Lurking in the Cities: Urbanization and the Informal Economy

Ceyhun Elgin*
Bogazici University

Cem Oyvat†
University of Massachusetts, Amherst

Abstract

This study investigates the empirical relationship between the level of urbanization and size of the informal economy using cross-country datasets proxying GDP and employment shares of urban informal sector. Our estimation results indicate that there is an inverted-U relationship between informality and the level of urbanization. That is, the share of the informal sector grows in the early phases of urbanization due to several pull and push factors; however, it tends to fall in the latter phases. We also show that factors like level of taxes, trade openness, and institutional quality tend to affect the size of the informal economy.

Keywords: urbanization, informal sector, Kuznets curve, panel data.

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*Address: Bogazici University, Department of Economics, Natuk Birkan Building, 34342 Bebek, Istanbul, Turkey. Phone: +90-212-359-7653. Fax: +90-212-287-2453. E-mail: ceyhun.elgin@boun.edu.tr.

†Corresponding Author. Address:Department of Economics, University of Massachusetts Amherst, Thompson Hall, MA 01003, USA. Phone: +1-413-461-6560. Fax: +1-413-545-2921. E-mail: coyvat@econs.umass.edu.

I. INTRODUCTION

Urbanization is a process, which is often observed as a frequent consequence of economic development. New industries in urban areas create new job opportunities, stimulating the shift of labor from rural to urban areas. Nevertheless, the growth in formal sector employment might not keep pace with the growing population of new urban dwellers. Still migration towards urban sector continues. As a result, many of the new dwellers end up in informal urban activities.

Informal sector or economy, sometimes also titled shadow, hidden, black, parallel, second or underground economy (or sector) is defined by Hart (2008) as a set of economic activities that takes place outside the framework of bureaucratic public and private sector establishments. Another paper by Ihrig and Moe (2004) defines it as a sector which produces legal goods, but does not comply with government regulations. Similar definitions are provided by Schneider and Enste (2000), Schneider (2005, 2007) and Schneider, Buehn and Montenegro (2010) as well.

Informality is a widespread phenomenon and poses serious social, economic, cultural and political challenges across the world; however many issues about its nature and consequences still remain largely under-explored or unresolved. (See Schneider and Enste, 2000; Schneider, 2005, 2007; Buehn and Schneider, 2012 and Elgin and Oztunali, 2012 among others.) For example, the evidence presented in the existing literature, has failed to generate a consensus around the determinants of the informal sector among researchers. There are also many other open questions including even such basic ones such as whether informal sector size would be larger in low income or high income nations (see Dreher and Schneider, 2010); whether taxes are positively correlated with informal sector size or not (See Schneider and Enste, 2000, Friedman et al. 2000 and Elgin, 2010) or whether shadow economy and corruption are substitutes or complements (Dreher and Schneider, 2010). As the number of papers in the growing literature on informality indicates, there is an increasing attention on the economic analysis of the informal economy.

The shift from the rural to the urban informal sector can be explained by several pull and push factors. In many cases, the urban informal sector offers better opportunities than the rural sector. Earnings can be higher in urban informal employment than in rural occupations and urban areas tend to offer better public services due to an urban bias in policies (Lipton, 1976). Even in the cases in which conditions between two sectors are similar, many individuals prefer the urban informal sector with the expectation of finding a job opportunity in the formal sector in the future (Banerjee, 1983).

The technical changes that industrialization brings to urban industry are joined by technical improvements in the rural sector. However, the technical change might be unbalanced and reduce the incomes of small scale producers (Boyce, 1993). It also can damage the non-agricultural activities in the rural sector (Hymer and Resnick, 1969). In addition, in many cases the technical changes in the rural sector are labor-saving (de Janvry, 1981; Boyce, 1993) and pull down the demand for agricultural labor. These processes can lower the incomes of many rural dwellers and push them to the urban informal sector.

The pull and push factors that foster the growth of urban informal activities can be greater than any counteracting factors during the early phases of development that involves urbanization stimulated by early industrialization. Therefore, in many cases the first phases of urbanization feature a greater growth in the urban informal sector than in the urban formal sector (eg. de Janvry, 1981; Furtado,1976; Moser, 1978).

However, as urbanization and industrialization continue, the share of the informal urban sector tends to dwindle. First, as the urban share of population increases the migration process can slow down. The move towards the urban sector increases the per capita incomes of rural dwellers; therefore, many of these dwellers might cease to prefer the earnings offered by the urban informal sector. In addition, according to Marxian literature (eg. Marx, 1867; Marx, 1932; Baran and Sweezy, 1966; Aglietta, 2000) capitalist development leads to greater concentration and centralization of capital. Hence, capitalist accumulation reduces the share of small scale informal activities, which have weaker links with the growing formal sector.

In summary, we propose that there is an inverted-U curve relationship between urbanization and the share of urban informal sector. 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 1 using Schneider, Buehn and Montenegro (2010)'s averaged data from 1999 to 2007 for a set of 152 countries which is fitted with polynomial trend lines (indicated by Poly (All)). Using the same dataset, we also draw the polynomial regression line using data from only 114 developing countries.[1]

Figure 1 about here

In a similar fashion, Figure 2 illustrates the same tendency for a different group of countries: Latin American and Caribbean countries, MENA (Middle Eastern and North African) countries and others.[2] Our proposed inverted-U curve is also consistent with Kuznets (1955)'s hypothesis, which underlines the unbalanced gains of early development and "the agricultural and industrial revolutions"' dislocating effects. Kuznets claims that there is a tendency for economic positions of new urban dwellers and their descendants to change in time and for labor markets to become more homogenous during the later stages of development.

Figure 2 about here

Indeed, the existence of an inverted U relationship between urbanization and the share of the urban informal sector was first proposed and tested by Rauch (1993). However, Rauch's data was limited to the share of self-employment in Latin American countries; it excludes informal activities operated by wage-workers. In this study, we empirically test the existence of the inverted U all for output and non-agricultural employment shares of informal sector and for share of non-agricultural self-employment. We also use significantly larger number of countries from three different datasets. Our estimation results also indicate that the share of the informal economy is either small when the urban population relative to the

[1]The method of choosing the developing countries will be explained in detail in the next section.
[2]Sources of the data and a more detailed empirical analysis will be provided in the next section.

total population is small or large and it is considerably larger when the urban population is medium size. We also examine the impact of factors such as trade, population density, taxes, and institutional quality that might contribute to or counteract the inverted-U trend.[3]

The rest of the paper is organized as follows: In the second section of the paper we build the theoretical framework which we want to utilize to account for the proposed relationship between urbanization and informality. To this end, we first define and review the concept of informality. Then we provide a theoretical account of the growth and decline of the informal sector in the early and later stages of urbanization, respectively. Next, in the third section of the paper we conduct an empirical analysis and establish a robust inverted-U relationship between urbanization and the size of the informal sector, even after controlling for various variables that might be associated with informality. Finally, we provide concluding remarks in the last section.

II. THEORETICAL FRAMEWORK

A. *Informal Sector*

The informal sector is an important set of economic activities, which plays a crucial role on a country's development. The size and structure of informal sector can vary in different stages of development. By definition, the informal sector is hard to observe, define, measure and calculate. It can include a wide range of activities, from street traders in Thailand to firms in Italy implementing flexible specialization. Nevertheless, for examining the impact of development on informal sector, we need to develop a concrete definition for the informal sector.

In this paper, we will measure the informal sector by using Schneider, Buehn and Montenegro (2010)'s definition. According to this paper, the informal sector[4] are market-oriented

[3]Even though we will address this issue further in the empirical section, we recognize that in a paper of this nature it simply is impossible to overcome endogeneity issues in a completely satisfactory manner. However, to establish robustness we investigate this empirical relationship with different econometric specifications, data stratifications and data series and obtain qualitatively similar results. Moreover, we also mention the results of an endogeneity test which does not favor the presence of endogeneity in our estimations.

[4]Schneider, Buehn and Montenegro (2010) use the term "shadow economy" for describing the informal sector.

production activities that are hidden from state authority to avoid:

- payment of income, value added, or other taxes
- payment of social security contributions
- having to meet certain legal labor market standards, such as minimum wages, maximum working hours, safety standards etc.
- complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms

This definition is also consistent with different approaches including structuralist approaches (Castells and Portes, 1989). We are not entirely satisfied with Keith Hart's (1973) definition of the informal sector as the economic activities of the self-employed since it excludes the activities of unregulated firms with salaried employees.[5] We also reject the assumption made in a group of studies (Ranis and Stewart, 1999; PREALC, 1981; ILO, 2002) that the informal sector includes only small-scale enterprises. As Harriss-White (2009) points out, large-scale unregulated activities can exist either by the direct use of political power or with the protection of mafia and/or formal forces such as the police. We did not wish to exclude these cases from our definition of the informal sector.

B. *Growth of Informal Sector*

In his groundbreaking paper "Economic Development with Unlimited Supplies of Labor", Arthur Lewis (1954) claims that the growth of capitalism would attract laborers in the subsistence sector to the capitalist sector. In Lewis's model, not only agricultural laborers on small scale farms, but also "petty retail" traders and casual workers like carriers or gardeners form the "unlimited supplies of labor" of the capitalist sector. Lewis defines the capitalist sector as a sector "which uses reproducible capital, and pays capitalists for the use thereof" and the subsistence sector as "all that part of the economy which is not using reproducible

[5]Nevertheless, we use non-agricultural self-employment share as a proxy for urban informal sector's employment share. The reasoning of this is explained in the following sections.

capital". Thus, in the Lewis model subsistence sector covers at least a part of the informal sector and there would be a flow of labor from urban informal to urban formal sector.

Following this, many scholars (Castells and Portes, 1989; Copestake, 2003) claim that Lewis was wrong, since in his model subsistence sector shrinks with the growth of capitalist sector, but this pattern is not observed in many developing economies[6]. In many developing economies, the industrialization process and growing formal service activities do not create sufficient growth and formal jobs to absorb the explosive increase in the urban labor supply resulting from large-scale rural-to-urban migration. As a result, in some cases industrialization results in rising unemployment or/and an increase in the size of informal sector (Todaro, 1969). The growth of the informal sector was observed all in Asian (Moser, 1978), African (Wuyts, 2001) and Latin American (de Janvry, 1981; Furtado, 1976) countries in their early phases of development. The informal sector is also recently growing in China (Hart-Landsberg and Burkett, 2007), which is a lower income country transforming to a medium income one.

Although the formal sector might not create enough jobs for the new city dwellers, people still prefer to migrate to the cities, which stimulates the growth of the informal economy. There are several pull factors that could explain this behavior. According to Cole and Sanders (1985), the growth of the formal urban sector increases the demand of the products of the urban subsistence sector. As a result, urban subsistence wages would rise, which would increase the urban-subsistence, rural-subsistence wage gap. Hence, migration would be stimulated.

Another reason could be migrants' future expectation of finding a job in the formal sector (Harris and Todaro, 1970). As Joshi and Joshi (1976) show for India, there might be cases in which average informal sector earnings are close to rural earnings. Still, many rural dwellers

[6]In fact, the Lewis (1954) model does not say anything about the medium-run changes in the relative sizes of either urban informal/formal or urban subsistence/capitalist sectors. It is reasonable to claim that the growth of the capitalist sector would lead to a flow of labor from subsistence to the capitalist sector. However, this flow does not guarantee a reduction in the urban subsistence sector, since there might be a greater flow from the rural to the urban subsistence sector.

decide to migrate with the expectation of finding a job in the formal sector and hold an informal job while looking for an alternative employment (Banerjee, 1983). However, it may take a long time to find formal employment - in some cases it might take more than 50 years. (Cole and Sanders, 1985). Hence, many of the new urban dwellers are never be able to move to the formal sector, which leads to congestion in the informal sector. Therefore, as urbanization continues, it often results in a large informal labor force.

An urban bias in national policies also contributes to the pull of the cities (Lipton, 1976; Williamson, 1988). In many countries, the state changes the domestic terms of trade in favor of the urban sector, which encourages further migration (Kay, 2002). In addition, social investments including educational and medical facilities, roads, water supplies and electricity are disproportionately made in urban areas. Many of the migrants move to cities to access better schooling and health care for their families (World Bank, 2009). As a form of family investment, some families send a young adult to the city with the expectation that the migrant will send remittances. Many of these new urban dwellers who cannot find formal jobs enter to the informal sector.

Industrialization brings technological improvements to the urban sector. These technological improvements could also spill over to the rural sector. The rural sector can also benefit from infrastructure investments: transportation, irrigation, electricity, and so on. It adapts techniques from the urban sector and starts using new seeds, fertilizers, and machinery. The new agricultural technology's increasing returns to scale gives large-scale farms an advantage over small-scale farms (Sen, 1996). This unbalanced development might damage small scale producers by lowering prices. Boyce (1993) shows that there was a positive relationship between land size and adoption of new technology during the Philippines's Green Revolution. By keeping crop prices at lower levels, the Green Revolution pauperized the small scale farmers and possibly pushed them to urban sector. Hence, the improvements in the rural sector might push a portion of rural dwellers that do not benefit from these improvements to the urban informal sector.

In many cases, the technological improvements decrease the demand for agricultural labor. According to de Janvry (1981), technological change in Latin America between 1960 and 1974 was biased towards labor-saving techniques. Increasing use of machinery in countries like Colombia, Brazil and Argentina reduced the need for agricultural labor. Likewise, the mechanization of agriculture, the shift to the use of chemical herbicides and the introduction of light threshing machines contributed to labor displacement in Philippine rice agriculture during the 1970s and 80s (Boyce, 1993).

A similar process is also observed in 1950's Turkey. After the Second World War, the mechanization in large scale farms reduced the demand for rural wage labor. According to Köymen (2008), the labor displacement in plantation type farms forced peasants to move to the urban sector. There was a rapid population increase in both industrial centers and in regional centers, such as Trabzon, Diyarbakır in which industrialization was not observed (Beşikçi, 1969; Yerasimos, 2001). This clearly suggests that the migration was not driven entirely by pull factors. Migrants in non-industrialized cities were likely employed in informal jobs and contributed to the growth of informal sector.

Another push factor that forces migration is the destruction of "z-goods" production. Z-goods is a term used by Hymer and Resnick (1969), to represent subsistence non-agricultural activities in the rural sector. According to their definition, z-goods production includes activities held by "small scale service and artisan establishments in the village". Importantly, z-goods are consumed within the village.

Accordingly, if the z-good is an inferior good, a rise in rural income would decrease the production of the z-good, whereas if the z-good is a normal good, a rise in rural income would increase the production of the z-good. Nevertheless, they suggest that z-goods are most often inferior goods. As a larger set of urban goods become available and as their quality improves, urban goods become preferred substitutes for z-goods. Thus, growing urban goods production often damages z-goods production in developing economies.

Industrialization not only attracts or pushes rural dwellers to the urban informal sector,

but in many cases it also results in faster growth in the urban informal sector compared to the urban formal sector. This higher relative growth of the urban informal sector is observed in many case studies for different periods[7]. In addition, by using a cross country analysis, Rauch (1993) shows that there is an inverted-U relationship between the relative size of informal sector and urbanization in Latin American countries. Thus, he shows that the growth of informal sector is greater during the early phase of development.

During the period of early development, informal activities' comparative advantages not only ensure survival of many informal industries competing with formal firms, but also lead to relatively higher growth of the informal sector. Indeed, the formal sector is usually associated with better managerial organization and greater capital intensity, technology and skill (e.g La Porta and Schleifer, 2008; Temkin, 2009; Yamada, 1996; Portes & Schauffler, 1993; Yuki, 2007; ILO, 1972)[8]. However, the informal sector also has competitive advantages over the formal sector. First, by definition informal activities are unregulated. Thus, informal firms have a cost advantage since they avoid paying taxes. Second, most studies show that average wages in the informal sector are lower compared to formal sector (Karpat, 1976; Joshi and Joshi 1976; Portes and Schauffer, 1993; Temkin, 2009). This is partially due to lack of unionization and to informal firms' avoidance of labor market regulations such as the minimum wages. In addition, informal firms avoid paying social security contributions for their workers. Hence, they also have cost advantage on labor payments.

Tokman (1978) claims that although a decrease in the share of informal firms could be expected in the long run, the informal sector can also survive for a period due to market imperfections. For example, he shows that with the help of distance the small retail shops can have higher prices than supermarkets. The price gap between small shops and supermarkets rises as the distance between two increases.

Many informal self-employed activities can survive with the help of self-exploitation. In

[7]See Bhattacharya (2011) for India; Moser (1978) for Indonesia; Bosch, Goni and Maloney (2007) for Brazil; Ranis and Stewart (1999) for the Philippines

[8]Still, there are exceptional cases that are exhibited by Ranis and Stewart (1999) and Swaminathan (1991).

many cases (Temkin, 2009), the earnings of the self-employed are lower than the average earnings of informal employees. Thus, the self-employed were forced to lower their own labor costs to be able to compete with formal and informal firms and the other self-employed. Still, self-employment is attractive for many migrants and develops as an important part of informal sector. In fact, Maloney (2004) shows that the majority of the self-employed in Brazil do not prefer to move to a formal job and most of the male self-employed are happy with their current activity. Although, they earn less, the self-employed prefer being their own bosses and having flexible hours.

C. *Informal Sector in Later Phases of Development*

According to many works in the Marxian literature (e.g. Marx; Baran and Sweezy, 1966; Gordon, Edwards and Reich, 1994; Aglietta, 2000), capitalist accumulation increases the size of corporations and concentrates capital in fewer hands. We often observe the increasing concentration of capital together with the collapse of traditional activities that are attached to the informal sector. In addition, as urbanization continues pressure on the land decreases and agricultural income rises making remaining the rural dwellers less willing to move to the urban informal sector (Rauch, 1993). Therefore, the share of the informal sector may decline in the later stages of development.

According to Marx (1867, 1932), capitalist development is associated with the creation of modern, industrial cities. Wherever the capitalist mode of production penetrates, it destroys the crafts and traditional industrial activities. Thereby, the capitalist development leads to centralization of capital. The process of concentration of capital is also mentioned in contemporary Marxian literature by the followers of theories of "monopoly capital" (Baran and Sweezy, 1966; Foster, McChesney and Jonna, 2011), social structure of accumulation (Gordon, Edwards and Reich, 1994) and the regulation school (Aglietta, 2000). According to these theories, the concentration of capital is a result of capitalists' desire to eliminate the other firms and seek monopoly power. Monopoly power increases profits and reduces risks - very appealing for a capitalist. Once the monopolistic or oligopolistic structure is

achieved in an industry, the capitalist creates and maintains barriers that reduce new smaller competitors' chances of survival in that industry. Larger companies can use various tools such as high capital requirements, high product differentiation, research and development intensity, information asymmetries, formal barriers set up by governments for keeping their market power etc. for maintaining their monopoly power.[9]

Therefore, we observe an asymmetric structure in capitalist development. Structural changes in an industry that would lead to the destruction of traditional informal activities and to the concentration of capital in fewer hands are likely. However, a structural change which would destroy oligopolies in favor of traditional sector is more unlikely to happen. This asymmetric tendency leads to the reduction of traditional informal activities over time.

Also, the improvements in marketing activities favor the larger formal enterprises and reduce the attractiveness of traditional products in the later phases of capitalist development. According to Baran and Sweezy (1966), until the end of 19th century, advertising played a small role in influencing consumers' preferences in the US. However, starting from 1890's, the advertising activities improved significantly and started to support "the growing monopolization" of the economy. By using means of advertising, trademarks, brand names, distinctive packaging and product differentiation, the relatively large firms earn capability of pronouncing the differences between their products and the products of informal enterprises that are seemingly homogeneous. The greater effort for this type of product differentiation would bring large formal enterprises greater monopoly rents. This might reduce the competitiveness of traditional informal activities that have weak links with the formal sector. In summary, the capital accumulation followed by urbanization pulls down the share of traditional informal sector in GDP and leads to growing large scale enterprises during the later phase of capitalist development.

[9]The claim for concentration of capital is supported by the empirical evidence presented by Foster, McChesney and Jonna (2011). They show that the ratio between the total revenues of top 500 corporations and world income GDP has a rising trend during the period 1960-2009. They also exhibit that revenues of top 200 US corporations as a percentage of total US business revenue significantly increased between years 1950-2008.

In addition, agricultural incomes increase due to lower pressure on land in the later phases of urbanization. This process would raise the agricultural incomes per capita. Therefore, the rural dwellers would no longer prefer not to move from rural sector to urban informal sector (Rauch, 1993). The rural-to-urban migration will slow down, which would either reduce the size of traditional informal sector or prohibit the growth it.

III. EMPIRICAL ANALYSIS

In this section we run panel regressions to gain a deeper understanding of the relationship between urbanization and the out the informal sector. In the first subsection below, we first discuss how we measure the rate of urbanization, the output and employment shares of the informal sector and select our control variables by explaining our data sources. In the second subsection we present estimation results of the panel analysis.

A. *Variable Selection*

In order to separate the effect of the variation in urbanization on the variation in the size of the informal sector, we use various control variables most of which are widely employed in the empirical literature using informal sector size as the dependent variable. Our control variables are tax burden, capital-output ratio, trade openness, population density, unemployment rate and three institutional quality variables, namely law and order, bureaucratic quality and corruption control indices.

Ceteris paribus, we expect that lower values for institutional quality variables should be associated with a larger informal sector size. This stems from the fact that worse institutional quality acts as a burden on formal firms, producers and households. Considering that the informal sector is generally a labor intensive sector, we expect a negative correlation between informality and capital-output ratio. Capital intensity also shows the level of capital accumulation which we expect to increase capital concentration and reduce traditional informal activities. Higher population density would enable greater supply of labor and create more room for informal firms, producers and households; therefore we expect a positive

correlation. Moreover, for unemployment we expect a positive coefficient since individuals would be more willing to accept the informal jobs in the case of high unemployment. As for taxes one might tend to expect a positive correlation since one of the main motives to go informal is avoiding taxes. However, as documented by Friedman et al. (2000), Elgin (2010) and many others empirical studies usually associate higher tax levels with a smaller informal sector size.[10]

Finally, for trade openness, our expectation is also ambiguous. According to the structuralist view, the formal enterprises interlink their activities to the informal sector for the aim of cost reduction and increasing labor flexibility (Castells and Portes, 1989; Chen, 2006; Carr and Chen, 2002). Since openness is a proxy that serves for the external subordination of the informal sector to the formal sector we might expect a positive correlation between openness and informal sector size. On the other hand, opening to international trade may also ease a government's ability to scrutinize informal production. Following this logic, one might obtain a negative correlation between openness and informal sector size. Moreover, trade openness might also be effective in increasing the external returns to human capital. Considering that the informal economy is unskilled labor intensive (and at the same time less human capital intensive compared to the formal economy), this might further contribute to the decline of informality. [11]

Table 1 about here

B. *Data Sources*

We use three different variables to proxy the magnitude of informality. The one with highest number of observations is obtained from the panel estimates of Schneider, Buehn and Montenegro (2010) running from 1999 to 2007 which uses a dynamic version of MIMIC

[10] The main reason for this somewhat surprising observation is that taxes might be endogenous. Specifically, as argued by Elgin (2010), what matters more than the level of taxes is whether governments use the tax revenue for activities discouraging informality or not.

[11] The findings of Bakis et al. (2010) on Turkish wages using a very large data set corroborates this link. In this paper the author associate a higher trade openness with a larger returns to higher education due to the knowledge spillover from the foreign to the domestic sector. This is particularly true for the median to upper quantiles of the wage distribution.

(multiple-indicator multiple-cause) approach to estimate the size of the informal economy. This approach builds upon the works of Frey and Weck-Hannemann (1983, 1984) and is essentially based on the use of a specific structural equation model, titled the MIMIC approach. This approach treats the size of the shadow economy as an unobserved latent variable and essentially consists of two steps: In the first step, one determines the causes and the indicators of the shadow economy. Then in the second step, given the causes and the indicators and the specified relationship among them through the unobserved latent variable, one runs a structural equation model to estimate the coefficients of the causes and the indicators. [12] In our case this data covers 152 countries over a time span of 9 years with 1365 observations.

Moreover, for robustness we also use two other variables to proxy informality. These are share of self-employed and share of informal employment in total non-agricultural employment. We obtained these datasets from Charmes (2009). As the data for informal employment is usually very limited [13], self-employment is a widely used proxy for informal employment. In both cases estimates are obtained from countrywide surveys.[14] In the case of informal employment the data spans from 1975 to 2007 in five-year intervals[15]. On the other hand, in the case self employment the time span is from 1970s to 2000s in ten-year intervals.

As a measure of urbanization we use the ratio of urban population to total population and extract the data from the World Development Indicators (WDI) of the World Bank. Similarly, we also obtain the tax burden, rate of unemployment and population density data from WDI. As a measure for corruption control, we use the corruption control index of the International Country Risk Guide (ICRG) provided by the Political Risk Services (PRS). Similarly, the indices of bureaucratic quality and law and order are obtained from ICRG, as well. These three variables aim to control for institutional quality. The greater values of

[12] See Schneider (2007) and Schneider, Buehn and Montenegro (2010) for details and an explanation of superiority of this methodology to others and comparisons of various methods previously used to estimate the size of the informal sector.

[13] Notice from Table 1 that we only have 95 observations. This dataset only includes developing economies

[14] See the cited paper for more detailed sources and explanations.

[15] The last observations are for 8 year period (2000-2007).

these indices imply better institutional quality.

The data on openness (defined as the ratio of the sum of exports and imports to aggregate GDP) come from the Penn World Tables (PWT) 7.0. Finally, to create the series for capital-output ratio we simply employ the the perpetual inventory method using the following system of equations:

$$K_{t+1} = K_t(1-\delta) + I_t \tag{1}$$

$$\frac{K_{1998}}{Y_{1998}} = \frac{\sum_{i=1998}^{2007} \frac{I_i}{Y_i}}{\delta + g_Y} \tag{2}$$

Equation (1) is the standard law of motion for capital, where K_t stands for the aggregate capital stock in year t, δ for the depreciation rate of physical capital, and I_t for the amount of investment in year t.[16] Equation (2) is based on the assumption that the economy is at the steady state in the initial period of analysis which we take as 1998 here. Once the capital stock in 1998 is calculated using equation 2, equation 1 allows us to create a capital stock series for the years between 1998 and 2007. Finally, we divide the capital stock by real GDP to obtain the capital-output ratio. Descriptive statistics of all the variables are provided in Table 1.

C. *Empirical Results*

We first check the relationship between urbanization and the informal sector size as % of GDP by using Schneider, Buehn and Montenegro (2010)'s dataset. The panel equation we estimate is of the following form:

$$IS_{i,t} = \beta_0 + \beta_1 urb_{i,t} + \beta_2 urb_{i,t}^2 + \sum_{k=3}^{n} \beta_k X_{k_{i,t}} + \theta_i + \epsilon_{i,t},$$

where for country i in year t, IS stands for the informal sector size as % of GDP, urb for urbanization, $X_{k_{i,t}}$ are various control variables included in the regression. Moreover, θ_i

[16] We set $\delta = 0.05$ and obtain the data on investment from PWT 7.0.

represents the country fixed-effects and $\epsilon_{i,t}$ is the error term. Notice that, in order to check for the potential inverted-U relationship between urbanization and the informal sector we include the urb^2 term on the right-hand-side of the regression equation.

Table 2 about here

Table 2 presents results of the fixed-effect linear panel estimation with an AR(1) disturbance using data for all the 152 countries in our dataset.[17] Here, we run 6 regressions with different independent variables in each. As both the coefficient for urban and urbansquared are significantly positive and negative, respectively, the inverted-U relationship between urbanization and informal sector is robust to the inclusion of different control variables to the regression equation. Other than urbanization, another factor that seems to be correlated with the informal sector size in 4 of the 6 regressions is the tax burden and its coefficient is negative.[18] The institutional variables are not significant, since these variables change modestly in nine years period of time. Another variable that seems to matter is unemployment. As expected, higher unemployment (in the formal sector) is associated with larger informal sector size. Finally, we observe a more interesting result in estimation 6 in which we replace the urbansquare term with Urban•Capital that captures the interaction between urbanization and capital-output ratio. The signs of the coefficient in this regression indicate that the capital-output ratio significantly affects the relationship between urbanization and the informal sector. Specifically, when the capital-output ratio is low, urbanization and the size of the informal sector are positively correlated. On the other hand, when capital-output ratio is high, urbanization and informal sector are negatively correlated. This interaction of capital output ratio with urbanization shows that the capital intensity might be the driving force behind the inverted-U relationship we investigate. The magnitudes of the coefficients

[17] Hausman test points us in favor of a fixed-effect regression and Wooldridge test rejects absence of autocorrelation. Moreover, in order to check for possible endogeneity of our regressors we ran an instrumental variable estimation using one-period lagged values of the regressors as instruments. However, Hausman test rejects the presence of significant differences in the estimates.

[18] Considering the cited papers above this is not a surprising result.

of urbanization and the interaction term between urbanization and the capital-output ratio (0.13 and 0.06, respectively.) imply that when the capital-output ratio is lower (larger) than about 2.17 urbanization and the size of the informal sector are positively (negatively) correlated.

Table 3 about here

The results for the complete dataset strongly support our theoretical arguments for Schneider, Buehn and Montenegro (2010)'s dataset. However, considering that the variation in both urbanization and in the size of the informal sector are small in highly developed mature economies, a closer look at the data would be more appropriate. Indeed both the process of urbanization and informality are merely phenomena of developing economies. To this end using the UNDP classification[19], we divided Schneider, Buehn and Montenegro's dataset into two subsets: Developed and developing economies. This division creates a subset of 114 developing economies which we can further utilize to analyze the relationship between urbanization and informal sector. Table 3 presents summary statistics of this developing-country subset.

Table 4 about here

We estimate the same panel equation and Table 4 presents results of the fixed-effect linear panel estimation with an AR(1) disturbance using data for the 114 developing countries. Again, the results are in line with our theoretical hypothesis and similar to the regression results with the complete dataset, except now two more coefficients of independent variables are significant in certain regressions. These are population density and openness both of which are negatively correlated with the informal sector size. As for the openness, the results indicate that the out of the two counteracting effects, the one reducing informality seems to be the dominant one.

[19]In this division we simply exclude countries under the very high human developed index category. (See UNDP, 2010)

Considering that the time-series dimension of Schneider, Buehn and Montenegro (2010)'s dataset is limited and the urbanization-informal sector relationship might have a similar path across countries one might want to check results of ordinary-least squares (OLS) regressions. The advantage of an OLS regression here is that it gives an idea of the longer term relationship between urbanization and the informal sector size. Therefore, to check for robustness, in addition to the fixed-effect regressions we also run OLS regressions using pooled data.[20] Since there are no country fixed effects in the OLS specification, we also introduce dummy variables to represent several country groups. These are dummies for Subsaharan African, European Union, Latin American and Caribbean and MENA countries. This is to capture the common institutional characteristics share by countries in each group.

Table 5 about here

Table 5 presents results of the OLS regressions. In total we run 8 regressions, 4 using data from developing countries (DC) and another 4 using the complete dataset. The results again given evidence in favor of the inverted-U relationship between urbanization and the informal sector. Since the OLS regression captures longer term relationships, in addition to the capital-output ratio, the coefficients of two institutional quality variables (bureaucratic quality and law and order indices) are significant as well. Moreover, as expected they are all negatively correlated with the informal sector size. The coefficients of most of the regional dummies are significant, too. On the other hand, corruption becomes insignificant once we control for population density, unemployment and capital-output ratio.

Next, we exhibit the relationship between urbanization and the informal sector size as % of urban employment by using Charmes (2009)'s dataset.

$$SE_{i,t} = \beta_0 + \beta_1 urb_{i,t} + \beta_2 urb_{i,t}^2 + \sum_{k=3}^{n} \beta_k X_{k_{i,t}} + \theta_i + \epsilon_{i,t},$$

[20] Actually, the Breusch and Pagan Lagrange multiplier test rejects the null hypothesis that the OLS is the appropriate estimation method.

$$IE_{i,t} = \beta_0 + \beta_1 urb_{i,t} + \beta_2 urb_{i,t}^2 + \sum_{k=3}^{n} \beta_k X_{k_{i,t}} + \theta_i + \epsilon_{i,t},$$

where for country i in year t, IE stands for non-agricultural informal employment and SE for non-agricultural self-employment as % of non-agricultural self- employment respectively. The rest are similar to the previous regressions. Charmes (2009) dataset reports observations for periods rather than exact years. Therefore, we selected the median years of periods as years of observations[21].

Table 6 about here

In Table 6, we report regressions results using informal and self-employment as dependent variables in different panel regressions.[22] The first three regressions in Table 6 use self-employment, whereas the last three regressions use informal employment as the dependent variable. Estimations, 1, 2, 4 and 5 indicate that there is an inverted-U relationship between self-employment/informal employment and urbanization. Moreover, similar to regression 6 in Table 2, in regression 3 we observe that the capital-output ratio significantly affects the relationship between urbanization and self-employment. Again, when the capital-output ratio is low, urbanization and self-employment are positively correlated. On the other hand, when capital-output ratio is high, urbanization and self-employment are negatively correlated. However, even though the estimated coefficients in regression 6 have the expected signs, as they are not significant, we do not find support for this for informal employment. One reason for this might be that the number of observations is significantly low in this regression. Finally, other control variables population density, openness and tax burden do not seem to be consistently significant in these regressions.

[21] We selected the years 1977, 1982, 1987, 1992, 1997 and 2004 for informal employment and 1975, 1985, 1995 and 2005 for self-employment.

[22] Here, as the Hausman text points us in favor of a fixed-effect regression we use the fixed-effects estimator in a static panel data setting. We did not prefer to present the results for OLS regressions, since Charmes (2009)'s dataset already covers a long period of time and the dataset is very imbalanced. Moreover, to check for possible endogeneity of our regressors we again ran an instrumental variable estimation using one-period lagged values of the regressors as instruments. Again, Hausman test rejects the presence of significant differences in the estimates.

IV. CONCLUDING REMARKS

This article examines how urbanization affects the size of the informal sector during the development process. The empirical evidence reveals an inverted-U relationship between urbanization and the share of informal sector. According to our interpretation, this result is caused by several factors that both push and pull labor towards the informal sector in the early phases of industrialization. During the later phases of development, the impact of these pull and push factors are reduced as a natural result of rural dwellers getting wealthier. In addition, greater capital accumulation leads to greater concentration of capital and reduces the share of informal activities.

These results are also in line with the Kuznetsian hypothesis, which predicts an inverted-U relationship between development and urban inequality. The growth of the informal sector 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. Nevertheless, the article also shows that other variables such as trade, tax burden, institutional structure and the like can either accentuate or mitigate the typical inverted-U trend. Our conclusions benefit from Schneider, Buehn and Montenegro (2010) and Charmes (2009)'s datasets. Although these datasets are complements for each other, both datasets suffer from various problems. Specifically, the timeline of Schneider, Buehn and Montenegro's dataset is relatively limited and Charmes's dataset is discrete and imbalanced. Hence, our study leaves space for further examinations that can benefit from improvements in the informal sector data.

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Tables and Figures

Table 1: Complete Dataset Summary Statistics

	Mean	Std. Dev.	Min.	Max.	Obs.
Output Share of Informal Sector (in %)	34.60	13.54	8.40	72.5	1365
Non-agricultural Self-employment (in %)	26.44	19.12	0.20	95.30	293
Informal Employment (in %)	55.48	18.63	5.40	95.20	95
Urbanization (in %)	55.84	23.52	8.34	100.00	1368
Law and Order Index	3.89	1.35	0.50	6.00	1177
Bureaucratic Quality Index	2.23	1.11	0.00	4.00	1179
Corruption Control	2.78	1.22	0.00	6.00	1176
Population Density	198.87	730.67	1.52	6646.74	1366
Openness (in %)	89.55	52.53	4.83	453.44	1359
Capital-Output Ratio	2.33	1.97	0.74	10.91	1368
Tax Burden (in %)	17.16	7.07	0.82	57.49	796
Unemployment (in %)	8.88	5.85	0.70	37.30	816

Table 2: Output Share of Informal Sector and Urbanization: All Countries

Dependent variable: IS

	(1)	(2)	(3)	(4)	(5)	(6)
Urbanization	1.34*	1.35*	1.36*	1.37*	0.89*	0.133*
	(0.09)	(0.09)	(0.09)	(0.13)	(0.10)	(0.03)
Urbanization-squared	-0.01*	-0.01*	-0.01*	-0.01*	-0.008*	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
Tax Burden	-0.09*	-0.08*	-0.08*	-0.06**	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Openness		-0.006**	-0.007**	-0.01*	-0.006	-0.005***
		(0.003)	(0.003)	(0.004)	(0.004)	(0.003)
Population Density			-0.0008	-0.001	-0.0002	-0.0005
			(0.002)	(0.002)	(0.008)	(0.0008)
Bureaucratic Quality				-0.32	-0.21	-0.14
				(0.30)	(0.26)	(0.23)
Corruption Control				0.07	-0.05	0.02
				(0.08)	(0.08)	(0.07)
Law and Order				-0.17	-0.007	0.11
				(0.11)	(0.12)	(0.11)
Unemployment Rate					0.04*	0.03*
					(0.01)	(0.01)
Capital-Output Ratio						7.36*
						(0.95)
Urban•Capital						-0.06*
						(0.01)
R-squared	0.33	0.33	0.34	0.28	0.38	0.46
Observations	670	662	660	576	402	402
F-Test	89.05	68.48	54.85	22.50	21.41	26.85

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Table 3: Developing Countries Dataset Summary Statistics

	Mean	Std. Deviation	Minimum	Maximum
Output Share of Informal Sector (in %)	39.45	11.36	13.00	72.5
Urbanization	48.76	21.72	8.34	98.32
Law and Order Index	3.36	1.14	0.50	6.00
Bureaucratic Quality Index	1.73	0.77	0.00	3.00
Corruption Control	2.29	0.85	0.00	5.00
Population Density	164.88	620.13	1.52	6646.74
Openness	82.35	37.10	4.83	220.41
Capital-Output Ratio	2.19	2.22	0.74	10.91
Tax Burden	15.65	7.00	0.82	57.49
Unemployment	9.81	6.44	0.71	37.30

Table 4: Output Share of Informal Sector and Urbanization: Developing Countries

Dependent variable: IS

	(1)	(2)	(3)	(4)	(5)	(6)
Urbanization	1.62*	1.67*	1.76*	1.91*	1.14*	0.15*
	(0.12)	(0.12)	(0.12)	(0.20)	(0.18)	(0.05)
Urbanization-squared	-0.02*	-0.02*	-0.02*	-0.02*	-0.01*	
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	
Tax Burden	-0.10*	-0.09*	-0.10*	-0.06	-0.01	0.03
	(0.03)	(0.03)	(0.03)	(0.04)	(0.06)	(0.05)
Openness		-0.01**	-0.01*	-0.01*	-0.007	-0.009
		(0.005)	(0.05)	(0.004)	(0.01)	(0.009)
Population Density			-0.04***	-0.07*	-0.01	-0.009
			(0.02)	(0.02)	(0.007)	(0.009)
Bureaucratic Quality				-0.42	-0.16	0.13
				(0.53)	(0.58)	(0.47)
Corruption Control				0.10	-0.07	-0.01
				(0.12)	(0.15)	(0.12)
Law and Order				-0.16	0.05	0.18
				(0.17)	(0.24)	(0.20)
Unemployment Rate					0.07*	0.05**
					(0.02)	(0.02)
Capital-Output Ratio						7.89*
						(1.39)
Urban•Capital						-0.05*
						(0.02)
R-squared	0.33	0.36	0.37	0.29	0.51	0.58
Observations	433	425	424	340	191	191
F-Test	53.03	47.57	40.16	14.09	16.12	19.28

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Table 5: Output Share of Informal Sector and Urbanization: OLS Regressions

Dep. var.:IS								
	DC				All			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Urban	0.24*	0.27*	0.22*	-0.07*	0.18*	0.28*	0.15*	-0.08*
	(0.05)	(0.05)	(0.06)	(0.02)	(0.05)	(0.05)	(0.05)	(0.02)
Urbansquare	-0.003*	-0.003*	-0.002*		-0.004*	-0.004*	-0.002*	
	(0.0006)	(0.0005)	(0.0006)		(0.0004)	(0.0004)	(0.0004)	
Subsaharan		3.29*	3.13*	0.38		6.31*	3.61*	0.28
		(0.84)	(1.01)	(1.38)		(0.83)	(0.95)	(1.25)
MENA		-9.58*	-8.39*	-2.41***		-2.72*	-6.05**	-0.35
		(1.05)	(1.11)	(1.50)		(0.89)	(0.88)	(1.11)
EU		-5.09*	-2.60**	0.23		-7.22*	-0.92	0.40
		(0.90)	(1.01)	(1.17)		(0.84)	(0.61)	(0.63)
Latin		3.81*	5.18*	7.43*		9.90*	7.00*	8.13*
		(1.05)	(1.13)	(1.56)		(1.00)	(0.97)	(1.27)
Bureaucracy			-4.15*	-4.48*			-4.79*	-4.87*
			(0.44)	(0.71)			(0.37)	(0.48)
Corruption			-1.52*	0.27			-1.40*	0.32
			(0.45)	(0.68)			(0.30)	(0.38)
Law			-0.67*	-1.84*	-		-1.20*	-2.30*
			(0.33)	(0.47)			(0.29)	(0.40)
Pop. Dens.				0.0007*				0.00005
				(0.0002)				(0.0001)
Unemployment				0.05				-0.02
				(0.07)				(0.05)
Capital				-1.54*				-1.59*
				(0.25)				(0.24)
R-squared	0.05	0.19	0.33	0.30	0.23	0.41	0.60	0.60
Observations	1026	1026	834	453	1365	1365	1173	734
F-Test	27.51	75.95	76.10	43.96	281.68	242.69	295.78	167.23

Robust standard errors are in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively.
In all regressions a constant is also included but not reported.

Table 6: Informal Employment and Urbanization

Self-Employment				Informal employment		
	(1)	(2)	(3)	(4)	(5)	(6)
Urban	0.92*	0.75*	0.84**	-3.08*	3.06*	3.67
	(0.23)	(0.26)	(0.34)	(0.91)	(1.00)	(3.38)
Urbansquare	-0.005*	-0.004**		-0.02**	-0.02**	
	(0.002)	(0.002)		(0.009)	(0.009)	
Openness		0.01	0.14**		-0.08	-0.11
		(0.03)	(0.06)		(0.11)	(0.24)
Population Density		-0.001	0.009		0.06	0.19
		(0.003)	(0.01)		(0.13)	(0.29)
Capital-Output Ratio			35.02**			122.25
			(14.71)			(104.11)
Urban•Capital			-0.53**			-1.72
			(0.22)			(1.83)
Tax			0.62**			-182.03
			(0.28)			(167.26)
R-squared	0.15	0.12	0.44	0.32	0.31	0.53
Observations	293	273	97	95	94	36

Robust standard errors are in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively.
In all regressions a constant is also included but not reported.

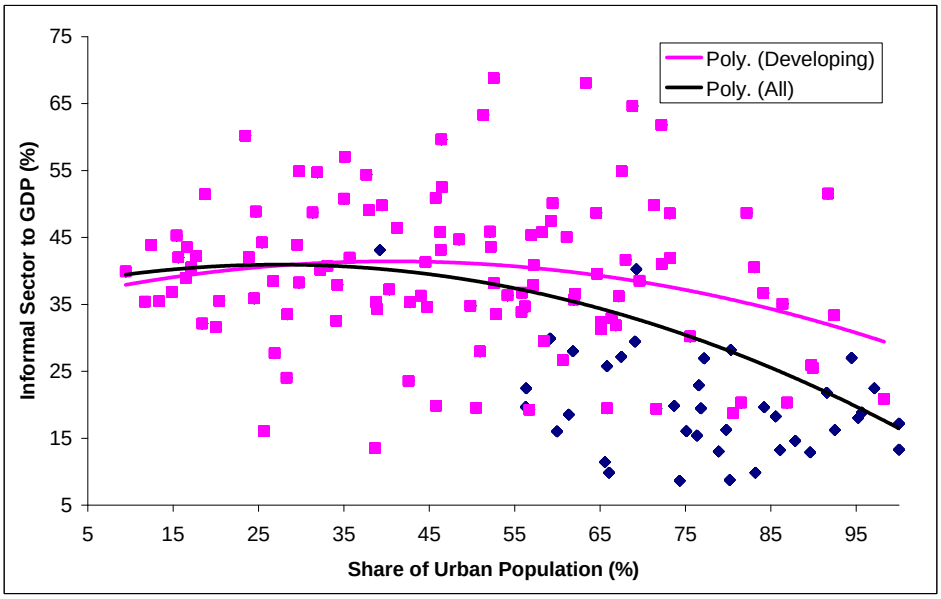

Figure 1: Informality and Urbanization: Developed and Developing Economies

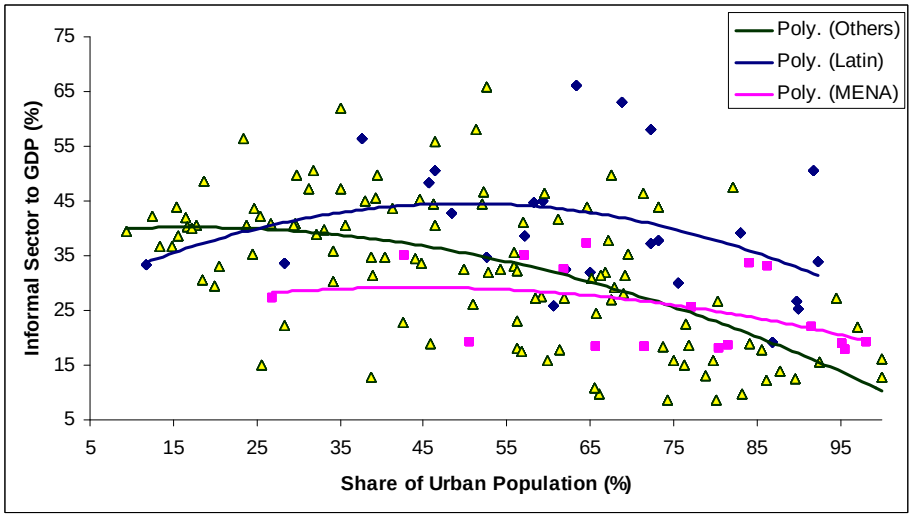

Figure 2: Informality and Urbanization: Different Regions