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Urbanization, Governance and Informal Economy: an African Tale.

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Abstract

Using system Generalized Method of Moments (GMM), and Panel Smooth Transition Regression (PSTR) on an unbalanced panel data of 45 African countries over the period 2000-2015, this paper empirically analyzes the role of governance in the relationship between urbanization and informal economy. Our results show that there is a reverse U-shaped relationship between urbanization and the informal economy. At the earlier stage, urbanization increases informal economy in Africa, and in the later stage the effect of urbanization on informal economy decreases with the interaction of governance quality.

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1 Introduction

The important role played by urbanization in sustainable development has been recognized in many countries, through many works and reports; the most recent of which are the Agenda for Sustainable Development 2030 and the New Urban Agenda. While many Sustainable Development Goals (SDGs) are related to urbanization, SDG 11 addresses this topic directly. Thus, it aims to make cities and urban environment inclusive, safe, resilient and sustainable (United Nations, 2019). Urbanization is defined as an increase in the proportion of the population living in urban areas" (OECD, 2013).

According to Cobbinah et al. (2015), rapid urbanisation has become synonymous with developing countries in recent years, with an urbanisation level more than doubled between 1950 and 2000, from 18% to 40%, with the expected level to exceed 50% by 2020 and 64% in 2050. Africa's urban population has grown from about 237 million in 1995 to about 472 million in 2015, an average growth rate of 3.44% (UN-Habitat, 2016). Across the various sub-regions and countries, Africa's urbanisation has been rough. For example, from 2000 to 2015, Eastern Africa recorded an urbanisation level of 24% compared to 40%, 41%, 52% and 62% for Western Africa, Southern Africa, Central Africa and Northern Africa respectively (See Figure 1).

However, the rapid growth of Africa's urban population is accompanied by serious governance challenges. Sixteen of the twenty countries with the highest urban population growth rates in 2018, are in the bottom half of Transparency International's Corruption Perception Index, showing high risks of corruption and poor governance in the public sector (Zinnbauer, 2020). Similarly, the ten most rapidly urbanizing countries for which data are available have a very high proportion of their urban workforce in informal employment, from 63% in Mali to 88% in Nigeria and Angola (ILO, 2018; United Nations, 2019; Zinnbauer, 2020). One of the strongest consequences of urbanization in Africa is the increase in the size of the informal sector. The development of urban areas in Africa has encouraged the movement of people from rural to urban areas in search of decent work and a better quality of life. As a result, this has led to the development of activities that are sometimes beyond the control and regulation of public authorities, leading to the proliferation of the informal economy.

Informal economy, still called shadow economy or underground economy according to Medina and Schneider (2018) includes all economic activities that are hidden from official authorities for monetary, regulatory and institutional reasons. The informal economy is a widespread phenomenon in developing countries, which poses significant economic, social and political problems. The size of the informal sector is thriving in Africa, exceeding almost 34% (Medina et al., 2017). While in past decades important works have been done to explain the nature, determinants and consequences of the informal economy, empirical studies on this issue remain limited (Buehn and Schneider, 2012; Igudia et al., 2016; Medina et al., 2017; Elgin and Erturk, 2019; Njangang et al., 2020). Moreover, while tax burden are considered as one of the most important determinants of the proliferation of the informal economy in urban areas, many other factors can be exploited, including the level of development, trade openness and governance. However, governance can prove to be an important tool to curb the development of the informal economy. Theoretically, governance can curb the development of the informal economy in urban areas through different channels. For example, with good governance that reduces corruption, whose interests of individuals are adequately represented, whose rule of law is respected, and whose corporate property rights are protected, both individuals and firms will be more likely to migrate from the informal to the formal sector (Torgler and Schneider, 2007; Jonasson, 2012; Williams and Horodnic, 2016; Smit, 2018; Zinnbauer, 2020).

There are very few empirical studies on the effects of governance on the informal economy, especially the role that governance plays in the relationship between urbanization and the informal economy. Among these few studies (Torgler and Schneider, 2007; Hellebrandt, 2008; Elgin and Oyvat, 2013; Mwaniki et al., 2015), none of them have specifically focused on the case of Africa, yet Africa is the world' region with the fastest rate of urbanization and the largest size of the informal sector. Africa is also one of the regions with the lowest governance scores in the world.

The aim of this study is to fill this gap by analyzing the role of governance quality in the relationship between urbanization and the informal economy in Africa. The contribution of this paper is threefold. First, this paper is one of the few empirical studies to investigate the nexus between urbanization and informal economy in African countries. The few previous studies have focused either on a worldwide sample of countries, or on countries' case of study. Second, this paper highlights the mitigating role of governance on the increase in the size of informal sector, due a rapid growth of urban population. Thus, while we agree with the works of Kuznets that urbanization is accompanied by a growth of urban inequalities, individuals who are victims of inequalities in access to jobs, wages, education and health care are incentive to develop informal activities. Governance therefore appears as an effective tool for reducing the size of the informal sector. Third, this article uses two robust estimation techniques. We first run a direct and indirect GMM model, controlling for the endogeneity bias exerted by urbanization on the informal economy. Then, we subsequently run a PSTR model to capture the different thresholds at which governance changes the nature of the relationship between urbanization and informal economy. To our knowledge, our study is the first to use such a method on this issue.

To sum up, the results show that there is a reverse U-shaped relationship between urbanization and the informal economy. At the earlier stage, urbanization increases informal economy in Africa, and in the later stage the effect of urbanization on informal economy decreases with the interaction of governance quality.

The rest of this paper is organized as follows. Section 2 describes the data and methodological approach while Section 3 discusses the results. Section 4 presents Robustness checks and section 5 concludes.

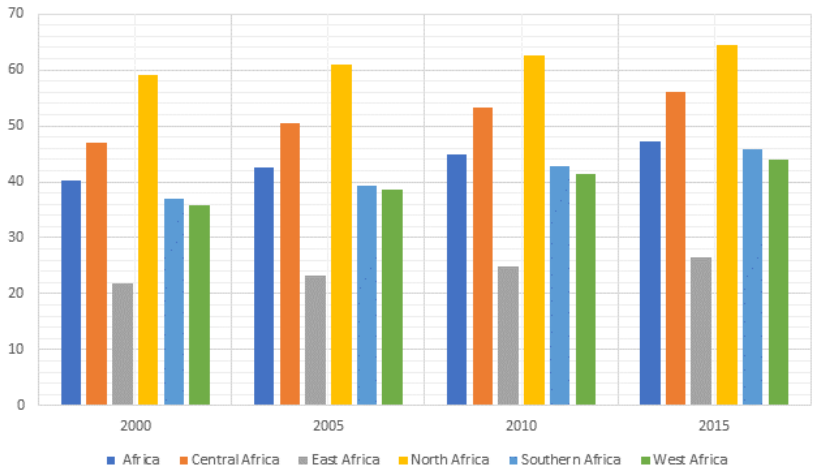

Figure 1: Urbanization in Africa
Source: Authors' construction with WDI database

2 Data and Methodological Approach

2.1 Data and Description of Variables

In order to assess the role of governance in the nexus between urbanization informal economy, we use a set of variables from different sources. Our sample covers a sample of 45 African countries[1] over the period 2000-2015. Our dependent variable is informal economy obtained from the work of Medina and Schneider (2018), who applied the Multiple Indicators Multiple Causes (MIMIC) modeling approach to estimate the size of the informal economy as a percentage of GDP. Our key explanatory variable is urbanization, captured by the urban population growth rate, from the *World Development Indicator* (WDI). Drawing on the literature on the determinants of the informal economy (Igudia et al., 2016; Medina et al., 2017; Medina and Schneider, 2018; Elgin and Erturk, 2019), we use as control variables: (i) GDP per capita; (ii) unemployment rate; (iii) trade openness and (v) tax burden. These variables are obtained from the WDI. Finally, as interaction variables, we use six indicators of the quality of governance, namely: (a) rule of law; (b) regulatory quality; (c) political stability; (d) control of corruption; (e) government effectiveness and (f) voice and accountability. These variables are obtained from the *Worldwide Governance Indicator* (WGI). Table 1 provides summary statistics on the used variables, while Tables 5 and 6 in appendix report description and sources of variables, and correlation matrix respectively,.

Table 1: Descriptive statistics

Variables	Unit	Obs.	Mean	SD	Min	Max
Informal Economy	Percentage	720	3.600	0.239	2.956	4.235
Urbanization	Percentage	720	3.667	1.504	-0.138	11.49
GDP Per Capita	USD	720	2366.437	3128.037	193.8669	20333.94
Unemployment	Percentage	720	1.932	0.872	-1.139	3.639
Trade Openness	Percentage	697	4.216	0.401	3.043	5.138
Tax Burden	Percentage	480	60.104	59.717	13.6	339.1
Rule of Law	Index	630	-0.634	0.615	-1.852	1.077
Regulatory Quality	Index	630	-0.599	0.569	-2.236	1.127
Political stability	Index	630	-0.491	0.847	-2.699	1.200
Control of corruption	Index	630	-0.620	0.594	-1.772	1.216
Government Effectiveness	Index	630	-0.672	0.582	-1.848	1.049
Voice and Accountability	Index	630	-0.600	0.694	-2	0.970

Source: Authors calculations

2.2 Empirical strategy

Our empirical strategy is based on two estimation techniques: the generalized method of moments (GMM) and the Panel Smooth Transition regression (PSTR) method. The GMM estimator allows us to estimate the direct and indirect effects of urbanization on the size of informal

[1] Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, CAF, Cabo Verde, Cameroon, Chad, Congo, DRC, Egypt, Ethiopia, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Bissau Guinea, Mauritius, Congo Ivory, Kenya, Lesotho, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sierra Leone, South Africa, Senegal, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

sector, while the PSTR method allows us to highlight the different transitions in the nexus between urbanization and the informal economy by respecting the threshold variables. The PSTR method also provides robustness to the GMM method.

2.2.1 GMM Specifications

In order to analyse the effects of urbanization on informal economy, we specify the following dynamic panel model:

$$Informal = \beta_0 + \beta_1 Informal_{it-1} + \beta_2 Urb_{it} + \beta_3 X_{it} + \lambda_i + \mu_t + \varepsilon_{it} \quad (1)$$

where $Informal$ is the informal economy level in the country i at the date t, Urb urbanization, X the vector of control variables, λ_i the unobserved country fixed effects, μ_t the time fixed effects, and ε_{it} the error term.

Besides the direct effect of urbanization on the informal economy described above in equation (1), the effect can also be observed through indirect channels. As mentioned at the beginning of this work, we test the indirect link, by an interaction between urbanization and governance indicators, namely: regulatory quality, rule of law, government effectiveness, political stability, control of corruption, government effectiveness and voice and accountability. The nonlinear specification of the equation is:

$$Informal = \beta_0 + \beta_1 Informal_{it-1} + \beta_2 Urb_{it} + \beta_3 \vartheta_{it} + \beta_4 (Urb * \vartheta_{it}) + \beta_5 X_{it} + \lambda_i + \mu_t + \varepsilon_{it} \quad (2)$$

In this equation, we introduce an interaction term to account for the nonlinear effect exerted by the mediating variable ϑ_{it} . This specification of the equation (2) makes it possible to check whether beyond a certain level the mediating variable ϑ_{it} becomes more or less important in determining the marginal effect of urbanization on the informal economy. Thus, the marginal effect is given by the equation (3) below :

$$\frac{\partial Informal_{it}}{\partial Urb_{it}} = \beta_3 + \beta_4 \vartheta_{it} \quad (3)$$

We estimate the above equations (1) and (2) by the system generalized method of moments (GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998).

The main advantage of the GMM estimator is that it is often used to address the endogeneity problem that appears in panel data estimation (Arellano and Bover, 1995; Blundell and Bond, 1998). There are at least two sources of endogeneity commonly known to bias the estimates: omitted variables and reverse causality. To mitigate the concern of omitted variable, the common practice is to add fixed effects to control for the effect of the time-invariant unobserved countries heterogeneity. To deal with reverse causality, the lagged dependent variable is included in the model (Wooldridge, 2010). Two versions of the GMM technique have been developed: “difference GMM” and “system GMM”. For the difference GMM estimator, the lagged levels of the endogenous variables are used as instruments (for exogenous variables, their first differences serve as their own instruments). The system GMM estimator simultaneously employs the equation in differences and the equation in levels by using lagged levels of the variables as instruments in the differenced equation and lagged differences of the variables as instruments in the level equation. Given sample bias concerns associated with the difference GMM estimator, Bond et al. (2001) noted that the system GMM estimator can dramatically improve efficiency and avoid the weak instrument problem of the first-difference GMM estimator.

The consistency of the GMM estimator depends on two things: the validity of the assumption that the error term does not exhibit serial correlation (AR (2)) and the validity of the instruments (Hansen test).

Although equation (2) takes nonlinearity into account, it assumes that the transition function is linear. We check the validity of this nonlinearity by using a PSTR estimator. The main advantage of the PSTR model is that it allows the urbanization-informal economy coefficients to vary with respect to time and country. Hence, the coefficients can take different values; depending on the value of another observable variables, which in our case governance indicators (rule of law, regulatory quality, political stability, control of corruption, government effectiveness and voice and accountability). The PSTR model allows individuals to move between groups and over time depending on changes in the threshold variables. The PSTR model also provides a parametric approach to cross-country heterogeneity, and to the time instability of the urbanization-informal economy coefficient, smoothing the alterations of these coefficients with respect to the threshold variables.

2.2.2 PSTR Specifications

To assess the nonlinear nexus between urbanization and the informal economy, we use the PSTR model developed by Gonzalez et al. (2005) and Fok et al. (2005).

let a PSTR model with two regimes and a single transition function illustrated as follows:

$$Informal_{it} = \lambda_i + \beta_1 IS_{it-1} + \beta_2 IS_{it-1}\Gamma(\vartheta_{it};\gamma;c) + \theta_0' X_{it} + \varepsilon_{it} \tag{4}$$

where for any $i = 1, ..., N$ and $t = 1, ..., T$. N and T represent the individual and time dimensions of the panel, respectively. The transition function Γ is continuous and depends on the threshold variable ϑ_{it} and the smooth parameter c. γ determines the nature of the transition function. Inspired by the work of Granger et al. (1993) and Gonzalez et al. (2005), we propose the following logistic function:

$$\Gamma(\vartheta_{it};\gamma;c) = \left[1 + \exp(-\gamma(\vartheta_{it} - c))^{-1}\right], \qquad \gamma \succ 0 \tag{5}$$

Thus, for a high value of γ, i.e. when its value tends towards infinity, the regime change is of a raw nature and the PSTR model is similar to that of Hansen (1999). On the other hand, when the value of γ is low, i.e. when it tends towards zero, the transition function is smooth in nature. The sensitivity of the informal sector to urbanization is given by :

$$\frac{\partial Informal_{it}}{\partial Urb_{it}} = \beta_1 + \beta_2\Gamma(\vartheta_{it};\gamma;c) \tag{6}$$

The estimation of a PSTR model according to Gonzalez et al. (2005) follows the following procedure : (a) the linearity test of the model, (b) the choice of the number of regimes of the transition function and (c) the estimation of the parameters.

3 Results and Discussions

As a starting exercise, we analyzed the direct impact of urbanization on informal economy. Then, we captured the individuals effects of governance on informal economy by adding governance indicators. Although this linear specification is not our theoretically preferred model, it shows us the standalone effects of urbanization and the other control variables and highlights the relative effect of urbanization in the increase in size of informal economy. The results got from the first set of regressions on dynamic panel models are presented in Table 2.

To lessen concerns about endogeneity, we lagged all regressors. In the regressions in Table 2, we first control for the level of GDP per capita, trade openness, unemployment rate, tax burden (Column 1) and further we control for rule of law, regulatory quality, control of corruption, government effectiveness, political stability and voice and accountability (Column 2 to 7). The regressions satisfy the specification tests (AR1, AR2 and Hansen test). There is no evidence of a second serial correlation, but there is strong evidence of a first serial correlation. Moreover, the regressions pass the Hansen test and confirm the validity of the instruments.

Across all estimations, we find that urbanization is positively and significantly related to informal economy. Indeed, the results in column 1 show that, all things being equal, an increase in one percent in urbanization enhance informal economy in african countries by 0.044%. This finding corroborates the results by Yuki (2007); Hellebrandt (2008); Moreno-Monroy (2012), as well as UN-Habitat (2016) and United Nations (2019). This result confirms the fact informality is one of the strongest consequences of urbanization in Africa. The development of urban areas in Africa has encouraged the movement of people from rural to urban areas in search of decent work and a better quality of life. As a result, this has led to the development of informal activities.

Regarding to the effect of governance variables, we find that the coefficients of all governance indicators are negative and significant, but not all at conventional levels. Control of corruption, rule of law and regulatory have the most statistical significance and effects. Thus, containing corruption in urban areas, respecting rule of law and ensuring good regulatory quality appear to be important tools to curb the proliferation of the informal economy in Africa. These results are in line with Torgler and Schneider (2007); Elgin and Oyvat (2013); Friedman (2014); Elgin and Oztunali (2014) and Mwaniki et al. (2015).

Let us consider a general comment relating to the other control variables. All the explanatory variables have the expected sign. Indeed, the negative sign of GDP per capita means that the size of informal economy decreases with the level of development (Elgin et al., 2016). The positive signs of Unemployment means that individuals would be more willing to move to informal activities and accept informal jobs in the case of high unemployment (Almeida and Carneiro, 2012; Bosch et al., 2012). Tax burden also have a negative sign meaning that informal economy is associated with higher tax levels. Moreover, one of the main motives to go informal is avoiding taxes (Prado, 2011; Elgin et al., 2010). Finally, the negative value of trade openness implies that opening to international trade may also ease a government's ability to scrutinize informal production. Therefore, trade openness might also be effective in increasing the external returns to human capital as the informal economy is unskilled labor intensive. This might further contribute to the decline of informality (Elgin and Oyvat, 2013).

Table 2: Urbanization, Governance and Informal Economy

	Dependent Variable: Informal Economy						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Urbanization	0.0442***	0.0233**	0.0209**	0.0249***	0.0216***	0.0135**	0.0167**
	(0.016)	(0.010)	(0.010)	(0.009)	(0.007)	(0.007)	(0.008)
GDP Per Capita	-0.0521***	-0.0366*	-0.0213	-0.0372**	-0.0391**	-0.0168*	-0.0162
	(0.019)	(0.021)	(0.018)	(0.018)	(0.019)	(0.009)	(0.013)
Unemployment	0.0247	0.0413*	0.0377*	0.0483*	0.0483*	0.0313*	0.0296*
	(0.028)	(0.021)	(0.022)	(0.026)	(0.027)	(0.018)	(0.017)
Trade Openness	-0.1138**	-0.0744**	-0.0762**	-0.0763**	-0.0383	-0.0896***	-0.0758**
	(0.054)	(0.035)	(0.034)	(0.032)	(0.053)	(0.031)	(0.031)
Tax Burden	0.0013**	0.0001	-0.0000	0.0000	0.0001	0.0000	0.0000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rule of Law		-0.0724***					
		(0.026)					
Regulatory Quality			-0.0597**				
			(0.029)				
Political Stability				-0.0315*			
				(0.018)			
Control of corruption					-0.0561***		
					(0.019)		
Government Effectiveness						-0.0599**	
						(0.024)	
Voice and Accountability							-0.0284**
							(0.013)
Lag of Informal Economy	0.3143**	0.5659***	0.6195***	0.6217***	0.5956***	0.7187***	0.8033***
	(0.139)	(0.114)	(0.103)	(0.110)	(0.090)	(0.101)	(0.082)
Constant	0.2288***	1.9076***	1.6289***	1.6956***	1.6811***	1.3322***	0.9802***
	(0.085)	(0.504)	(0.485)	(0.452)	(0.439)	(0.393)	(0.338)
Observations	675	345	345	345	361	345	345
Instruments/Countries	43/45	39/43	41/43	39/43	40/44	39/43	39/43
AR (1)	0.000	0.004	0.002	0.002	0.000	0.000	0.000
AR (2)	0.742	0.487	0.532	0.422	0.678	0.615	0.662
Hansen OIR	0.454	0.791	0.874	0.428	0.644	0.569	0.606
Fisher	868.2***	24.34***	94.18***	39.84***	53***	138.7***	142.8***

Notes : The sample runs from 2000 to 2015. Robust standard errors are reported in parentheses. (***, **, *) indicate statistical significance at the 1%, 5%, and 10% respectively.

The previous linear specification assumes a homogeneous relationship between urbanization and informal economy, which can be misleading. Indeed, countries that have almost the same speed of urbanization have different sizes of the informal sector. These divergences may be linked to differences in governance quality in those countries, especially control of corruption, rule of law and regulatory quality. So, we explored whether there is a threshold of urbanization to cross, in order to expect a negative effect of urbanization on informal economy. Otherwise, we explore whether there is a threshold at which the positive relationship between urbanization and the informal economy may change and become negative, and the different channels. Consequently, we developed a nonlinear informal economy model associated with urbanization, using a nonlinear specification on dynamic panel models.

The results of dynamic panel estimates of the nonlinear relationship between urbanization and informal economy, using urbanization, control of corruption, rule of law, regulatory quality, government effectiveness, political stability and voice and accountability as threshold variables, are displayed in Table 3. The regressions satisfy the specification tests (AR1, AR2 and Hansen test). There is no evidence of a second serial correlation, but there is strong evidence of a first serial correlation. Overall, the control variables have expected signs in the regressions.

The outcomes of Table 3 suggest a positive relationship between urbanization and informal economy in the first time and a negative nexus in the second time between both variables, after a given level of urbanization. As shown by the results of the first specification, where urbanization is considered as threshold vaiable (column 1), the nonlinear GMM model highlights significant variable for the urbanization variable as well as the interaction term. Indeed, the system GMM shows an inverted U-shaped relationship between urbanization and informal economy, suggesting a positive relationship between both variables in the first time, and a negative nexus in the second time. These results allow us to appraise wether beyond a certain level, the threshold variable becomes more or less important in determining the marginal effect of urbanization on informal economy.

Therefore, the share of informal sector first increases in the early phases of urbanization and then decreases as urbanization continues. We observe such a tendency for urban informal sector's output share in Figure 2.

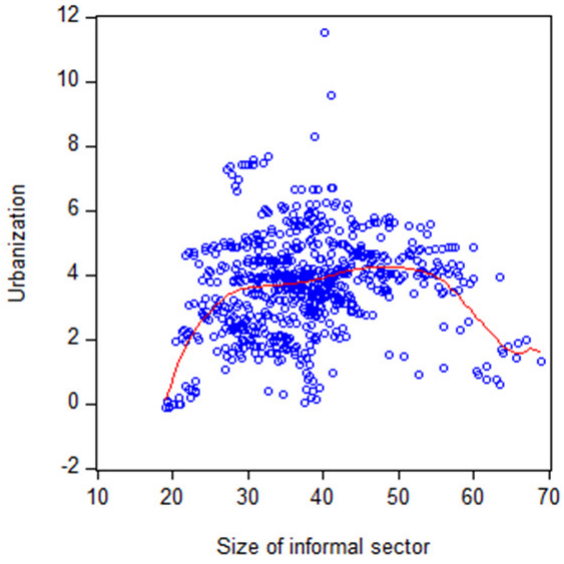

Figure 2: Nonlinear relationship between urbanization and informal economy
Source: Authors' construction

Table 3: Nonlinear estimates of urbanization and informal economy relationship

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Threshold variable	Urbanization	Rule of Law	Regulatory Quality	Political Stability	Control of Corruption	Government Effectiveness	Voice and Accountability
Urbanization	0.0761***	0.0065**	0.0066**	0.0083***	0.0183**	0.0156*	0.0088***
	(0.026)	(0.003)	(0.003)	(0.003)	(0.009)	(0.009)	(0.003)
Interaction Variable	-0.0082***	-0.0036**	-0.0046**	-0.0025**	-0.0052**	-0.0075**	-0.0039**
	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)	(0.004)	(0.002)
GDP Per Capita	0.0131	0.0012	-0.0000	-0.0001	-0.0157	-0.0093	-0.0013
	(0.012)	(0.006)	(0.005)	(0.004)	(0.012)	(0.013)	(0.006)
Unemployment	-0.0153	0.0094	0.0078	0.0113	0.0513*	0.0489*	0.0204*
	(0.022)	(0.016)	(0.015)	(0.016)	(0.026)	(0.025)	(0.012)
Trade Openness	-0.0374**	-0.0324***	-0.0350***	-0.0258***	-0.0568**	-0.0654***	-0.0356***
	(0.017)	(0.011)	(0.012)	(0.009)	(0.021)	(0.020)	(0.010)
Tax Burden	0.0002***	0.0001*	0.0001*	0.0001*	0.0002**	0.0002**	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lag of Informal Economy	0.7966***	0.9129***	0.9059***	0.9170***	0.8189***	0.8245***	0.9386***
	(0.073)	(0.031)	(0.030)	(0.026)	(0.057)	(0.053)	(0.026)
Constant	0.6325**	0.3664***	0.4122***	0.3275***	0.7926***	0.7708***	0.2786***
	(0.306)	(0.117)	(0.127)	(0.111)	(0.273)	(0.253)	(0.092)
Observations	361	347	361	361	361	361	347
Instruments/Countries	24/44	23/44	22/44	23/44	26/44	26/44	24/44
AR (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.792	0.887	0.871	0.923	0.679	0.660	0.874
Hansen OIR	0.829	0.839	0.868	0.788	0.905	0.812	0.703
Fisher	149.6***	730.9***	1307***	1308***	374.1***	430.3***	524.2***

Notes : The sample runs from 2000 to 2015. Robust standard errors are reported in parentheses. (***, **, *) indicate statistical significance at the 1%, 5%, and 10% respectively.

The above results confirm the view that the high level of urbanization and the quality of governance, including political stability, control of corruption, rule of law, regulatory quality, government effectiveness and voice and accountability reduce the size of the informal sector after a certain threshold. Then in an inefficient state where corruption is rampant, citizens will have little trust in authority and therefore be reluctant to cooperate. If individuals and businesses feel that neither contracts will be enforced nor productive efforts protected, they will have a greater incentive to engage in the underground economy. Citizens will feel protected when they see corruption reduced, taxes paid well reallocated, their government accountable, and the rule of law and regulatory quality strong. This would further stimulate their incentive to enter the formal sector.

However, although the results of the above nonlinear GMM specification confirms a reverse U-shaped relationship between urbanization and the informal economy, it is also difficult for us to comment and discuss the results in depth, as this specification does not allow us to clearly identify the thresholds at which the nature of the relationship between our two variables changes. As a result, more consistent results are provided and discussed in the following section based on the estimation of a PSTR model.

4 Robustness Checks

The results of the nonlinear estimates from GMM presented above established a reverse U-shaped relationship between urbanization and informal economy. First, we found a positive relationship between the both variables, and then a negative relationship with the respect of interaction variables. In this section, we test the robustness of the results by changing the estimation technique. We run a PSTR model, which has the advantage for not only testing the nonlinearity but also allows us to highlight the different thresholds that change the nature of the relationship between urbanization and informal economy.

The results of estimates are reported in Table 4. The value of the slope parameter is low in the transition function, indicating a smooth change of regime. Hence, urbanization exhibit two extreme regimes with a sharp shift characterizing the urbanization-informal economy nexus, where the urbanization effect is positive and significant in the first regime and negative and significant in the second one. Indeed, under the first regime (urbanization lower than 4.05%), all things being equal, an increase of 1% in urbanization enhance informal economy by 0.853%, while the effect of urbanization on informal economy becomes negative (-0.171%) under the second regime (urbanization higher than 4.05%). This implies that when urbanization increases, the link between urbanization and informal economy increases and this nexus becomes negative when the transition variable exceeds the threshold value. Therefore, countries with an urbanization growth below 4.05% can increases the size of their informal sector. The positive effects of urbanization on informal economy may be caused by several factors that spur informal activities at the early stages of urbanization. Above the 4.05% threshold, urbanization negatively affect informal economy, through greater quality of governance, which mitigates the development of informal activities in the later stage of urbanization. These results are also in line with the Kuznetsian hypothesis, which predicts an inverted U-shaped relationship between development and urban inequality. The growth of the informal economy partially explains the rising inequality in the Kuznets process. The later tendency towards a declining share of informal activities can lead to rising homogeneity in labor markets, which is also consistent with Kuznets's hypothesis (Elgin and Oyvat, 2013).

Regarding the estimation results using governance indicators as the threshold variables, the coefficients of urbanization remain positive and significant, whereas the interaction variables have a negative sign but not all significant at the conventional level. For example, regarding estimation results using rule of law as the threshold variable, the coefficient of urbainization remains positive and significant, whereas the interaction variable has a negative and significant coefficient. The estimated threshold for rule of law is 0.59 and the transition is smooth due to the low value of the slope of the transition function (see column 2 in Table 4). Under the first regime (rule of law lower than 0.59), our results suggest that informal economy effect of urbanization is positive and significant (0.346), while the effect is negative (-0.171) under the second regime corresponding to high rule of law score (i.e rule of law higher than 0.59). These results imply that urbanization has a positive effect on informal economy in countries where the score of rule of law is below a given threshold, and the impact becomes negative beyong this threshold. As rule of law captures the perceptions of the extent to which agents have confidence in their governments, beyong a given threshold of rule of law, the size of informal economy decreases (Elgin and Oztunali, 2014).

In the same vein, when we use control of corruption as interaction variable, the estimated threshold is 0.57, and the transition is smooth because of the low value of the slope of transition function (See column 5 in Table 4). Under the first regime (control of corruption lower than 0.57), our results show that urbanization is positively and significantly linked to informal

economy (0.025), while this effect becomes negative (-0.058) under the second regime (control of corruption higher than 0.57), corresponding to high level of the control of corruption (good governance quality). This result shows that urbanization increases informal economy in african countries when the level of the control of corruption is below a certain threshold, and the effect decreases beyond this threshold. Thus, rampant Corrupt practices in urban areas spur informal activities and the increase of informal sector. this effect may be mitigated by a sound quality of governance, where the control of corruption is effective (Igudia et al., 2016; Zinnbauer, 2020).

Finally, the estimated threholds for regulatory quality, political stability, government effectiveness and voice and accountability are respectively 0.71, 0.41, 0.55 and 0.53. The tansitions are smooth due to the low values of the transition functions in all specifications. Under the first regime the coefficients of urbanization are positive and significant, and they turn to negative in the second regime. These findings show that in the later stage of urban development associated with good governance quality, the share of the informal sector tends to dwindle. Our results are in accordance with (Elgin and Oyvat, 2013).

Overall, the results in Table 4 above confirm a reverse U-shaped relationship between urbanization and the informal economy in accordance with the different threshold variables. The values of the slope parameter confirm a smooth transition regardless of the threshold variable used. This means that when urban governance policies are undertaken, they take time to be implemented and produce the expected effects.

Table 4: Robustness cheks, Nonlinear estimates of urbanization and informal economy relationship, PSTR Model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Threshold variable	Urbanization	Rule of Law	Regulatory Quality	Political Stability	Control of Corruption	Government Effectiveness	Voice and Accountability
Urbanization	0.8534***	0.3466***	0.0918***	0.6835**	0.0253**	0.0341**	0.0279***
	(0.185)	(0.123)	(0.031)	(0.335)	(0.012)	(0.018)	(0.008)
Interaction Variable	-0.1713***	-0.4083***	-0.0750**	-0.6844**	-0.0583***	-0.0218*	-0.0219*
	(0.067)	(0.155)	(0.031)	(0.353)	(0.014)	(0.012)	(0.012)
GDP Per Capita	-0.3220***	-0.1206	-0.1033***	-0.0003***	-0.0280	-0.0220	-0.0656**
	(0.052)	(0.467)	(0.031)	(0.000)	(0.034)	(0.065)	(0.029)
Unemployment	0.4024***	0.0401**	0.1587**	0.4430	0.0606**	-0.0214	0.0074
	(0.050)	(0.559)	(0.066)	(0.133)	(0.030)	(0.056)	(0.021)
Trade Openness	-0.2065***	0.8224	-0.0394	0.0513***	0.1248*	-0.1346	-0.1531***
	(0.075)	(0.710)	(0.093)	(0.103)	(0.069)	(0.108)	(0.045)
Tax Burden	0.0307	0.7207***	0.2442***	0.7565	-0.0705	0.1637***	0.0935***
	(0.029)	(0.243)	(0.076)	(0.468)	(0.050)	(0.061)	(0.029)
C	4.05	0.59	0.71	0.41	0.57	0.55	0.53
γ	11.44	3.506	37.69	9.445	6.53	5.63	9.98
LM_F	4.207***	5.120***	10.571**	6.393***	3.108***	4.702***	6.653***

Notes : The sample runs from 2000 to 2015. We used the Matlab code of Colletaz and Hurlin (2006) to estimate the PSTR model. The code determines automatically the optimal model, i.e. the optimal number of transition functions and calculate the optimal threshold. Robust standard errors are reported in parentheses. (***, **, *) indicate statistical significance at the 1%, 5%, and 10% respectively.

5 Conclusion and Implications

The aim of this paper was to empirically examine the role of governance in the nexus between urbanization and informal economy. Using dynamics panel model and panel smooth transition regression (PSTR) model on a sample of 45 African countries over the period 2000-2015, we found a reverse U-shaped relationship between urbanization and informal economy in Africa. Specifically, we found that urbanization increases the size of the informal sector in Africa in the earlier stage of urban development, and in the later stage, the quality of governance decreases the effect of urbanization on informal economy.

Based on the results of our empirical analyses, several economic policy implications can be derived. Since the informal economy is strongly rooted in the development process of African countries, with strong income-generating activities, it is not necessarily bad for African countries. However, policies instead of totally eradicating informal activities should be oriented towards new strategies that could lead to stimulating individuals and firms to join the formal sector. To do so, besides broadening the tax base to avoid tax evasion, emphasis should be placed on the quality of governance, especially corruption, which is rampant in urban areas. Serious measures must be taken to promote outstanding quality of regulation and a sound rule of law so that individuals feel protected as well as their activities. This may encourage them to move out of the underground economy and into formal activities.

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Appendix

Table 5: Description and sources of variables

Variables	Description	Sources
Informal Economy	Size of informal sector as a percentage of GDP	Medina and Schneider (2018)
Urbanization	ratio of urban population to total population	WDI
GDP per capita	Per capita gross domestic product	WDI
Unemployment	Unemployment rate. It captures the percentage of the labor force that is jobless	WDI
Trade openess	the ratio of the sum of exports and imports as a percentage of GDP	WDI
Tax burden	it includes all forms of direct and indirect taxation of government, as a percentage of GDP	WDI
Rule of Law	captures perceptions of the extent to which agents have confidence in and abide by the rules of society.	WGI
Regulatory Quality	captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	WGI
Political Stability	measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.	WGI
Control of Corruption	captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption.	WGI
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, implementation of the government's commitment to such policies.	WGI
Voice and Accountability	captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	WGI

Note: WDI: World Development Indicators; WGI: Worldwide Governance Indicators.

Table 6: Correlation matrix

Panel A: Correlations between Informal economy, Urbanization and Control Variables							
	IE	Urb	GDPGr	Unemp	Educ	Trade	TB
IE	1						
Urb	0.19***	1					
GDPGr	-0.09***	0.19***	1				
Unemp	0.33***	0.35***	-0.02	1			
Educ	-0.17***	-0.13***	0.03	0.14***	1		
Trade	-0.30***	-0.29***	0.02	0.50***	0.19***	1	
TB	0.25***	0.15***	-0.04	-0.17***	-0.14***	-0.20***	1
Panel B: Correlations between informal economy and governance indicators							
	IE	RL	RQ	PS	CC	GE	VA
IE	1						
RL	-0.49***	1					
RQ	-0.47***	0.88***	1				
PS	-0.30***	0.71***	0.59***	1			
CC	-0.47***	0.89***	0.81***	0.63***	1		
GE	-0.45***	0.90***	0.87***	0.59***	0.87***	1	
VA	-0.25***	0.77***	0.73***	0.56***	0.72***	0.70***	1

Source: Authors' Calculations.

Note: IE = Informal Economy; Urb = Urbanization; Unemp = Unemployment; Educ = Education; RL = Rule of Law; RQ = Regulatory Quality; PS = Political Stability; CC = Control of Corruption ; GE = Government Effectiveness; VA = Voice and Accountability; TB = Taxe burden. ***, **, * indicate statistical significance at 1%, 5% and 10%, respectively.