; a 1 unit increase in government effectiveness reduces the informal sector by 5.16 percentage points,⁵ but only 2.15 percentage points decrease in the developed countries. Three variables have no significant impact on the informal sector in developing countries: *i*) the business freedom index; *ii*) annual GDP growth; and *iii*) financial intermediary. In comparison, the same variables have significant adverse effects in the developed countries by -0.042, -0.12, and -0.02 percentage points, respectively.

Table 6.

Model with An Interaction Term

Summary of the final models

	Model2 Coeff./se	Model2_1 Coeff./se
Dependent variable is ie		
fc	-0.0745*** (0.02)	-0.2011*** (0.02)
bfi	-0.0219 (0.02)	-0.0422*** (0.02)
openess	-0.0110** (0.01)	-0.0270*** (0.01)
goveff	-5.9106*** (0.79)	-2.1516*** (0.70)
ggdp	-0.1092*** (0.04)	-0.1240*** (0.04)
fi	-0.0207*** (0.01)	0.0158*** (0.01)
1.Type#c.fc		0.1576*** (0.03)
1.Type#c.bfi		0.0156 (0.02)
1.Type#c.o~s		0.0184* (0.01)
1.Type#c.g~f		-3.0097** (1.29)
1.Type#c.g~p		0.0234 (0.05)
1.Type#c.fi		-0.0281 (0.02)
_cons	42.4394*** (1.69)	41.7390*** (1.83)
r2	0.8299	0.8007
N	1106	1106

Standard errors are in the parenthesis
* p<0.1, ** p<0.05, *** p<0.01

Source: constructed by author bases on Stata output

⁴ -0.027+0.0184= -0.01

⁵ -2.1516-3.0097= -5.16

Thus, we can conclude that the negative impact of freedom of corruption and openness is more significant for DC, the negative impact of government effectiveness estimate is more critical for LDC, and the effects of the business freedom index, annual GDP growth, and financial intermediary are not significantly different across the countries.

Finally, table (7) summarizes the four models employed during the stepwise analyses, modified with the inclusion of interaction terms, to assess whether there are any coefficient differences across the developed and developing countries in the full model specification.

Table 7.

Models with the Interaction Term

Summary of the models with interaction term

	Model1 Coeff./se	Model2 Coeff./se	Model3 Coeff./se	Model4 Coeff./se
Dependent variable is ie				
fc	-0.1372*** (0.02)	-0.2011*** (0.02)	-0.2031*** (0.02)	-0.1649*** (0.02)
1.Type#c.fc	0.1003*** (0.03)	0.1576*** (0.03)	0.1614*** (0.03)	0.1382*** (0.04)
bfi	-0.0263 (0.02)	-0.0422*** (0.02)	-0.0610*** (0.01)	-0.0184 (0.01)
1.Type#c.bfi	0.0005 (0.02)	0.0156 (0.02)	0.0357 (0.02)	-0.0330 (0.03)
openess	-0.0611*** (0.01)	-0.0270*** (0.01)	-0.0196*** (0.00)	-0.0192*** (0.01)
1.Type#c.o~s	0.0472*** (0.01)	0.0184* (0.01)	0.0039 (0.01)	-0.0061 (0.01)
goveff	-1.7956*** (0.68)	-2.1516*** (0.70)	-2.8781*** (0.67)	-3.1028*** (0.74)
1.Type#c.g~f	-3.2146** (1.29)	-3.0097** (1.29)	-2.1158 (1.31)	-2.0763 (1.42)
ggdp		-0.1240*** (0.04)	-0.0958*** (0.04)	-0.3703*** (0.14)
1.Type#c.g~p		0.0234 (0.05)	0.0025 (0.05)	0.3124** (0.14)
fi		0.0158*** (0.01)	0.0183*** (0.01)	0.0365*** (0.01)
1.Type#c.fi		-0.0281 (0.02)	-0.0117 (0.02)	-0.0394** (0.02)
infl			-0.0855 (0.08)	-0.0034 (0.09)
1.Type#c.i~l			0.0789 (0.08)	-0.0039 (0.09)
unemp			0.1730*** (0.06)	0.2460*** (0.07)
1.Type#c.u~p			-0.2223** (0.10)	-0.2754*** (0.09)
fdi				-0.0223* (0.01)
1.Type#c.fdi				-0.0041 (0.05)
hdi				-0.3888 (2.08)
1.Type#c.hdi				0.3879 (2.08)
dpcgdp				0.0007** (0.00)
1.Type#c.d~p				-0.0018*** (0.00)
agr				0.5823** (0.26)
1.Type#c.agr				-0.5257** (0.25)
ffi				-0.1264*** (0.02)
1.Type#c.ffi				0.1693*** (0.04)
gdi				-1.6719* (0.88)
1.Type#c.gdi				1.8956** (0.90)
_cons	41.5044*** (1.94)	41.7390*** (1.83)	42.0618*** (1.98)	40.2488*** (4.04)
r2	0.7739	0.8007	0.8165	0.7874
N	1106	1106	1106	1027

Standard errors are in the parenthesis
* p<0.1, ** p<0.05, *** p<0.01

Source: constructed by author bases on Stata output

The model with full specification and interaction terms improves the previous models, and when we treat different slope coefficients, some of the variables become significant. We can conclude that a 1 unit increase in *freedom from corruption* in developed countries decreases the share of the informal economy by 0.1649 percentage points, while by 0.0267 percentage points in the developing countries ⁶. *Government effectiveness* has the most significant impact on the informal sector size by -0.51791%⁷ in the developing countries, and -3.1028% in the developed countries. One unit increase in the *GDP growth* decreases the share of the informal economy in the developed countries by 0.3703 percentage points and in the developing countries by 0.0579.⁸ *Financial intermediary* in the developed countries increases the share of the informal economy by about 0.0365 percentage points, and by 0.0029 percentage points in the developing countries.⁹ The *agricultural value added* in the developed countries has the most significant positive impact on the share of the informal sector. A one-unit increase in the agriculture value added increases the share of the informal economy by about 0.5823 percentage points, while only by 0.0566 percentage points in the developing countries.¹⁰ *Unemployment* has a higher impact on informality in developed countries than the developing countries. One unit increase in unemployment increases the share of the informal economy by 0.2460 percentage points in the developed countries and by 0.0294 in the developing countries.¹¹ The *democracy index* has a negative impact on informality in developed countries (1.6719) and a positive impact in developing countries (0.2237).¹² More *fiscal freedom index* (taxes) reduces the informal sector share in the developed countries by 0.1264 percentage points but increases informality in the developing countries by 0.0429 percentage points.¹³ Both *foreign direct investment* and *Trade* have no significant impact on the size of informality in developing countries. Still, they have an adverse effect on the informal sector share in the developed countries by 0.0223 and 0.0192 percent, respectively. *The business*

⁶ -0.1649+0.1382= -0.0267

⁷ -3.1028-2.0763= -5.1791

⁸ -0.3703+0.3124= -0.0579

⁹ 0.0365-0.0394= -0.0029

¹⁰ 0.5823 -0.5257= 0.0566

¹¹ 0.2460 -0.2754= -0.0294

¹² -1.6719+1.8956= 0.2237

¹³ -0.1264+0.1693= 0.0429

freedom index, *inflation*, and *human development index* are statistically insignificant for developing and developed countries.

Conclusion and Policy recommendation

Understanding the determinants and causes behind the informal sector's existence is crucial for sustainable development, as informality is highly related to the country's growth path and poverty and inequality status. Moreover, the informal sector has long been less productive and less vulnerable than the formal one. It tends to employ more low-skilled workers, has more restricted access to finance, and needs economies of scale (Amaral and Quintin 2006; Loayza 2018). Hence, countries with high informality tend to grow below their potential, have less access to finance for the private sector, lower labor productivity, and have smaller fiscal resources (Docquier, Müller, and Naval 2017; La Porta and Shleifer 2014). Furthermore, employment in the informal sector does not contribute to the tax base, thus depriving governments of resources to provide essential services to their populations. Accordingly, with the increase in informality across countries, investigating the causes behind informal business existence becomes necessary.

The current study examines the determinants of the informal sector in 79 developing and developed countries; the study further investigates the reasons for the variations in the size across countries over time. The study employs several econometric techniques, through applying a multinomial logit model period 1999 to 2012 and following (Dreher and Schneider, 2009; Jajkowicz and Drobiszova, 2015; Schneider and Buehn, 2016) approach and using regression analysis to measure the effects of different economic, political, social, and institutional factors on the size of the shadow economy. The multinomial logit analysis results conclude that freedom from corruption negatively affects the informal economy; however, its impact is higher on developed countries than on developing ones. *Government effectiveness* is the primary determinant (the most substantial influence) of the informal sector size; the variable seems to be more effective in developed countries rather than in developing. Similarly, *GDP growth* negatively affects the informal economy; however, its impact is higher for developed countries. In contrast, *financial intermediaries can* positively impact the share of the informal economy; nonetheless, their impact is higher for developed countries. The *agriculture value-added* has a positive relationship with the informal sector size in both country types; moreover, it is considered the primary determinant of

the informal economy size in developed countries. Unemployment has a higher positive impact on the informal economy size in developed countries than the developing. The *democracy index* harms the informal sector size in developed countries while positively impacting developing countries. More *fiscal freedom index* (taxes) has a negative relationship with the informal sector size in developed countries; in contrast, it has a positive relationship with informality in developing countries. Both *foreign direct investment* and *Trade* have no significant impact on the size of informality in developing countries. Still, they have an adverse effect on the informal sector share in developed countries. Eventually, *the business freedom index*, *inflation*, and *human development index* are statistically insignificant for developing and developed countries.

Our findings have a clear set of implications for policymakers when designing and setting reforms based on the most relevant determinants for their countries to combat the informal economy phenomenon significantly. According to our study findings, the policies menu most pertinent to developed countries and developing countries is almost similar, with a few variations. Hence, the menu of policies for both countries would include reducing regulatory and administrative burdens, simplifying registration and regulatory requirements for new firms, improving government effectiveness, promoting transparency, increasing industrialization, and reducing unemployment, among others.

A well-designed policy set should address incentives for informal workers to transition to the formal sector. For policymakers in developed countries, the study highlights the negative impact of trade liberalization, which raises competition and is associated with greater informality. Thus, measures to protect the new and small firms have to be implemented to encourage the informal sector to operate formally.

Simple tax systems, including easy registration and electronic payment of taxes, and declining the tax burden, especially for start-ups, must be implemented.

The study suggests incorporating new determinants or, in other words, new policy areas, for instance, ICT/digitalization infrastructure. Although digitalization is shaping the fourth industrial revolution, it holds tremendous potential for workers in the SE. Moreover, the COVID-19 pandemic shock sheds more light on the vulnerability of the informal sector, especially in developing countries; hence future research could focus more on investigating policies that can better protect the informal economy workers and prevent them from being tipped into poverty by adverse shocks such as COVID-19.

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Appendix

Table I.

Determinants of SE in developed countries

Empirical Studies	Determinant	Its effect on SE size.	Methodology
Ruge,M. (2010); Barbosa et al., (2013); Robertodell’anno, (2007); Buehn and Schneider (2008); Dobre and Alexandru (2009), Buehn and Schneider (2011),	Unemployment rate	Positive (except in Buehn and Schneider (2008) it is negative only in the long run)	MIMIC model
Remeikiene et al., (2014), Mara and Popa, (2013), Jajkowicz,O. (2015)		Positive	Regression analysis
Barbosa et al., (2013), Robertodell’anno (2007), Buehn and Schneider (2008), Buehn and Schneider (2008), Buehn and Schneider (2011),	Tax burden	Positive	MIMIC
Remeikiene et al., (2014)		Positive	Regression analysis
Dell’Anno, et al., (2004)	Direct taxes	Positive	MIMIC
Jajkowicz (2015)		Negative	Regression analysis
Dell’Anno et al., (2004)	Indirect taxes	Ambiguous	MIMIC
Mara And Popa (2013)		Negative	Regression analysis
Ruge, M. (2010); Barbosa et al., (2013); Robertodell’anno (2007); Buehn and Schneider (2008); Buehn & Schneider (2011)	Regulation	Positive	MIMIC
Axel Dreher and Friedrich Schneider (2010)		Ambiguous (+ve / -ve)	Regression analysis
Dell’Anno et al., (2004),	Social Security contributions	Positive	MIMIC
Jajkowicz, O. (2015)		Negative (contrary to the literature)	Regression analysis
Ruge,M. (2010)	Wealth & development level measured	Negative	MIMIC
Robertodell’anno, (2007); Dell’Anno, et al., (2004), Dobre and Alexandru (2009)	Self- employment	Positive	MIMIC
Barbosa et al., (2013)	Subsidies % of GDP	Positive	MIMIC
Robertodell’anno. (2007)	Social Benefits Paid by Government % of GDP	Positive	MIMIC

Mara And Popa (2013)	Inflation rate	Positive	Regression analysis
Dreher and Schneider (2010); Jajkowicz, O. (2015)	Corruption	Positive	Regression analysis
Dreher and Schneider (2010); Jajkowicz, O (2015)	GDP per capita	Negative	Regression analysis
Buehn and Schneider (2011)	Institutions (Governance)	Negative	MIMIC
Dreher and Schneider (2010),			Regression analysis

Source: constructed by the author.

Table II.

Determinants of SE in developing countries

Empirical Studies	Determinant	Effect on SE size.	Methodology
Buehn & Schneider (2011), Schneider (2006), Hosseini et al., (2014), Ogbuabor and Malaolu (2013), Alkhdour (2011), Bouanani (2014), Hassan (2011), VO and Pham (2014), Vo and Ly (2014)	Unemployment	Ambiguous	MIMIC
Sabra et al., (2015), Maddah and Sobhani (2014), Elgin and Oyvat (2013), Robertodell'anno (2010)		Positive (except Robertodell'anno, 2010) urban unemployment rate (-ve)	Regression analysis
Buehn and Schneider (2011), Hosseini et al, (2014), Siddiki (2013), Alkhdour (2011), Schneider and Hassan (2016), Vo and Pham (2014), Vo and Ly (2014),	Tax burden	Positive (except study by Ceyhun Elgin and Cem Oyvat ())	MIMIC
Sabra et al., (2015); Tunyan (2005), Elgin and Oyvat (2013)			Regression and time series analysis
Buehn and Schneider (2011), Schneider (2006),	Direct taxes	Positive	MIMIC
Badariah Haji Din (2016)			Regression analysis
Buehn & Schneider (2011), Schneider (2006),	Indirect taxes	Positive	MIMIC
Badariah Haji Din (2016)		Negative	Regression analysis
Hassan (2011)	Trade Openness	Negative	MIMIC
Maddah and Sobhani (2014), Elgin and Oyvat (2013)			Regression analysis
Schneider (2006); Hosseini et al., (2014); Ogbuabor and Malaolu (2013); Rajeh Alkhdour (2011)	Regulation	Positive	MIMIC

Badariah Haji Din (2016)	Financial development	An inverted U-shape curve between financial development and SE.	Regression analysis
Buehn & Schneider (2011), Schneider (2006), Hassan (2011)	GDP per capita	Negative	MIMIC
Badariah Haji Din (2016)			Regression
Hassan (2011); Bouanani (2014); Ogbuabor and Malaolu (2013)	Inflation	Positive	MIMIC
Maddah and Sobhani (2014)			Regression analysis
Hassan (2011); Siddiki (2013)	Government size	Positive	MIMIC
Badariah Haji Din (2016)		Negative	Regression analysis
Maddah and Sobhani (2014)	Corruption	Positive	Regression analysis
Schneider and Hassan (2016)	Institutions	Negative	MIMIC
Robertodell'anno (2010)			Regression analysis
Sabra et al., (2015), Schneider and Hassan (2016)	Self-employment	Positive	Regression analysis
Vo and Pham (2014)			MIMIC
Hosseini et al., (2014)	Urbanization	Positive	MIMIC
Elgin and Oyvat (2013)		Positive and then negative (Non-linear)	Regression analysis
Schneider and Hassan (2016)	Agriculture sector importance	Positive	MIMIC
Hosseini et al., (2014)	Human development (Measured by Human development index)	Negative	MIMIC
Robertodell'anno (2010)		Positive and then negative (non-linear or inverted U-shape)	Regression analysis
Hosseini et al., (2014)	Economic development (measured by Human development index)	Negative	MIMIC
Sabra et al., (2015)	Economic Growth	Negative	Regression analysis
Elgin and Oyvat (2013)	Population Density	Negative	Regression analysis
Siddiki (2013)	Demand for currency (Measured by M0% of M2 or M3)	Negative (contrary to theory)	MIMIC
Vo and Ly (2014)	Public sector services (Measured by Government expenditures)	Negative	MIMIC

Vo and Pham (2014)	Net investments	Negative	MIMIC
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Source: constructed by the author.

Table III.

Determinants of SE in Developed & Developing countries

Empirical studies	Determinants of SE	Effect on SE size	Methodology
Hassan and Schneider (2016)	Tax burden	Positive	MIMIC
Torgler et al., (2011)			Regression analysis
Buehn and Farzanegan (2013)	Direct taxes	Ambiguous (Positive and Negative)	Regression analysis
Buehn and Schneider (2011)	Indirect taxes	Positive	MIMIC
Buehn and Schneider (2011), Buehn & Schneider (2009), Hassan and Schneider (2016)	Unemployment	Positive	MIMIC
Torgler et al., (2011)			Regression analysis
Hassan and Schneider (2016), Buehn and Schneider (2009)	Regulation	Positive	MIMIC
Friedman (2014), Torgler et al., (2011)	Institutions	Negative	Regression analysis
Buehn and Schneider (2009)	Government size	Positive	MIMIC
Goel, and Nelson (2016); Berdiev and Saunoris (2014)		Positive	Regression analysis
Berdiev and Saunoris (2014)	Globalization (overall and political globalization)	Negative	Regression analysis
Buehn and Farzanegan (2013); Berrittella (2013); Berdiev and Saunoris (2014)	Education (measured by Secondary school enrollment as a percentage of gross enrolment)	Positive	Regression analysis
	Education (measured by public education expenditure)	Negative	
Buehn & Schneider (2011)	GDP per capita	Negative	MIMIC
Berdiev and Saunoris (2014); Buehn and Farzanegan (2013); Torgler et al., (2011)			Regression analysis
Hassan and Schneider (2016)	Self-employment	Positive	MIMIC
Ghosh and Paul (2008)	FDI (measured by net inflows % of GDP)	Positive	Regression analysis
Barry A. Friedman (2014)	Economic growth	Negative	Regression analysis

Barry A. Friedman (2014)	Manufacturing share (% of GDP)	Positive	Regression analysis
Barry A. Friedman (2014), Torgler et al., (2011)	Corruption	Positive	Regression analysis
Torgler et al., (2011)	Agriculture share (% of GDP)	Negative	Regression analysis
Torgler et al., (2011)	Tax morale	Negative	Regression analysis
Ghosh and Paul (2008)	Trade openness	Positive	Regression analysis
Goel, and Nelson (2016)	Inflation	Positive	Regression analysis
Hassan and Schneider (2016)	Economic freedom	Negative	MIMIC
Torgler et al., (2011)	Population	Negative	Regression analysis
Ghosh and Paul (2008)	Urbanization	Positive	Regression analysis

Source: constructed by the author

Table IV.

List of Countries

Country	Type	Obs.	Country	Type	Obs.	Country	Type	Obs.
Albania	LDC	14	France	DC	14	Peru	LDC	14
Algeria	LDC	14	Gabon	LDC	14	Philippines	LDC	14
Argentina	LDC	14	Gambia	LDC	14	Portugal	DC	14
Armenia	LDC	14	Georgia	LDC	14	Russia	LDC	14
Australia	DC	14	Germany	DC	14	Saudi Arabia	LDC	14
Austria	DC	14	Ghana	LDC	14	Senegal	LDC	14
Azerbaijan	LDC	14	Guyana	LDC	14	Singapore	LDC	14
Bahamas	LDC	14	Honduras	LDC	14	South Africa	LDC	14
Bangladesh	LDC	14	India	LDC	14	Spain	DC	14
Belarus	LDC	14	Ireland	DC	14	Sri Lanka	LDC	14
Belgium	DC	14	Italy	DC	14	Suriname	LDC	14
Bolivia	LDC	14	Jordan	LDC	14	Sweden	DC	14
Botswana	LDC	14	Kenya	LDC	14	Switzerland	DC	14
Brazil	LDC	14	Lesotho	LDC	14	Thailand	LDC	14
Burkina Faso	LDC	14	Malaysia	LDC	14	Trinidad and Tobago	LDC	14
Cambodia	LDC	14	Mali	LDC	14	Tunisia	LDC	14
Chad	LDC	14	Mauritius	LDC	14	Turkey	LDC	14
China	LDC	14	Mexico	LDC	14	Uganda	LDC	14
Colombia	LDC	14	Mongolia	LDC	14	Ukraine	LDC	14
Costa Rica	LDC	14	Morocco	LDC	14	United Kingdom	DC	14

Croatia	LDC	14	Mozambique	LDC	14	Uruguay	LDC	14
Czech Republic	DC	14	Nepal	LDC	14	Vietnam	LDC	14
Denmark	DC	14	Netherlands	DC	14	Zambia	LDC	14
Dominican Republic	LDC	14	Nicaragua	LDC	14			
Ecuador	LDC	14	Niger	LDC	14			
Egypt, Arab Rep.	LDC	14	Nigeria	LDC	14			
El Salvador	LDC	14	Pakistan	LDC	14			
Fiji	LDC	14	Paraguay	LDC	14			

Source: (UN, 2013).

Table V.

Variables Definitions and Resources

Variable	Definition	Source
Informal economy	Measured as the shadow economy size % of GDP estimated by MIMIC approach (Multiple Causes Multiple Indicators model)	Size and Development of the Shadow Economies of 157 Countries Worldwide: Updated and New Measures from 1999 to 2013 (an empirical study by Mai Hassan and Friedrich Schneider, October 2016): http://www.econ.jku.at/members/Schneider/files/publications/2016/SizeShadEc157countries_JOGE.pdf
business freedom index	The business freedom component measures the extent to which the regulatory and infrastructure environments constrain the efficient operation of businesses. The quantitative score is derived from an array of factors that affect the ease of starting, operating, and closing a business. The business freedom score for each country is a number between 0 and 100, with 100 indicating the freest business environment.	Heritage Foundation: http://www.heritage.org/index/explore
Freedom from corruption index	The score for this component is derived primarily from Transparency International's Corruption Perceptions Index (CPI) for 2011, which measures the level of corruption in 183 countries. The CPI is based on a 10-point scale in which a score of 10 indicates very little corruption and a score of 0 indicates a very corrupt government. In scoring freedom from corruption, the <i>Index</i> converts the raw CPI data to a scale of 0 to 100 by multiplying the CPI score by 10. For example, if a country's raw CPI data score is 5.5, its overall freedom from corruption score is 55.	Heritage Foundation: http://www.heritage.org/index/explore
Fiscal freedom index (tax burden index)	Tax burden is a composite measure that reflects marginal tax rates on both personal and corporate income and the overall level of taxation (including direct and indirect taxes imposed by all levels of government) as a percentage of gross domestic product (GDP). The component score is derived from three quantitative sub-factors: The top marginal tax	Heritage Foundation: http://www.heritage.org/index/explore

	rate on individual income, The top marginal tax rate on corporate income, and The total tax burden as a percentage of GDP. Each of these numerical variables is weighted equally as one-third of the component score. This equal weighting allows a country to achieve a score as high as 67 based on two of the factors even if it receives a score of 0 on the third. Tax burden scores are calculated with a quadratic cost function to reflect the diminishing revenue returns from very high rates of taxation.	
Human development index	The Human Development Index (HDI) is a summary measure Of achievements in three key dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions.	Human Development Reports Different years (UNDP): http://hdr.undp.org/en/search/file/REPORT
Democracy index (average of political rights and civil liberties indices)	Political Rights (PR) and Civil Liberties Ratings (CL): A country or territory is assigned two ratings (7 to 1)—one for political rights and one for civil liberties—based on its total scores for the political rights and civil liberties questions. Each rating of 1 through 7, with 1 representing the greatest degree of freedom and 7 the smallest degree of freedom, corresponds to a specific range of total scores. Democracy index for country (i)= (score of country (i) in PR + score of country (i) in CL /2)	Freedom House: https://freedomhouse.org/sites/default/files/FH_Country_and_Territory_Ratings_and_Statues_1972-2016.xls (Freedom House)
inflation (CPI) Annual %	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.	World development indicators: http://data.worldbank.org/products/wdi
trade % GDP	Merchandise trade as a share of GDP is the sum of merchandise exports and imports divided by the value of GDP, all in current U.S. dollars.	World development indicators: http://data.worldbank.org/products/wdi
Agriculture value added% GD	Agriculture corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. (as % of GDP)	World development indicators: http://data.worldbank.org/products/wdi
urban population %	Urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects. (% of total population)	World development indicators: http://data.worldbank.org/products/wdi

GDP per capita	GDP per capita (constant 2010 US\$): GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars.	World development indicators: http://data.worldbank.org/products/wdi
unemployment rate	Unemployment refers to the share of the labor force that is without work but available for and seeking employment ((modeled ILO estimate)	World development indicators: http://data.worldbank.org/products/wdi
government effectiveness Estimate (-2.5:+2.5)	Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Governance Indicators available at: http://data.worldbank.org/data-catalog/worldwide-governance-indicators
Economic growth (GDP growth annual%)	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.	World development indicators: http://data.worldbank.org/products/wdi
Foreign direct investment Inward flows % of GDP	Foreign direct investment measured as FDI Inward flows % of GDP	UNCTAD STAT: http://unctadstat.unctad.org/wds/TableViewer/tableViewer.aspx
domestic credit % GDP	Domestic credit to private sector (% of GDP): Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. The financial corporations include monetary authorities and deposit money banks, as well as other financial corporations where data are available (including corporations that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other financial corporations are	World development indicators: http://data.worldbank.org/products/wdi

	finance and leasing companies, money lenders, insurance corporations, pension funds, and foreign exchange companies.	
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Source: constructed by the author

Table VI.

Levin, Lin, Chu Unit root test for stationarity

Variable	Unadjusted t	Adjusted t*	p-value	Unit root
<i>ie</i>	-14.9313	-8.2927	0.0000	No
<i>fdi</i>	-16.9625	-7.4753	0.0000	No
<i>fc</i>	-16.9696	-7.5803	0.0000	No
<i>hdi</i>	-27.3062	-18.716	0.0000	No
<i>bfi</i>	-12.0815	-4.4741	0.0000	No
<i>pcgdp</i>	0.193	3.7644	0.9999	Yes
<i>ggdp</i>	-22.9465	-12.0836	0.0000	No
<i>infl</i>	-33.6042	-28.0519	0.0000	No
<i>urb</i>	2.0314	2.4483	0.9928	Yes
<i>unemp</i>	-13.6321	-6.5692	0.0000	No
<i>agr</i>	-17.655	-11.7467	0.0000	No
<i>ffi</i>	-14.6924	-7.7855	0.0000	No
<i>openess</i>	-12.5548	-5.0803	0.0000	No
<i>fi</i>	-9.3213	-4.2536	0.0000	No
<i>goveff</i>	-14.9745	-7.3453	0.0000	No
<i>gdi</i>	-50.3574	-50.2297	0.0000	No
<i>d1.pcgdp</i>	-19.2694	-9.6736	0.0000	No
<i>d1.urb</i>	-2.1731	25.3949	0.9999	Yes

Source: constructed by author bases on Stata output

Table VII.

Limer F

F test that all $u_i = 0$:

$F(78, 934) = 60.81$ $Prob > F = 0.0000$

Source: constructed by author bases on Stata output

Table VIII.

Modified Wald test for group wise heteroskedasticity

H0: $\sigma(i)^2 = \sigma^2$ for all i

chi2 (79) = 79864.32
 Prob>chi2 = 0.0000

Source: constructed by author bases on Stata output

Table IX.

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F(1, 78) = 72.610
 Prob > F = 0.0000

Source: constructed by author bases on Stata output

Table X.

Hausman specification test

Test: Ho: difference in coefficients not systematic

chi2(14) = (b-B)' [(V_b-V_B)^(-1)] (b-B)
 = 185.11
 Prob>chi2 = 0.0000
 (V_b-V_B is not positive definite)

Source: constructed by author bases on Stata output

Table XI.

VIF

Variable	VIF	1/VIF
bfi	44.73	0.022358
ffi	28.90	0.034598
fc	26.86	0.037235
goveff	9.77	0.102326
gdi	8.11	0.123274
fi	6.32	0.158342
openess	5.87	0.170489
agr	3.86	0.259217
unemp	3.47	0.288364
ggdp	3.32	0.301487
fdi	2.04	0.491338
dpcgdp	1.63	0.612356
infl	1.61	0.620498
hdi	1.01	0.987866

Source: constructed by author bases on Stata output

محددات القطاع غير الرسمي في الدول المتقدمة والنامية

مستخلص

أصبح الاقتصاد غير الرسمي ظاهرة متنامية في البلدان النامية والمتقدمة على حد سواء، حيث يعمل تحت مظلة هذا القطاع نحو ملياري شخص، أي ما يعادل 60% من سكان العالم. وفي خضم السعي نحو تحقيق أهداف التنمية المستدامة، يمثل التعرف على محددات الاقتصاد غير الرسمي ودوافعه أمراً بالغ الأهمية، إذ يرتبط وجوده وانتشاره ارتباطاً وثيقاً بمعدلات النمو المتحققة في البلدان المختلفة، وكذا معدلات الفقر واللامساواة. وعليه، تبحث الدراسة في محددات وأسباب وجود القطاع غير الرسمي في عينة من 79 دولة نامية ومتقدمة خلال الفترة من 1999 إلى 2013 باستخدام نموذج الانحدار اللوجستي متعدد الحدود. وقد توصلت الدراسة إلى تباين واختلاف محددات الاقتصاد غير الرسمي بين الدول النامية والمتقدمة من حيث الأهمية وحجم التأثير. كما كشفت النتائج التجريبية عن أن فعالية الحكومة تمثل المحدد المحوري والأكثر أهمية في كل عينة، من الدول النامية والمتقدمة على حد سواء. في حين تأتي القيمة المضافة للقطاع الزراعي على رأس محددات القطاع غير الرسمي في البلدان المتقدمة. بالإضافة إلى ذلك، فإن نمو الناتج المحلي الإجمالي، والتحرر من الفساد، والبطالة، وكذا الديمقراطية جاءت كأكثر العوامل فعالية في تحديد قيمة القطاع في الدول المتقدمة عنها في الدول النامية. وبناءً على ما تقدم، تقدم الدراسة التوصيات لصانعي القرار بالسياسات التي من شأنها العمل على تقليص حجم القطاع غير الرسمي تدريجياً من خلال تفعيل حزمة من الإجراءات الشاملة والفعالة التي تأخذ في اعتبارها محددات تواجد القطاع غير الرسمي في كل بلد، وتباين هذه المحددات من بلد لآخر.

الكلمات الدالة: محددات الاقتصاد غير الرسمي، نموذج الانحدار اللوجستي متعدد الحدود، نموذج العزوم المعممة، الدول المتقدمة، الدول النامية، التنمية المستدامة