

The driving effect of informal economies on urbanization in China

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Abstract: This paper examines the rise of informal economies in China, a hidden driving force overlooked in studies on China's urbanization. Estimating the size of informal economies using the multiple indicators multiple causes model, the paper employs mathematical models to examine the driving effect of informal economies on urbanization and to reveal the paths by which such effect works. The results were as follows. (1) In 2018, the size of the informal economy in China accounted for 23.5% of GDP with an output value of 21.16 trillion yuan. (2) The informal economy had a driving effect on China's urbanization, and every 1-percentage-point increase in its share of the GDP led to an increase of 0.291 percentage points in the urbanization rate. (3) The informal economy's effect on urbanization showed regional differences, decreasing in size from the eastern to the central to the western regions. (4) The informal economy drives urbanization through four paths - by promoting foreign direct investment (FDI), fixed asset investment (FAI), social consumption (SC), and secondary sector employment (SSE). Their effect sizes are ranked in descending order as follows: FDI > FAI > SC > SSE. This paper contributes to theories on urbanization dynamics and process in China by highlighting the role of the informal economy as a hidden economic power lurking in the city.

Keywords: urbanization; informal economy; regional differences; driving force; effect paths

1 Introduction

Since the adoption of reform and opening up policies, China's urbanization level has risen from 17.9% in 1978 to 58.5% in 2017. This is an increase of 41 percentage points in 40 years, much faster than developed Western countries, which took about 100 years to attain the same increase (Zhou, 2013). Rapid urbanization has caused China to face a fundamental contradiction; opportunities for urban employment are far from meeting the virtually unlimited supply of surplus rural labor forces who continually move into cities (Zhou, 2010).

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However, this contradiction might be exaggerated due to the neglect of informal employment, which is outside the scope of the state's routine statistics. For example, Zhou (2006) found an average rural-to-urban population shift of nearly 20 million people each year during the 2001–2003 period; however, only 8.29 million newly created urban jobs were reported during this period, suggesting a huge gap between the newly added urban populations and available job opportunities. Furthermore, according to China's statistical yearbooks, while an average of 18.84 million people were newly added to the urban population every year between 1991 and 2019, only 9.38 million new urban jobs were created on average during the same period. In light of the pseudo-urbanization theory (McGee, 1967), researchers have suggested that China's urbanization is to some degree pseudo (Lu, 2014), wherein the annually increasing population of unemployed rural migrants will lead to the emergence of a lumpenproletariat, eventually resulting in social unrest. Yet, the reality anticipated by the pseudo-urbanization theory has not occurred in the case of China.

Given the fact that the majority of rural migrants are not able to attain urban citizenship, there is indeed a "pseudo" component to China's urbanization. However, based on the quantity of urban employment and its capacity to absorb rural migrants, the extent of pseudo-urbanization was overstated, because the argument relied solely on official employment statistics and failed to consider the informal economy. In short, the impact of the informal economy has been neglected, leading to a misleading understanding of the urbanization dynamics in China. To fill the research gap, this paper uses quantitative models to examine effects of the informal economy on driving China's urbanization and reveal acting paths of the driving effect. The paper betters the understanding of China's urbanization dynamics by highlighting the role of the informal economy, a hidden economic power lurking in cities. It provides an explanation for the puzzle of why China's urbanization has not faced systematic unemployment risks despite the huge insufficiency of reported job opportunities.

2 Urbanization and the informal economy

The discovery of the informal sector in the 1970s provided new insight for understanding the urbanization in developing countries (Hart, 1973), enabling scholars to explain urbanization from a new perspective attending to unobservable factors outside the state's statistical system. Studies have found that, although many rural migrants failed to find jobs in modern urban sectors, a large part of them earned their income through informal economy activities. Informal economy is generally defined as income-generating activities that are legal (or non-criminal) but are either not covered or insufficiently covered by the regulatory system (Chen, 2007). It is heterogeneous and includes self-employment and informal waged employment activities. Street vendors, motorcycle drivers, construction workers, babysitters, deliverymen, and temporary workers are typical examples of informal workers in many developing countries. The International Labor Organization (ILO, 2018) estimated that 2 billion people worldwide or 61.2% of the global workforce are engaged in informal economic activities. Emerging and developing countries have higher shares of informal employment than developed countries. About 70% of the employed population in emerging and developing countries are engaged in informal employment while the percentage is about 18% in developed countries (ILO, 2018). In urban areas of developing countries, the informal econo-

my accounts for up to 79% of the workforce (Chen, 2019). The informal economy has become a global development problem as it is listed as a major challenge of sustainable urban development by the UN in the 2030 Sustainable Development Goals. However, despite its importance in worldwide urban studies and policy discussion, little is known of the role of the informal economy in urbanization.

Extensive research has been conducted concerning driving forces of China's urbanization (Ning, 1998; Zhao and Zhou, 2002; Gu and Wu, 2008; Xu and Li, 2009). Early studies distinguish between top-down urbanization led by state investment and bottom-up urbanization led by local government and township and village enterprises (Cui and Ma, 1999). With the implementation of opening-up policies, foreign investment economy and other globalization factors became new driving forces of China's urbanization. The concept of export-oriented urbanization was developed to highlight this driver (Xue and Yang, 1997). Recently, Cao and Liu (2010) emphasized the driving effect of economic growth and industrial restructuring, examining the roles of economic development, economic structure, rural industrialization, foreign investment, and foreign trade in China's urbanization. Han and Zhi (2014) were focused on the industrial structure, education level, social investment, urban-rural income gap, and farmers' income structure in explaining the process of urbanization in China. Furthermore, Gu *et al.* (2017) explained China's rapid urbanization by highlighting both macroeconomic and institutional factors, such as economic globalization, marketization, and land economy. Lin *et al.* (2018) shed light on the economic and geographic factors in their explanation for China's urbanization and its regional differences.

While current studies highlight the role of economic development in examining urbanization, they are based on the official routine economic statistics and therefore fail to consider the effect of the informal economy. One study has estimated that the expansion of informal economy in China between 1990 and 2004 contributed 44% of the country's GDP growth (Hu and Zhao, 2006). Another study estimates that, in 2010, some 110–135 million urban employments were unregistered and informal, roughly 30% of total urban employment (Chen *et al.*, 2021). The huge magnitude of the informal economy renders any study on the relationship between economic development and urbanization inaccurate. Despite the difficulty in estimating the informal economy, it is one of the four main sectors of the Chinese economy alongside the formal economy, township and village enterprises, and the agricultural sector (Hu and Ma, 2012). It is also argued that the informal economy is a constituent component and characteristic of modern economy in the context of marketization, globalization, and flexible capital accumulation systems rather than an "abnormal" economic phenomenon (Huang, 2010). According to the experience of developed countries, the informal economy will not vanish completely but will persist with the changing capitalist economies (Portes *et al.*, 1989; Perry *et al.*, 2007; ILO, 2018). Therefore, investigating the effects of the informal economy is crucial to improving the understanding of China's urbanization dynamics.

Research on the effect of informal economies on urbanization can be traced back to Todaro's (1969) improvement of Lewis's (1954) two-sector model. According to the Lewis model, the urbanization process involves the spatial and economic transformation of rural surplus labor from the traditional agricultural sector to the modern urban sector. However, the model failed to explain why urbanization persists in many developing countries in the

context of severe shortages in urban employment opportunities. Todaro (1969) argued in response that the traditional urban sector absorbs the rural surplus labor that cannot be absorbed by the modern sector. That is, urbanization involves the transition of the rural population from the agricultural sector to the traditional urban sector and then to the modern urban sector. The traditional urban sector is the informal sector defined by the ILO in the 1970s and catching widespread attention in subsequent decades.

Attention has been paid to effects of the informal economy on economic growth, employment growth, and poverty reduction (Huang *et al.*, 2011; Shen and Li, 2011; Akinwale, 2012). However, little is known of the relationship between the informal economy and urbanization. Yuki (2007), one of the first to study this area, found that the increase in urbanization rate in many developing countries is positively related to the expansion of the informal economy. This is consistent with the fact that developing countries often have sizeable informal economies. Elgin and Oyvat (2013) found an inverted U-shaped relationship between the informal economy and the level of urbanization at the global level. That is, with the growth in urbanization rate, the informal economy's share in an economic system is likely to increase first and then decrease. This inverted U-shaped relationship has been confirmed by researchers in the case of China (Huang *et al.*, 2019b). Although these studies provide preliminary explorations into the informal economy's effect on urbanization, the extent to which the informality drives urbanization and the paths by which this driving force acts remain unclear. As the informal economy is interrelated with the processes of industrialization, globalization, and urban development (Meagher, 2013; Mukim, 2015), it might drive urbanization by impacting other factors in indirect ways. This study aims to fill the research gap by employing a multiple mediation model to reveal the way the informal economy drives urbanization, focusing on China.

3 Methods and data

3.1 Model for estimating the informal economy

As the informal economy is outside the state's statistical system, it is difficult to obtain direct and long-term data on it on a national scale. This study employs the multiple indicators multiple causes (MIMIC) model to estimate the size of the informal economy. Compared with the traditional variable substitution method, this model has the advantage of accurately measuring the data that are difficult to observe directly, although its operation process is relatively complex and requires high data correlation. The MIMIC model is a form of structural equation modeling that is often used to estimate unobservable latent variables. The model includes a set of observable indicator variables and causal variables. By estimating the equations for these two sets of variables, one can approach the estimation of variables that are unobservable and difficult to measure directly (Chaudhuri *et al.*, 2006; Hoa, 2019; Tonuchi *et al.*, 2020).

Causal variables represent a set of influencing factors that can cause the change of latent variables. The following equation is given for estimating the effect of causal variables on the informal economy:

$$\eta = \delta_1 a_1 + \delta_2 a_2 + \dots + \delta_p a_p + \xi \quad (1)$$

where η denotes the size of the informal economy; a_1, a_2, \dots, a_p denote a set of causal variables influencing the size of the informal economy; $\delta_1, \delta_2, \dots, \delta_p$ are the model's parameters; and ζ denotes the stochastic disturbance term. In light of the research on determinants of the informal economy, five causal variables for the study are selected:

(1) Tax burdens (a_1, a_2, a_3). A greater tax burden may cause firms to turn to informal economic activities to avoid taxation (Dell'Anno and Schneider, 2003; Schneider, 2005). Thus, tax burden has a positive effect on the size of the informal economy. This variable was measured as the share of taxes in GDP. Furthermore, to capture differences in the impact of different tax categories on informal economies, we divided taxation into total taxes (a_1), direct taxes (a_2), and indirect taxes (a_3) (RG, 2005).

(2) Residents' income (a_4). Workers with lower incomes are more likely to engage in informal economic activities to make a living. Hence, residents' income has a negative effect on the size of the informal economy. This variable was measured as the share of residents' disposable income in GDP.

(3) Urban unemployment (a_5). Research has shown that a higher unemployment rate will lead to more workers entering informal economies (Bajada and Schneider, 2005; Dell'Anno and Solomon, 2008). Hence, unemployment rate has a positive effect on the size of the informal economy. It was measured as the registered unemployment rate in urban areas.

(4) Individuals' self-employment (a_6). Self-employed individuals usually do not or cannot fully comply with taxation and labor systems. Given the small scale and flexibility of their business, they can easily evade taxation and employ workers without complying with the law of labor contracts. Therefore, participation in self-employment has a positive effect on the size of informal economies (Dell'Anno *et al.*, 2007). This variable was measured as the share of self-employed workforce in total employment.

(5) Governmental regulation (a_7). The impact of governmental regulation on the size of informal economies is uncertain. On one hand, inefficient and procedurally complicated government provisions may burden firms with additional costs and thus lead them to more informal status; on the other hand, government can restrict the growth of informal economies by fine-tuning relevant laws and regulations and strengthening their supervision and enforcement (Biswas *et al.*, 2012). Since government regulation is often accompanied by substantial consumption of financial and material resources, we measured it using government spending as a share of GDP.

Indicator variables represent a set of indicators that can reflect changes in latent variables, that is, variations in latent variables can lead to variations in indicator variables. The following equation is given to estimate the effect of latent variables on indicator variables:

$$m_1 = \mu_1\eta + \varepsilon_1, m_2 = \mu_2\eta + \varepsilon_2, \dots, m_q = \mu_q\eta + \varepsilon_q \quad (2)$$

where m_1, m_2, \dots, m_q are indicator variables; η denotes the size of the informal economy; $\mu_1, \mu_2, \dots, \mu_q$ are parameters to be estimated; and ε denotes the measurement error. Based on studies concerning the effects of informal economies, two indicator variables were selected:

(1) GDP growth rate (m_1). As the informal economy is functionally linked with the formal economy, its expansion will positively promote economic growth (Meagher, 2013).

(2) Formal labor force participation rate (m_2). As the informal economy absorbs labor forces, its expansion will lead to a reduction in the labor force participation rate documented

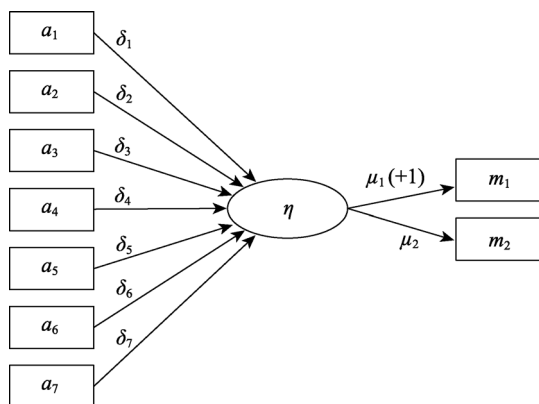


Figure 1 Schematic diagram of the MIMIC model's estimation for informal economies

the estimation is conducted, one can refer to Alañón and Gómez-Antonio (2005) and Yang and Sun (2010). Using the model, the size of the informal economy will be measured and represented as its share of GDP.

3.2 Model for examining the informal economy's effect

A panel data regression model was used to test the effects of the informal economy on urbanization. Given significant differences in urbanization levels across Chinese provinces, the paper employed the regression model with individual fixed effects, expressed in the following equation:

$$Urban_{i,t} = \beta_0 + \beta_1 Informal_{i,t} + \sum_{k=2}^n \beta_k X_{k,i,t} + \theta_i + \epsilon_{i,t} \quad (3)$$

where i denotes the province; t denotes the year; $Urban_{i,t}$ denotes the urbanization rate, as measured with the share of urban population in the total population; and $Informal_{i,t}$ denotes the share of the size of informal economies in the overall economy, estimated from the MIMIC model above. $X_{k,i,t}$ denotes other factors affecting urbanization, that is, control variables of the model. Finally, $\beta_0 \dots \beta_k$ denote the regression coefficients, θ_i denotes the individual fixed effects, and $\epsilon_{i,t}$ is the stochastic disturbance term.

Five key control variables were selected according to the existing research. (1) Floating population, measured as the percentage of migration without local hukou in the total population, reflects the process of rural-to-urban migration, which is a crucial factor for China's rapid urbanization (Zhang and Song, 2003; Liu *et al.*, 2015). (2) Land finance, measured as the government's land lease revenue as a share of GDP, is a featured driving force of urbanization in China (Gu *et al.*, 2017a). Fiscal land revenue is a primary source of government revenue and funding for urban construction projects, which promotes the expansion of urban land use and infrastructure construction (Tian, 2011; Wang, 2013). (3) Human capital, measured as the logarithm of the average number of students in higher education per 100,000 people, played an increasingly prominent role in urbanization by driving the mobil-

in states' official statistics (Popescu *et al.*, 2018). This variable was measured as the share of the total employed population in the economically active population aged between 16 and 64 years old.

Based on the variables above, the diagram of the MIMIC model for estimating the informal economy size is established (Figure 1). To make the structural equation identifiable, an element in the vector μ is preset and standardized. We set the path coefficient of GDP growth rate (m_1) to 1 because it is the most generally used indicator for output. For detailed work on how

ity of rural populations to urban areas, improving the Chinese population’s general education level, and promoting technological advancement (Weng and Han, 2012; Lyu *et al.*, 2019). (4) Industrial structure is measured as the tertiary sector’s output value as a share of GDP. Studies have measured economic development using economic structure and found that evolutions in China’s economic structure are associated with urbanization (Li *et al.*, 2013; Xiao and He, 2013). (5) Foreign investment, measured as the number of foreign invested enterprises, has been widely considered a major driving force in China’s rapid urbanization since the 1980s (Xue and Yang, 1997; Gu *et al.*, 2017; Ma and Sun, 2020). Table 1 shows expected impacts of all control variables above.

Table 1 Variables included in the panel data regression model

Variable type	Variable name	Indicators	Abbreviation	Expected impact
Dependent variable	Urbanization	Urban population/total population	urban	
Independent variable	Informal economy	The size of informal economy/GDP	informal	+
	Floating population	Floating population/total population	floating	+
	Land finance	Land lease revenue/GDP	renttogdp	+
Control variable	Human capital	The logarithm of the average number of students in higher education per 100,000 people	lnstudent	+
	Industrial structure	The tertiary sector’s output value/GDP	industry	+
	Foreign investment	The logarithm of the number of foreign invested enterprises	lnfie	+

3.3 Model for exploring effect paths of the informal economy

The multiple mediation model is established to explore the paths through which the informal economy drives urbanization. Multiple mediation model can be used to illuminate the mediating paths through which an independent variable affects a dependent variable (Figure 2). In this model, X, M, and Y denote the independent, mediating, and dependent variables, respectively. The symbol a_n denotes the mediating effect of the independent variable on the mediating variable, b_n denotes the mediating effect of the mediating variable on the dependent variable, c' denotes the direct effect of the independent variable on the dependent variable, and e_n denotes the regression residual. Equations for the model are given as follows:

$$M_n = a_n X + e_i \tag{4}$$

$$Y = c'X + \sum_1^n b_n M_n + e_{n+1} \tag{5}$$

At this point, the mediating effect of each mediating variable in the model can be expressed as $a_n b_n$, the total mediating effect as $c'' = \sum a_n b_n$, and the total effect as $c = c' + c''$ (Figure 2).

As the informal economy is closely linked with the formal economy, globalization, marketization, and other socioeconomic processes (Mukim, 2015; Huang *et al.*, 2020b), there is a mediating mechanism through which the informal economy effects on urbanization indi-

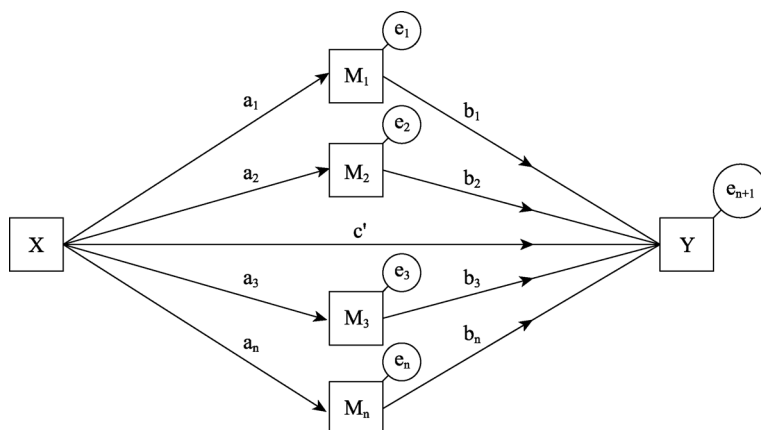


Figure 2 Schematic diagram of the multiple mediation model

rectly by affecting other driving factors. Notably, these indirect driving factors are influenced by the growth of the informal economy while at the same time promoting the development of urbanization themselves. Combining theories on the dynamics of informal economies and urbanization, we selected eight mediating factors (M_1 – M_8) to explore the paths by which informal economies drive urbanization.

First, in light of the economic dualism theory, the informal economy is a result of underdeveloped industrialization and the formal economy's inability to fully absorb surplus labor. Hence, informal economies provide employment opportunities for the urban unemployed population and serve as a safety valve to alleviate unemployment (Loayza, 2011; Huang *et al.*, 2020a). Empirical studies have shown that the effect of informal economies on employment creation is significant and larger than that of the formal economy (Xu, 2014). Given that employment growth contributes to urbanization, it can be assumed that the informal economy drives urbanization by promoting employment growth. We used the share of secondary sector employment (M_1) and the tertiary sector employment (M_2) to measure the employment factor.

Second, from the neo-Marxist perspective, the informal economy is viewed as a structural product of the flexible accumulation regime in late capitalism. Proponents of this perspective argue that the informal economy is closely linked to the formal economy and plays a role in reducing costs of production in the formal economy (Castells and Portes, 1989; Biles, 2008). Studies have shown that, in the current competitive and globalizing world, firms are intended to reduce their production costs and maximize their profits by informalization. For example, formal firms often subcontract production tasks to small-scale informal firms to avoid strict labor regulations (Xue *et al.*, 2014; Amara, 2016). Given its role in helping multinational companies circumvent local labor unions and reduce their production costs, the informal economy serves as an advantaged factor for attracting foreign investment in many developing countries. Considering positive effects of economic growth and foreign investment on urbanization (Xue and Yang, 1997; Chen *et al.*, 2007), one can assume that the informal economy drives urbanization by promoting the growth of the formal economy and foreign investment. We measured the former factor with state-owned industrial enterprises in terms of its sales value share of GDP (M_3) and the latter with foreign direct investment in

terms of its share of GDP(M_4).

Third, scholars from the neoliberalist perspective have suggested that the informal economy serves as a facilitating factor for the growth of the market economy (De Soto, 1989; Gindling and Newhouse, 2013). They argue that the informal economy can promote consumption by providing lower-priced products and services than the formal economy and by increasing individual income and spending power. For instance, studies have shown that salaried employees often earn a second income through flexible informal employment (Huang *et al.*, 2018). Rising consumption rates can facilitate the circulation of capital and increase economic growth, which promotes urbanization. Thus, we assume that the informal economy drives urbanization by promoting marketization development and social consumption. Regions with higher degree of liberalization generally have a lower share of government revenues in GDP. As the government’s fiscal revenue as a share of GDP (M_5) indicates the degree of governmental intervention in the market, we used the remainder of it ($1-M_5$) to measure the degree of marketization (Fan *et al.*, 2011). Total retail sales of consumer goods as a share of GDP (M_6) was used to measure the factor of social consumption.

Another mediating factor, which was rarely addressed in existing theories but cannot be overlooked in discussions on China’s urbanization, is the important role of the informal economy in the construction industry (Liu and Ke, 2020). Construction activities such as real estate development, urban renewal and redevelopment, and road construction often employ large numbers of informal workers without labor contracts (Pan *et al.*, 2010; Song and Zhu, 2020). These workers were employed by construction firms through a layered subcontracting system (Ren and Jia, 2010) to avoid labor regulations and reduce the construction cost (Cai, 2010). Hence, it can be assumed that the informal economy drives urbanization by promoting various types of urban construction activities. We measured urban construction factors using total investment in fixed assets (M_7) and road area per capita (M_8).

In summary, we assume eight effect paths through which the informal economy drives urbanization (Figure 3). We used the bootstrap method to validate these paths. This method involves repeatedly sampling the original dataset n times with replacement variables to cre-

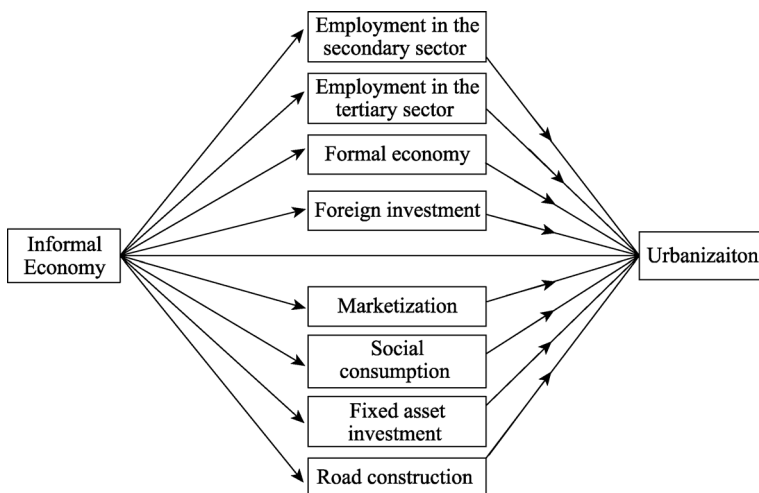


Figure 3 Hypotheses on effect paths by which informal economies drive urbanization

ate a bootstrap sample that approximates the original sample and then determining the confidence interval of the mediating effect to test whether the given mediating effect exists. As the bootstrap method can simultaneously handle multiple mediating variables and allow the variables to contain measurement errors, it can provide a more accurate assessment of model validity than traditional methods based on regression analysis (Zhang and Kang, 2016).

3.4 Data source

Data for this study were obtained from various years of China statistical yearbooks, China's National Bureau of Statistics, and the China Economic Information Network Statistics Database. Together, these three sources provided panel data for China's 31 provinces/autonomous regions/municipalities (excluding Hong Kong, Macao, and Taiwan) for a 19-year period (2000–2018). The amount of foreign direct investment in China is derived from the Wind Database provided by Wind Information, China's leading provider of financial data. This database includes data on finance, markets, securities, macroeconomics, and other aspects of economic activity in China. Data for land lease revenue came from the *China Land and Resources Yearbook* and the *China Land and Resources Statistical Yearbook*.

4 Results and analysis

4.1 The size of informal economies and urbanization

The MIMIC model showed that the size of China's informal economy grew from about 11.7% to 23.5% in terms of its share of GDP during 2000 to 2018 (Figure 4a), and the value of its output increased from 1.17 trillion to 21.16 trillion yuan. Assuming, as in other studies, that the labor productivity of the informal economy is equal to the average productivity of society as a whole (Hu and Zhao, 2006), we can find that about 183 million workers were engaged in the informal economy in 2018, accounting for about 9% of the 2 billion informal workers worldwide (ILO, 2018). The result is close to Chen *et al.*'s (2021) estimation using population census and labor sample survey data, which found 110–135 million workers informally employed in 2010. This suggests that the MIMIC model is credible in estimating the size of the informal economy.

On a national scale, the informal economy's share of GDP fluctuated between 10.2% and 13.2% between 2000 and 2007, then rose sharply over the next 10 years (Figure 4a). At the regional level¹ the size of the informal economy in eastern China had seen a rising trend on the whole since 2000 (Figure 4b) while, in central and western China, the informal economy fluctuated in size before 2008 and then turned to a rising trend (Figure 4c, 4d). Figure 4 shows a correlative relationship between the size of informal economies and the urbanization rate. In 2018, China's urbanization rate reached 60.0%, while urbanization rates for eastern, central, and western China reached 70.7%, 56.9%, and 52.3%, respectively.

¹ China's eastern region includes Beijing, Tianjin, Hebei, Liaoning, Shanghai, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong, and Hainan. Its central region includes Shanxi, Jilin, Heilongjiang, Henan, Jiangxi, Anhui, Hubei, and Hunan. Its western region includes Inner Mongolia, Guangxi, Chongqing, Sichuan, Yunnan, Guizhou, Shaanxi, Gansu, Ningxia, Qinghai, Xinjiang, and Tibet.

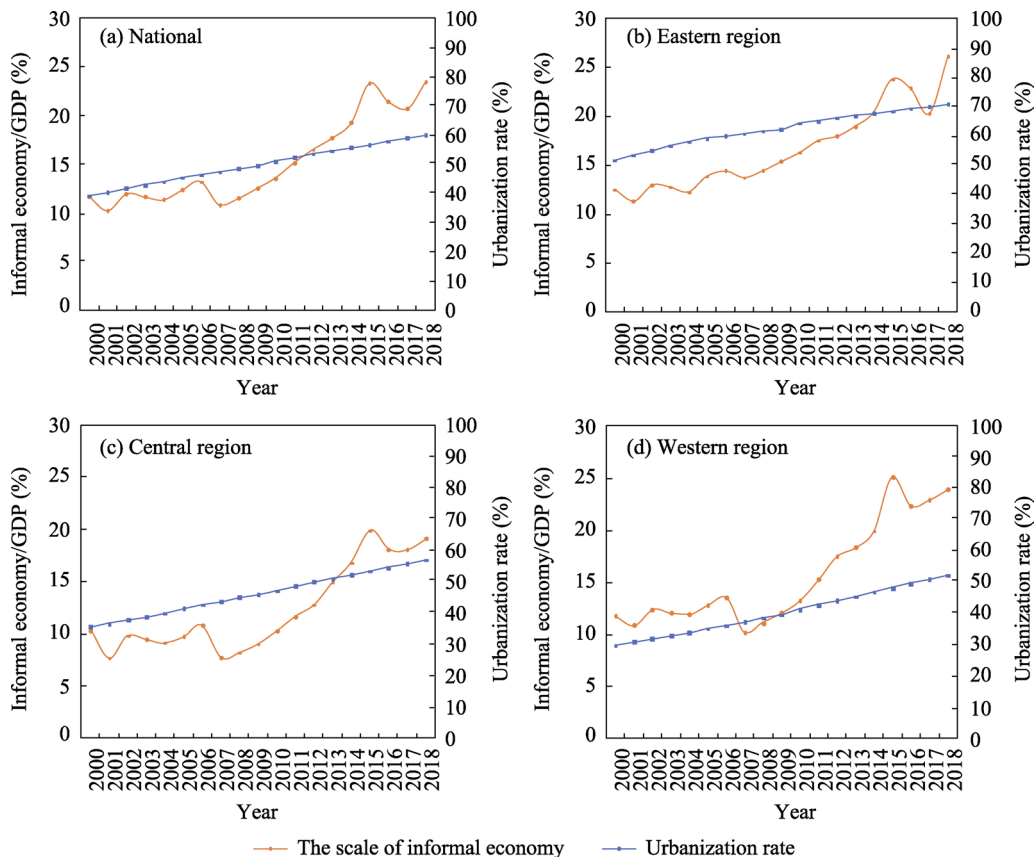


Figure 4 The informal economy and urbanization rate at the national and regional levels of China, 2000–2018

4.2 Driving effect of the informal economy on urbanization

To avoid spurious regression, we conducted unit root testing on the stationarity of each data series via the commonly used augmented Dickey-Fuller (ADF) test. All of the variables had unit roots while the first-order single-integer sequences did not have unit roots at a significance level of 1% (Table 2). Hence, cointegration tests were performed to verify whether there were long-term stationary relationships between the first-order single-integer variables. The Kao and Pedroni methods were employed for these tests. The ADF statistic passed the Kao test at a confidence level of 1% (Table 3). Because this study examined a timespan of less than 20 years, we referred primarily to the Group ADF-Statistic of the Pedroni test, which passed at a confidence level of 1%. This indicates that the data panels were cointegrated. To select the most suitable panel regression model and prevent our estimation results from deviating too far from reality, a Hausman test prior to regression analysis was performed to determine whether an individual fixed effects model or individual random effects model for panel data regression should be adopted. The results showed that the Hausman statistic was 59.842 and *P*-value was 0.000, indicating that the null hypothesis of using the individual random effects model was rejected and an individual fixed effects model should be adopted instead.

Using stepwise regression, each control variable was added to the model in turn. The R^2 of the regression equation rose from 0.904 to 0.970, suggesting that the stepwise addition of

Table 2 Panel data unit root test results

Variables	ADF statistics	P-value	Unit root	Variables	ADF statistics	P-value	Unit root
urban	35.345	0.997	yes	Δ lnfi	223.054	0.000	no
Δ urban	189.585	0.000	no	lnstudent	70.281	0.220	yes
informal	13.583	1.000	yes	Δ lnstudent	101.618	0.001	no
Δ informal	215.172	0.000	no	renttogdp	44.500	0.954	yes
industry	10.872	1.000	yes	Δ renttogdp	234.151	0.000	no
Δ industry	126.994	0.000	no	floating	34.030	0.999	yes
lnfi	27.627	1.000	yes	Δ floating	230.203	0.000	no

Table 3 Results of the panel data cointegration test

Methods	Statistics	Value	P-value
Kao	ADF	-3.917	0.000
Pedroni	Panel PP-Statistic	0.858	0.805
	Panel ADF-Statistic	-2.274	0.012
	Group PP-Statistic	-1.965	0.025
	Group ADF-Statistic	-4.203	0.000

the control variables enhanced the regression equation's fitness (Table 4). Regression model (6) indicates that, after controlling for all relevant variables, the urbanization rate was positively associated with the size of the informal economy. The regression coefficient was 0.291, which passed the significance testing at a confidence level of 1%. Thus, the results suggest that the informal economy had a positive driving effect on urbanization and that every 1-percentage-point increase in the share of the informal economy in GDP will lead to an increase of 0.291 percentage points in the urbanization rate.

The coefficients of control variables reflect multiple driving forces of urbanization in China. The coefficients for floating population, land finance, human capital, industrial structure, and foreign investment were positive in most cases and passed the significance test. Consistent with the existing literature, the result indicates that factors such as migration,

Table 4 Results of the panel data regression model

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Informal economy	0.858*** (22.542)	0.656*** (14.528)	0.646*** (15.605)	0.394*** (11.773)	0.314*** (9.056)	0.291*** (4.821)
Floating population		0.275*** (7.536)	0.172*** (4.934)	0.180*** (6.870)	0.129*** (4.859)	0.040 (1.613)
Land finance			0.983*** (10.316)	0.273*** (3.439)	0.356*** (4.563)	0.185** (2.597)
Human capital				0.116*** (20.679)	0.111*** (20.218)	0.093*** (18.100)
Industrial structure					0.219*** (6.289)	0.172*** (5.470)
Foreign investment						0.042*** (11.749)
Constant	0.368*** (59.999)	0.355*** (58.209)	0.337*** (57.713)	-0.480*** (-12.075)	-0.516*** (-13.285)	-0.695*** (-18.304)
R ²	0.904	0.913	0.927	0.959	0.962	0.970
F-statistics	169.925	182.876	214.180	380.250	396.218	484.511

high rates of land fiscal revenue, enhanced human capital, upgraded industrial structure, and economic globalization promote the process of urbanization in China. While the informal economy drives urbanization, urbanization also affects the informal economy. This might lead to the endogenous problem of mutual causality, resulting in the bias of the estimated coefficient. We use the level of informal economy with one lag period as an instrumental variable to alleviate the endogenous problem in the model. The two-stage least square method (2SLS) is used for estimation. The coefficient of informal economies remains positive and significant, indicating that the conclusion is robust and reliable.

4.3 Regional differences

Significant regional differences exist in the process of urbanization in China. The eastern region had the highest level of urbanization followed by the central and western regions. To clarify regional differences in the informal economy's effect on urbanization (and test the robustness of the above national model), we tested the relationship between the informal economy and urbanization for each region.

After controlling for all variables, the regression coefficients for the effect of the informal economy on urbanization were positive for all three regions, and all passed the test at a significance level of 1% (Table 5). This indicates that the informal economy has a positive effect on urbanization across China and that the national model is rather robust. The regression coefficient was 0.406 for the eastern region and 0.263 and 0.175 for the central and western regions, respectively. Thus, the informal economy has had a stronger effect on urbanization in eastern China than in the other two regions. These geographically divergent effects can be explained by the inverted U-shaped relationship between the informal economy and urbanization explored in studies by Elgin and Oyvat (2013) and Huang *et al.* (2019b). These studies suggest that the informal economy's size as a share of a country's overall economy grows initially and then decreases with the process of urbanization, suggesting that the informal economy's driving effect on urbanization strengthens at the beginning and then weakens once urbanization reaches a certain level. As the urbanization level in China has not reached the turning point, the informal economy will continue to grow with the urbanization rate. In other words, current China is still in the stage represented by the left half of the inverted U-shaped curve. Hence, as the urbanization rate decreases from east to west in China, the informal economy's driving effect on urbanization decreases in the same direction; this is what we see in Table 5 that the informal economy's regression coefficient (or degree of

Table 5 Regional differences of informal economy's effect on urbanization

Variables	National	Eastern region	Central region	Western region
Informal economy	0.291*** (4.821)	0.406*** (5.219)	0.263*** (5.715)	0.175*** (4.186)
Floating population	0.040 (1.613)	-0.029 (-0.746)	-0.074 (-1.217)	0.263*** (6.157)
Land finance	0.185** (2.597)	0.182* (1.656)	0.237 (1.407)	-0.190 (-1.518)
Human capital	0.093*** (18.100)	0.082*** (8.608)	0.195*** (11.416)	0.104*** (13.118)
Industrial structure	0.172*** (5.470)	0.192** (2.584)	0.155*** (3.477)	0.110** (2.136)
Foreign investment	0.042*** (11.749)	0.052*** (5.598)	0.029*** (4.414)	0.025*** (4.951)
Constant	-0.695*** (-18.304)	-0.689*** (-5.879)	-1.369*** (-13.998)	-0.630*** (-13.799)
R^2	0.970	0.959	0.945	0.948
F-statistics	484.511	280.957	184.103	225.682

effect) on urbanization descends as we move across China from east to west.

4.4 Acting paths of informal economies' effect on urbanization

To understand the mechanism by which the informal economy drives urbanization, we tested the eight effect paths constructed in the previous section. We used AMOS 24.0 software to conduct 5,000 bootstrapped resamples and adjusted the model based on theoretical hypotheses, signs of the standardized coefficients, and the significance level of the bias-corrected bootstrap 95% confidence intervals (BC 95%) (Table 6). The explorative work was conducted with the following steps.

(1) We first tested all mediating variables (Model 1). The results indicated that the informal economy had a positive effect on most mediating variables. However, contrary to theoretical hypotheses, the coefficients for state-owned industries and marketization level were negative. Furthermore, although the informal economy had a positive effect on road area per capita, the effect of this path on urbanization did not pass the significance test.

(2) We then removed state-owned industries, marketization level, and urban road construction to run Model 2. The coefficients for the informal economy's effect on all mediating variables were positive, and all passed the significance test. However, the direct effect of the informal economy on urbanization was negative in Model 2, conflicting with theoretical hypotheses and the results of the panel data regression analysis.

(3) We inferred that the conflicting results in Model 2 might be caused by the correlation between employment in the secondary and tertiary industries. We then removed secondary sector employment as a variable to run Model 3. The coefficient of the direct effect was still negative, contrary to our hypotheses.

(4) We chose to retain secondary sector employment and instead remove the tertiary sector employment to run Model 4, which showed the results that met our hypotheses and passed the significance test (Model 4). Model 4 revealed and validated four of the assumed eight effect paths, which are discussed in detail below.

Table 6 Bootstrap results of multiple mediation effects

Mediating variables	Model 1		Model 2		Model 3		Model 4	
	<i>Ie</i>	<i>Urb</i>	<i>Ie</i>	<i>Urb</i>	<i>Ie</i>	<i>Urb</i>	<i>Ie</i>	<i>Urb</i>
Employment in the secondary sector (M_1)	0.076*	0.405*	0.075*	0.386*			0.075*	0.396*
Employment in the tertiary sector (M_2)	0.397*	0.624*	0.399*	0.685*	0.399*	0.655*		
State-owned industries (M_3)	-0.154*	0.213*						
Foreign investment (M_4)	0.125*	0.300*	0.130*	0.260*	0.130*	0.363*	0.130*	0.451*
Marketization level (M_5)	-0.530*	-0.023						
Social consumption (M_6)	0.122*	0.098*	0.177*	0.060*	0.177*	0.043	0.177*	0.172*
Fixed asset investment (M_7)	0.169*	0.161*	0.208*	0.118*	0.208*	0.308*	0.208*	0.195*
Road construction (M_8)	0.246*	-0.050						
Total effect (c)		0.280*		0.291*		0.274*		0.269*
Direct effect (c')		-0.042		-0.081*		-0.106*		0.110*
Indirect effect (ab)		0.322*		0.371*		0.380*		0.160*

Note: ① *Ie* denotes informal economy, *Urb* denotes urbanization rate. ②* indicates 0 was excluded from the BC95% confidence interval of standardized coefficient, the paths passed the test at a significance level of 5%.

Model 4 in Table 6 shows that the standardized coefficient of the total effect c was 0.269, which suggests that, when mediating effects were considered, every 1-percentage-point increase in the informal economy’s share of GDP led to an increase of 0.269 percentage points in urbanization level. The standardized coefficient of the direct effect c' was 0.110, suggesting that every 1-percentage-point increase in the informal economy’s share of GDP directly led to an increase of 0.110 percentage points in urbanization level. The standardized coefficient of the indirect effect ab was 0.160, which accounted for 59.48% of the total effect and was higher than the direct effect. This suggests that 59.48% of the informal economy’s driving effect on urbanization was derived from informal economy’s influence on other driving forces including secondary sector employment, foreign investment, social consumption, and fixed asset investment.

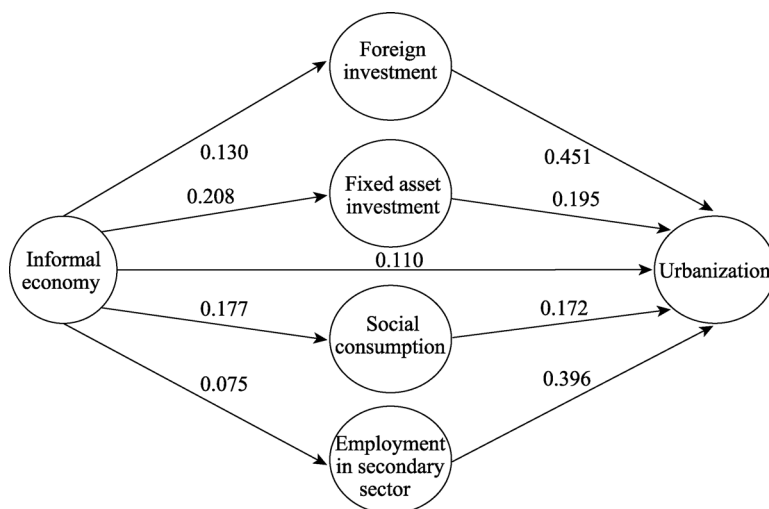


Figure 5 Acting paths of informal economies’ effect on urbanization

A path diagram for summarizing the informal economy’s driving effect on urbanization can be constructed based on Model 4 (Figure 5). The diagram includes four mediating driving factors: secondary sector employment (M_1), foreign investment (M_4), social consumption (M_6), and fixed asset investment (M_7). The effect sizes of these mediating factors were as follows, in descending order: foreign investment path ($a_4b_4 = 0.0586$) > fixed asset investment path ($a_7b_7 = 0.0406$) > social consumption path ($a_6b_6 = 0.0304$) > and secondary sector employment path $a_1b_1 = 0.0297$. This suggests that foreign investment had the greatest mediating effect while secondary sector employment had the smallest. Each path is analyzed below.

The foreign investment path represents the mechanism by which the informal economy drives urbanization by promoting foreign direct investment. The effect path is consistent with previous studies demonstrating a positive correlation between foreign direct investment and the size of a country’s informal economy (Ali and Bohara, 2017). The informal economy provides a cheap and flexible labor market, including workers who engage in temporary, daily-wage, and dispatched work. These kinds of informal labor enable foreign-funded enterprises or local enterprises embedded in global production networks to implement flexible

labor employment strategies and reduce labor costs, thereby allowing them to increase their profit margins in an increasingly competitive global market. Furthermore, the informal economy functions as a favorable factor for attracting foreign investors as it is part of the global subcontracting production system, in which informal factories, small workshops, and small-scale individual producers provide formal firms with low-cost, flexible production (Xue *et al.*, 2014).

The fixed asset investment path represents the mechanism by which the informal economy drives urbanization by facilitating various types of urban construction activities. It demonstrates how substantial informal employment and the prevailing labor outsourcing in construction industries can drive urbanization. According to data from China's National Bureau of Statistics, there were some 290 million migrant workers in China in 2019, and about 53% of them worked in construction, transportation, and warehousing industries. The majority of these migrant workers were informal workers who did not have access to social security or sign formal labor contracts. The finding suggests that the informal economy provides China's urban construction industries with a steady supply of low-cost labor and hence plays an indispensable role in the country's rapid urbanization.

The social consumption path represents the mechanism by which the informal economy drives urbanization by promoting consumption. There are three factors at play here. First, the informal economy provides cheap and convenient products and labor, such as through the street-stall and small-store economies (Huang *et al.*, 2019a). This decreases urban residents' and migrant populations' cost of living, especially those in urban villages and poor neighborhoods. In other words, informal economies increase consumer goods affordability for people with low income (Xue and Huang, 2008). Second, informal commerce constitutes part of the urban retail network and serves as an effective market outlet for the formal wholesale and retail industry. Third, the flexibility and easy entry of the informal economy provide additional income opportunities for low-income wage earners and urban residents and therefore enhance their consumption power (Huang *et al.*, 2018). In short, the informal economy can increase rates of consumption and thus stimulate economic growth (and, by extension, urbanization).

The secondary sector employment path represents the mechanism by which the informal economy drives urbanization by promoting the growth of employment opportunities. Three ways work here. First, given the limited availability of urban employment opportunities, the informal economy can absorb a substantial portion of surplus rural migrant labor and thus support the continuation of urbanization trends (Wan, 2008; Huang, 2017). For example, the high level of informal economic activity in the manufacturing industry of the Pearl River Delta region has absorbed a significant portion of low-skilled migrant workers. Second, the reform of state-owned enterprises since the mid-1990s has resulted in a large number of laid-off workers. Although some of these workers have found work through government reemployment projects, many of them found their means of livelihoods through the informal economic system (Ren, 2008). That is, the informal economy functions as a reservoir that can absorb redundant labor released from the formal economy. Third, the informal economy provides a channel for workers to upgrade or formalize their employment as they could accumulate financial and human capital through informal activities (Huang *et al.*, 2011). Such employment upgrading enhances their quality of life in cities.

5 Conclusions

The paper contributes to the literature on urbanization dynamics and processes in China as well as developing countries by revealing the driving effect of informal economies on urbanization and the mechanism by which this effect works. The informal economy had a positive effect on increasing the rate of urbanization in China, and every 1-percentage-point increase in the size of the informal economy led to an increase of 0.291 percentage points in the urbanization rate. Regional differences existed in the effect of informal economies on urbanization in China, which decreased in size from the eastern to the central to the western regions. These regional differences captured the inverted U-shaped relationship between the informal economy and urbanization. Specifically, before the urbanization rate reaches a given critical value (that is the apex of the curve), the informal economy should exert a stronger effect on regions with higher urbanization rates. This suggests that China is currently in the stage where the effect of the informal economy will increase with rising urbanization rate.

A multiple mediation model was constructed to identify four paths that mediate the informal economy's effects on urbanization. Our findings reveal that the informal economy drove urbanization by promoting foreign investment, fixed asset investment, employment in the secondary sector, and social consumption. In terms of their effect sizes, these paths were ranked in descending order as follows: foreign investment path > fixed asset investment path > social consumption path > secondary sector employment path. That is, foreign investment exerted the strongest mediating effect in the informal economy–urbanization causal chain followed by fixed asset investment, social consumption, and secondary sector employment. Scholars have emphasized the roles of foreign investment, industrialization, and infrastructure investment in driving China's urbanization. Our findings suggest that the informal economy plays a contributing role in these driving forces of urbanization. It is thus argued that the informal economy is inherently linked with other driving forces of urbanization and therefore constitutes a part of the driving mechanism of urbanization. However, as the causes of informal economies and the processes of urbanization vary in different countries, more empirical research is needed to contextualize the understanding of the urbanization effect of informal economies. This paper provides a theoretical and analytical framework for the exploration of such effect. It calls for studies in other developing countries that have experienced rapid urbanization to enhance the theorization of informal urbanization.

This study offers two policy implications for China's urbanization. First, the informal economy should not be viewed as a negative thing but as a positive factor that contributes to urbanization. In 2020, China began opening up the street-stall economy and supporting the small-store economy in response to employment pressures caused by the COVID-19 pandemic. This affirms the role played by the informal economy in ensuring socioeconomic stability within the short term. Our findings present theoretical support for this policy. Nevertheless, given the importance of the informal economy in urbanization, it is necessary to construct policies from a long-term perspective that maximizes its advantages and positive effects, rather than only treating it as a temporary measure in times of crisis. In light of the experiences of developed countries, it is evident that the informal economy will never disappear completely. For instance, the current shares of informal employment in the United States, Britain, Germany, France, and Japan are 18.6%, 13.6%, 10.2%, 9.8% and 18.7%,

respectively (ILO, 2018). This suggests that the informal economy in China will not vanish with the modernization process but will exist in new forms with economic change. Thus, even when China enters the latter stages of urbanization in the future, it will still have to face policy issues concerning the informal economy.

Second, different policy priorities should be adopted according to the levels of urbanization in different regions. The informal economy is characterized by different sizes and effects at different stages of urbanization. In less urbanized and economically underdeveloped regions, policies should focus on providing aid and support to the informal economy in order to secure stability of the urbanization process. In more urbanized and economically developed regions, policies should place greater emphasis on the quality of urbanization for informal workers. Although the informal economy provides a means of livelihood for a sizeable portion of migrant workers, it is fraught with problems such as income instability and lack of social security. Therefore, it is essential to improve the quality of employment for informal workers and facilitate their attainment of citizenship. This is an important goal of new-type urbanization in China and a policy focus of the UN's 2030 Sustainable Development Goals. Research is needed to examine the ways informal workers achieve social upgrading and the role of the state in facilitating such social upgrading. Policy responses from long-term and dynamic perspectives are needed to address the issue of the informal economy and strengthen its role in sustaining urbanization and social sustainability.

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