Urban development, excessive entry of firms and wage inequality in developing countries

Hamid Beladi1 | Chi-Chur Chao2 | Mong Shan Ee3 | Daniel Hollas1

1College of Business, University of Texas at San Antonio, San Antonio, Texas
2Department of Economics, Faculty of Business and Law, Deakin University, Burwood, Victoria, Australia
3Department of Finance, Faculty of Business and Law, Deakin University, Burwood, Victoria, Australia

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1 | INTRODUCTION

Urbanisation refers to a population influx from rural areas to urban cities to seek better opportunities. Urbanisation has been an unavoidable trend in both developed and developing economies. In 2015, 81.6% of the US population lived in cities, with an annual growth of 1.02%, while urban population accounted for 55.6% in China, with a 3.05% annual rate of urbanisation.1 In 2012, the United Nations forecasts that by 2050, the level of urbanisation for developed and developing countries would reach 85.9% and 64.1%, respectively.2

In developing countries, urbanisation is necessary for economic development and is almost synonymous to modernisation. Harris and Todaro (H-T) (1970) developed a dual structure model for a developing economy in which the modern urban manufacturing sector is much more advanced than the traditional rural agricultural sector. In H-T’s model, urban workers receive an institutionally set minimum wage rate that exceeds the market-determined wage rate in the rural sector. Thus, by shifting rural workers to urban, highly productive jobs, urbanisation can increase production efficiency and hence national income (cf. Restuccia & Rogerson, 2013). This theory has been used to explain the economic advances made in some Western developed countries.

However, critics of the above theory view urbanisation less favourably, for the following reasons:

1. Urbanisation results in urban unemployment, which can cause social problems that are detrimental to the economic welfare of society.
2. Urbanisation via urban development policies benefits urban firms at the expense of the rural sector. This has a negative effect on rural workers.

1See “The World Factbook” by Central Intelligence Agency. Retrieved 29 March 2016.
2See “Urban life: Open-air computers.” The Economist. 27 October 2012.
3. Urbanisation might attract new firms to the urban sector, leading to excessive entry of firms. This can lead to a higher demand for skilled labour and capital, which improves their returns relative to the returns to unskilled labour.

Thus, urbanisation can reduce the overall social welfare in the short term if the cost of urban unemployment exceeds the benefits of production efficiency. Additionally, in the long term, urbanisation can widen the wage gap between urban skilled labour and rural unskilled labour from excessive entry of firms in the urban sector.

The issues related to urbanisation and urban development policies in developing economies are widely covered in the literature on the subject. Using a Heckscher-Ohlin framework with sectoral mobile labour and capital as production inputs, Khan (1980a) finds that the economy can benefit from providing subsidies to labour and capital. However, the issue of wage inequality is not addressed in his model because labour is assumed to be homogenous. With regard to production subsidies, Beladi and Marjit (1996) find that in a vertically linked H-T model, a reduction in tariffs on urban goods can reduce capital costs and hence reduce urban unemployment. Conversely, Chang, Kaltanic, and Loayza (2009) claim that in the urban sector, a reduction in tariffs improves production efficiency but worsens unemployment in an H-T model that has labour as the only production input. Further, the above studies assume perfect competition in the urban sector. Nonetheless, in reality, imperfect competition prevails in the urban manufacturing sector in both developed economies and developing countries.

Urbanisation can expand firm production because of improved scale economies (Krugman, 1984), as well as attract new firms to the urban sector. However, favourable urban development policies may lead to excessive entry of urban firms (cf. Mankiw & Whinston, 1986), which may increase the demand for capital and skilled labour and hence raise their returns, thereby widening the gap between skilled and unskilled labours' returns. The effect of urbanisation on wage inequality has been discussed in Kuznets (1955), which indicates urbanisation as one of the forces that may lead to income inequality following an inverted-U shape along the development process.

The main contribution of this paper is to study the impact of urbanisation on income inequality in a developing economy. Our focus is on the effects of government urban development policies on the structural transformation of the economy, particularly on shifting rural workers to urban, highly productive jobs. In addition, not only the labour can shift from rural to urban sectors but firms can also enter. To this end, we connect the urbanisation-excessive entry argument to the distortion literature by Bhagwati (1971). Specifically, based on the existence of the institutionally set minimum urban wage, we suggest the possibility of a second-best policy prescription, such as subsidies to urban production, to tackle monopoly and unemployment distortions, along with free mobility of production factors, such as capital, which is in the national interest of social welfare.

This study demonstrates empirically that the implementation of favourable urban development policies may widen the income inequality gap via the firm dynamics channel. Thus, our study differs from, but also is complementary to, the past literature examining the relationship between urbanisation and income inequality, which has documented mixed results. For example, Wheeler (2001) reports an average 2.7% increase in a worker's hourly wage in the metropolitan area of United States relative to the non-metropolitan area when the population in metropolitan areas doubles, while using census and surveys data, Baum-Snow and Pavan (2013) demonstrate a positive relationship between city size and income inequality in the United States. Focusing on China, Cai, Chen, and Zhou (2010) find that urbanisation is a factor that accounts for the increase in income
inequality in urban China. Su, Liu, Chang, and Jiang (2015) conclude that urbanisation Granger causes the urban–rural income gap in China, with negative impact observed in provinces such as Tianjin, Hebei, Shanghai, Jiangsu, Shandong, Henan and Gansu, while provinces such as Fujian, Anhui and Sichuan experiencing positive impact.

Using the survey data of four countries (China, India, Indonesia and the Philippines), Kanbur and Zhuang (2013) show that urbanisation has reduced income inequality in China, although its impact has been negligible. Kanbur and Zhuang (2013) also find that urbanisation has widened the income inequality gap in India, Indonesia and the Philippines. In their study of eight selected Middle East and North Africa (MENA) countries, Acar and Dogruel (2012) do not find a statistically significant relationship between urbanisation and income inequality. As one of the control variables for their cross-countries study on the financial sector policies and income inequality, Johansson and Wang (2014) show that urbanisation has no impact (or a negative impact) on income inequality.

In this paper, using a sample based on 53 middle and low-income countries, we empirically investigate the theoretical predictions and implications derived in the model regarding both the positive direct and indirect effects of urbanisation on income inequality. In particular, we find that when the sample is limited to lower-middle and low-income countries, our empirical results provide support for the theoretical predictions of both short-run and long-run impacts of urbanisation on income equality. Furthermore, our results show that income inequality can be underestimated substantially by at least 13% if the positive indirect effect of firm dynamics is not taken into account.

This paper is organised as follows. Section 2 establishes a model for a dual developing economy in which urban development policies, such as freer mobility of domestic workers and foreign capital, as well as output subsidies, are offered to the urban manufacturing sector. Section 3 examines the short and long-term effects of urbanisation via favourable urban development policies on income distribution and welfare of the economy. Section 4 suggests a subsidy policy on rural agriculture to complement urban development policies. Section 5 describes our empirical methodology and then discusses the results from our regression models. Section 6 provides our conclusions.

2 | THE MODEL

We examine urbanisation via urban development in a dual developing economy, which consists of an urban manufacturing and a rural agricultural sector: The former produces good $X$ by $n$ monopolistic firms and the latter produces good $Y$ in a competitive market. Production of both goods requires unskilled labour and capital, while fixed inputs (and hence fixed cost) involving skilled labour and capital are needed for the production of the manufacturing good $X$. The existence of fixed cost is a prerequisite for imperfect competition in the urban manufacturing sector. Choosing good $Y$ as the numeraire, the price of the manufacturing good $X$ is denoted by $p$.

For the demand side of the economy, consumers demand for both urban and rural goods, represented by $D_X$ and $D_Y$, with a quasi-linear utility function: $U(D_X, D_Y) = u(D_X) + D_Y$, where $u' > 0$ and $u'' < 0$. Utility maximisation, subject to the budget constraint, $I_A = pD_X + D_Y - T$, gives the (inverse) demand function for the manufacturing good $X$: $p = p(D_X)$ with $p_X (= \partial p/\partial D_X) < 0$, where $I_A$ denotes after-tax income and $T$ is the lump-sum tax. Due to quasi-linear preference, the income effect falls entirely on the demand for good $Y$ and the indirect utility function is given by:
\( V = V(p, I_A) \), with \( V_p = -D_X \) and \( V_I = 1 \) by the envelope theorem.\(^3\) For the goods market equilibrium, demand for the manufacturing good \( X \) is equal to its supply in the economy; that is, \( D_X = X \). There are \( n \) firms in the urban manufacturing sector with \( X = \sum x_i \), where \( x_i \) denotes the output of the \( i \)th urban manufacturing firm.

On the supply side of the economy, by employing unskilled labour \( (L_I) \) and capital \( (K_Y) \), the rural sector produces good \( Y \) with a constant returns-to-scale production function: \( Y = Y(L_Y, K_Y) \). The corresponding unit cost of producing good \( Y \) is \( g(w_R, r) \), where \( w_R \) denotes the rural unskilled wage rate and \( r \) is the capital rental rate. The demands for unskilled labour and capital in the rural sector \( Y \) are, respectively, expressed by: \( L_Y = g_s(w_R, r)Y \) and \( K_Y = g_r(w_R, r)Y \), where the subscript represents the partial derivative. Assuming that the rural good market is perfectly competitive, in equilibrium, zero profit prevails:

\[
g(W_R, r) = 1, \tag{1}
\]

where the price of good \( Y \) is normalised to unity. Note that the rural unskilled wage rate \( w_R \) is flexible and endogenously determined.

For the production of the manufacturing good \( X \), there are \( n \) firms in the urban sector and each firm produces quantity \( x \) under an increasing returns-to-scale technology, in which fixed and variable costs are incurred. The fixed cost, \( F(w_S, r) \), comes from the wage payment of skilled labour, and the rental cost of capital with \( w_S \) denotes the skilled wage rate. The variable cost is associated with the payment to production factors of unskilled labour and capital input with unit variable cost \( m(w_U, r) \), where \( w_U \) denotes the urban unskilled wage rate. The total cost for an urban manufacturing firm to produce quantity \( x \) is therefore: \( C(w_S, w_U, r, x) = F(w_S, r) + m(w_U, r)x \). Using the envelope property, the employment of skilled and unskilled labour for each firm in the urban sector are given, respectively, by \( l_s = F_s(w_S, r) \) and \( l_x = m_s(w_U, r)x \). The use of capital is \( k_x = F_r(w_S, r) + m_r(w_U, r)x \). The subsidy-included profit of an individual firm is therefore: \( \pi = p(X)x - C(w_U, w_S, r, x) + sx \), where \( s \) is a per unit subsidy to the urban manufacturing firms. Note that the subsidy is financed by a tax imposed on consumers. Profit maximisation of each firm in the urban sector yields the equality of marginal revenue to marginal cost:

\[
p(X) + p_X(x)x = m(w_U, r) - s. \tag{2}
\]

Note that Cournot quantity competition (output adjustment) among urban firms is assumed in deriving this first-order profit-maximisation condition. By imposing a symmetry condition, we have \( X = nx \), where \( x \) denotes the output per manufacturing firm.

We turn next to the factor markets. As noted by Harris and Todaro (1970), the dual developing economy is unevenly developed: the urban manufacturing sector is more advanced than the rural agricultural sector, with an institutionally set minimum wage for unskilled labour, \( w_U \), which is higher than the market-determined rural wage rate, \( w_R \). Due to the set minimum wage, urban

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\(^3\)The purpose of this paper is to study the effects of urban development on wage inequality in a developing economy. A general-equilibrium analysis is therefore necessary to examine the interplay and linkage between goods and factor markets. Following the Harris-Todaro (1970) model for a developing economy, we consider a two-sector dual economy with urban and rural sectors. We depart from their competitive framework by allowing imperfect competition in the urban sector, in which firm entry/exit can be analysed. To make the monopolistic sector tractable, the literature follows the seminal papers of Dixit (1979), Singh and Vives (1984) and Brander and Spencer (1985) by considering quasi-linear preference, in which the income effect falls on the competitive numeraire good. Nonetheless, this assumption is not too stringent. For example, in many developing countries, the rural sector provides tourism services. It is observed that rural tourism has increased as income rises.
unemployment ($L_U$) exists. However, the higher urban wage attracts rural workers to migrate to the urban sector with a probability of $1/(1 + \mu)$ to be employed, where $\mu (= L_U/L_X)$ is a measure of the urban unemployment ratio and $L_X$ denotes the employment in the urban sector (i.e., $L_X = nL$). Rural–urban migration stops when the perceived urban wage rate equals the rural wage rate:

$$\frac{aw_U}{1 + \mu} = w_R,$$

where $a < 1$, a discounting factor to capture relevant migration costs, such as reallocation costs and policy barriers (such as the hukou system in China). Note that in the original H-T model (1970), the expected urban wage rate is $w_U/(1 + \mu)$. In Equation 3, an increase in $a$ signifies a reduction in migration costs or a relaxation in migration controls. Using $\mu = L_U/L_X$, we can rewrite Equation 3 as $aw_U L_X = w_R(L_X + L_U)$, which is a rectangular hyperbola depicted in the northeast quadrant in Figure 1, called the Harris-Todaro curve by Corden and Findlay (1975), in which the horizontal distance measures the endowment of unskilled labour in the economy.

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4Due to the hukou system, non-native workers are unable to receive equal benefits compared to native residents in many major cities of China. For example, migrant workers have unequal treatment in using public services or not allowed to purchase home properties in Beijing, Shanghai, Guangzhou and Shenzhen. Therefore, $(1-a)w_U$ captures migration costs. In addition, Pi and Zhang (2016) point out that the wage rate of migrants is usually lower than that of urban workers. See Bond, Riezman, and Wang (2016) for a theoretical study regarding the hukou barrier on economic development in China. Note that according to Equation (3), the average wage rate of unskilled workers is the same as the rural wage rate $w_R$.

5See Neary (1981).
For the factor markets, the market-clearing conditions of skilled labour, unskilled labour and capital are required by:

\[ nF_w(w_S, r) = L_S, \]  
\[ (1 + \mu)n m_w(w_U, r)x + g_w(w_R, r)Y = L, \]  
\[ n[F_r(w_S, r) + m_r(w_U, r)x] + g_r(w_R, r)Y = K + K^*, \]

where \( L_S, L \) and \( K \) denote, respectively, the exogenous supplies of skilled labour, unskilled labour and domestic capital in the economy. Note that \( K^* \) is the inflow of foreign capital, which can express technical progress in developing economies. In Equation 4, full employment prevails in the market of skilled labour, which determines its wage rate \( w_S \), with \( w_s > w_U > w_R \).

To complete the set up of the model, the number of urban manufacturing firms \( n \) needs to be considered. It is fixed in the short term, while in the long term, firms can freely enter into or exit from the urban manufacturing until zero profit is reached:

\[ p(X)x - F(w_S, r) - m(w_U, r)x + sx = 0. \]

The model specified in Equations (1)–(7) describes the dual structure of a developing economy, in which Equations (1)–(6) determine six unknowns, \( w_R, w_S, r, \mu, x \) and \( Y \), in the short term with a fixed number of urban firms \( n \), while in the long term, the number of urban firms \( n \) is determined by the entry/exit condition given in Equation (7). The exogenous variables in the model include urban development policy variables, namely, urban migration access \( \alpha \), urban production subsidy \( s \) and foreign capital quota \( K^* \). We use this framework to examine the short- and long-term impacts of urban development policies on wage inequality and social welfare in the developing economy.

3 | URBANISATION, WAGE INEQUALITY AND SOCIAL WELFARE

We start with a discussion of factor returns in both the rural and urban sectors. Changes in capital rentals affect the costs of production and hence outputs. This consequently influences the wage rates of skilled and unskilled labour in the economy. For the rural sector, the relationship between the capital rental and unskilled wage rate can be obtained by totally differentiating Equation (1) to have the following:

\[ \hat{w}_R = -(\theta_{KY}/\theta_{LY})\hat{r}, \]

where \( \theta_{jY} \) represents the cost share of the \( j \)th production factor in sector \( Y \). For the given price of good \( Y \), to maintain the constant unit cost, a rise in the capital rental will yield a negative impact on the unskilled wage rate in the rural sector. This relationship is illustrated in the northwest quadrant in Figure 1.

Since the urban minimum wage \( (w_u) \) for unskilled labour is fixed, changes in the perception of urban earning levels \( (\alpha) \) and the rural unskilled wage \( (w_R) \) will affect labour migration and hence urban unemployment ratio. From Equation (3) we have the following:

\[ \hat{\mu} = [(1 + \mu)/\mu](\hat{\alpha} - \hat{w}_R). \]

Thus, an increase in urban access to migration can raise the urban unemployment ratio; this ratio will go down when the rural wage rises.
As with urban firms, a change in the capital rental rate can cause a factor substitution between capital input and skilled labour in determining the components in the fixed cost. From Equation (4) we have the following:

$$\hat{w}_S = \hat{r} + \hat{n}/\sigma_{sx}^m,$$

(10)

where $\sigma_{sx}^m$ expresses the substitution effect between skilled labour and capital in sector $X$. Due to the factor substitution effect, a positive relationship exists between the capital rental and skilled wage rate in the urban sector, as depicted in the southwest section of Figure 1. In addition, the skilled wage rate will be higher if there are more firms in the urban sector.

To obtain the above effects of urbanisation on factor returns, its output effects also need to be considered. By totally differentiating Equation 2, the change in firm output $x$ in the urban manufacturing sector is:

$$-(1 + 1/n)\hat{x} = \hat{n} + \epsilon b \theta_{ky}^m \hat{r} - \epsilon \hat{h},$$

(11)

where $b = m/p$ and $h = s/p$. Note that $\epsilon = -p/p_X$ is the price elasticity of demand for good $X$ and $\theta_{jx}^m$ represents the variable cost share of factor $j$ in producing good $x$. Therefore, from Equation (11), the urban rental rate will negatively affect the production of good $x$. It is noted that market competition will reduce firm output, while subsidy will increase production.

In addition, totally differentiating the factor markets of unskilled labour and capital in Equations (5) and (6) gives the following:

$$\begin{align*}
(1 + \mu)\lambda_{lx}^m \hat{x} + \lambda_{ly} \hat{y} &= -(1 + \mu)\lambda_{lx}^m \hat{n} - [(1 + \mu)s_{lx}^m + s_{ly}]\hat{r} + [(1 + \mu)\lambda_{lx}^m + s_{ly}]\hat{w}_r, \\
\lambda_{kx}^m \hat{x} + \lambda_{ky} \hat{y} &= \delta \hat{k}^e - \lambda_{kx}^n + (s_{kx}^m + s_{ky}^m + s_{ky})\hat{r} - s_{ky} \hat{w}_r - s_{kx}^m \hat{w}_s,
\end{align*}$$

(12)

\(13\)

where $\lambda_{jx}^m$ and $\lambda_{jy}$ are, respectively, the allocative shares of variable factor $j$ in sectors $X$ and $Y$. Note that $\delta = K^y/(K + K^y)$ is the share of foreign capital in total capital available in the economy. Production of goods $x$ and $Y$ will be further adjusted through the changes in wage rates and capital rentals, as indicated in Equations (12) and (13).

Details in the Appendix show that for stability, the urban manufacturing sector $X$ is required to be capital intensive relative to the agricultural sector $Y$ in variable inputs; that is, $|\lambda_{lx}^m| = \lambda_{ky}^m \lambda_{lx}^n - (1 + \mu) \lambda_{lx}^m \lambda_{ky} > 0$. Note that as observed from the first terms on the right-hand sides of Equations 12 and 13, a more proactive set of urban development policies works to decrease the supply of unskilled labour and increase the supply of capital in the economy. According to the Rybczynski effect, this will initially increase the output of good $x$ but reduce the production of good $Y$, and the changes in outputs will be further adjusted when factor returns and the number of urban firms change.

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6 The unit fixed cost of an urban firm is $F(w_S, r_U)$, and the elasticity of factor substitution between skilled labour and capital is defined as follows: $\sigma_X^m = FF_{ww}/F_w$. Following Jones (1965, the substitution effect in demand for skilled labour is as follows: $s_{lx}^e = \sigma_X^m \theta_{kx}$, where $\theta_{kx}$ is the cost share of capital in the fixed cost of sector $X$.

7 Note that $s_{ly} = \sigma_Y \theta_{ky} \lambda_{ly}$, where $\sigma_Y = gg_{wy}/g_{wy}$.

8 As shown in the Appendix, for stability of the model, the urban manufacturing sector is relatively capital intensive compared with the rural agricultural sector. This factor intensity condition of the H-T model is stated by Khan (1980b) and used by Chao and Yu (1992).
3.1 | Short-term effects

By taking into account capital–labour substitution and output effects, from Equations (8)–(13), we can solve for the overall effects of increases in urban access, urban production subsidy and foreign capital on the capital rental rate as follows:

\[
\hat{r}/\hat{\alpha} = -(1 + 1/n)(1 + \mu)\lambda_{KY}\theta_{LY}\lambda_{LY}^m/D < 0, \\
\hat{r}/\hat{s} = \epsilon h\theta_{LY}|\lambda^m|/D > 0, \\
\hat{r}/\hat{K}^* = -\delta(1 + 1/n)\lambda_{LY}\theta_{LY}/D < 0,
\]

where \( D = (1 + 1/n)[A + \lambda_{LY}\theta_{LY}\lambda_{LY}^m + (1 + \mu)\lambda_{KY}\theta_{LY}\lambda_{LY}^m + \theta_{LY}\lambda_{LY}^m] + \epsilon b\theta_{LY} \theta_{LY}^m|\lambda^m| > 0 \) and \( A = \lambda_{KY}\theta_{LY} + \lambda_{LY}\theta_{KY} \). Therefore, the capital rental rate will be lowered if the supply of production factors in the urban areas increases, regardless of unskilled labour or capital, but the rental rate will be higher when the production subsidy to output \( x \) is increased. This will affect the wages of unskilled and skilled labour accordingly. From Equations (8) and (10) we have the following:

\[
\hat{w}_R/\hat{\} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{\alpha}) > 0, \\
\hat{w}_R/\hat{s} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{s}) < 0, \\
\hat{w}_R/\hat{K}^* = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{K}^*) > 0,
\]

and

\[
\hat{w}_S/\hat{\alpha} = \hat{r}/\hat{\alpha} < 0, \\
\hat{w}_S/\hat{s} = \hat{r}/\hat{s} > 0, \\
\hat{w}_S/\hat{K}^* = \hat{r}/\hat{K}^* < 0.
\]

We demonstrate these changes in capital rentals, unskilled and skilled wages in Figures 2–4, in which the northeast quadrant represents the market of unskilled labour in the economy. As indicated in Equation (3), a rise in \( \alpha, s \) or \( K^* \) for favourable urban development policies raises the demand for unskilled workers \( L_X \) in the urban sector. This causes a rightward shift of the H-T migration curve, along with a downward or an upward shift of the value of marginal product curve of the agricultural sector \( (Y_L) \) by a decrease or an increase in capital to the rural sector. The capital rental rate falls, the rural wage rate rises and the urban skilled labour wage rate falls if the migration effect overrides the capital reallocation effect. This case applies to a rise in urban access \( \alpha \) in Equations (14), (17) and (20) or a rise in foreign capital \( K^* \) in Equations (16), (19) and (22), but not for a rise in production subsidy \( s \) in Equations (15), (18) and (21).

In addition, changes in the rural unskilled wage rates affect the incentive for rural–urban migration and hence the urban unemployment ratio. From Equation (9), we have the following:

\[
\hat{\mu}/\hat{\alpha} = [(1 + \mu)/\mu](1 - \hat{w}_R/\hat{\alpha}) > 0, \\
\hat{\mu}/\hat{s} = -[(1 + \mu)/\mu](\hat{w}_R/\hat{s}) > 0, \\
\hat{\mu}/\hat{K}^* = -[(1 + \mu)/\mu](\hat{w}_R/\hat{K}^*) < 0.
\]

9\( \hat{\mu}/\hat{\alpha} = [(1 + \mu)/\mu][(1 + 1/n)[A + \lambda_{LY}\theta_{LY}\lambda_{LY}^m + (1 + \mu)\lambda_{KY}\theta_{LY}\lambda_{LY}^m] + \epsilon b\theta_{LY}\theta_{LY}^m|\lambda^m|]/D > 0.\)
FIGURE 2 An increase in urban migration access $\alpha$ [Colour figure can be viewed at wileyonlinelibrary.com]

FIGURE 3 An increase in urban output subsidy $s$ [Colour figure can be viewed at wileyonlinelibrary.com]
Hence, a rise in urban access or production subsidy increases the urban unemployment ratio indicated in Equations (23) and (24) because the total capital available in the economy is given. However, an increase in foreign capital can create more urban jobs and hence lower the urban unemployment ratio in Equation (25).

By solving Equations (8)–(13), we can also obtain the output effects of the favourable urban development policies as follows:

$$\hat{x}/\hat{\alpha} = \varepsilon b \theta K_X^m \theta^m \lambda^m \lambda Y^m (1 + \mu) / D > 0,$$

$$\hat{x}/\hat{s} = \varepsilon h \{ \lambda^m Y^m (s_K^m + \theta K_X^m \lambda^m \lambda Y^m (1 + \mu) / D > 0,$$

$$\hat{x}/\hat{K}^m = \delta \varepsilon b \theta K_X^m \theta^m \lambda Y^m / D > 0.$$  

Hence, production of the urban firm responds positively to these three urban development policies. This can be also reflected in the firm’s profit:

$$d\pi/d\alpha = -[F_w (dw_s/d\alpha) + F_r (dr/d\alpha) + x_m (dr/d\alpha)] > 0,$$

$$d\pi/ds = x - [F_w (dw_s/ds) + F_r (dr/ds) + x_m (dr/ds)] > 0,$$

$$d\pi/dK^* = -[F_w (dw_s/dK^*) + F_r (dr/dK^*) + x_m (dr/dK^*)] > 0.$$  

**FIGURE 4** An increase in foreign capital $K^*$ [Colour figure can be viewed at wileyonlinelibrary.com]
Note that $d\pi/ds > 0$ in Equation (30) if the incremental gain in output exceeds the incremental loss due to higher cost of production. In this case, the subsidy $s$ promotes further entry of firms in the urban manufacturing sector.

Using the results on outputs and unemployment, we can evaluate the short-term welfare impact of urbanisation in the dual developing economy. Social welfare is represented by the indirect utility function, $V = V(p, I)$, where national income, $I$, comes from factor incomes and profits of the urban firms: $I = w_U L_X + w_R L_Y + w_S L_S + rK + n\pi$. Totally differentiating the indirect utility function and then using Equations (1)–(6), we obtain the change in social welfare for the economy:

$$dV = (1 - \alpha)w_U dL_X - K^* dr + n(p - m) dx - w_R L_X d\mu,$$

(32)

where $p - m = -xp_x - s > 0$. This welfare expression captures four distortions in the economy: imperfect rural–urban migration of unskilled labour, quota restriction on foreign capital, imperfect competition of urban firms and urban unemployment because of the set minimum wage. Under the given urban minimum wage, a possible policy design could be as follows:

$$\alpha^* = 1,$$

(33)

$$s^* = -xp_x - w_R L_X (d\mu/ds)/n(dx/ds) < -xp_x,$$

(34)

$$r^* = r^*.$$  

(35)

That is, for the developing economy, the second-best coordinated policy set is as follows: free mobility of labour domestically by letting $\alpha$ equal 1 in Equation (33), to remove the barrier of rural–urban migration, and a production subsidy to urban firms given in (34) to correct the product market distortion adjusted by urban unemployment. In addition, a complementary policy is to have perfect mobility of capital internationally until the domestic rental rate equals to the world rate in Equation (35).

In summary, we have the following short-term results on social welfare and income distribution for the economy:

**Proposition 1:** For a dual developing H-T economy, urbanisation by removing the barriers of rural–urban migration can benefit the economy by reducing wage inequality, reducing urban unemployment and raising social welfare. However, urbanisation resulting from an output subsidy to urban firms can widen wage inequality and raise urban unemployment, but it can still raise social welfare if the favourable output effect overrides the detrimental unemployment effect.

### 3.2 Excessive entry of urban firms

In the previous section, we considered the short-term case (in which the number of firms in the urban sector is exogenously given) and showed that favourable urban development policies can raise the profits of urban firms in Equations (29)–(31). This provides an incentive for new firms to enter the urban sector. Consequently, demand for capital in the urban sector rises. This raises the capital rental rate in the economy. Solving Equations (1)–(7), we obtain the following:

$$\hat{r}/\hat{n} = \theta_{LY}\{(1 + 1/n)(|\lambda| + \lambda_{LY} s^F_{XX}/s^F_{SX}) - |\lambda^n|}\}/D > 0,$$

(36)
where $|\lambda_L| > |\lambda^m|$ and $\lambda_L = \lambda_{KX\lambda_{LY}} - (1 + \mu)\lambda_{LX\lambda_{KY}} > 0$, expressing that in an average sense, the urban manufacturing sector $X$ is capital intensive relative to the rural agricultural sector $Y$. However, the rise in the capital rental rate in Equation (36) raises the production cost of good $Y$ and hence lowers its output. This lowers demand for unskilled labour, thereby reducing the wage rate in the rural sector:

$$\hat{\hat{w}}_R/\hat{\hat{n}} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{n}) < 0.$$  

This result is depicted in the southwest quadrant in Figure 5. Consequently, rural labour migrates to the urban area and the urban unemployment ratio rises as follows:

$$\hat{\mu}/\hat{n} = -[(1 + \mu)/\mu](\hat{w}_R/\hat{n}) > 0.$$  

Further, the new entry of urban firms increases the demand for skilled labour. This raises the skilled wage rate according to Equation (10):

$$\hat{w}_S/\hat{n} = \hat{r}/\hat{n} + 1/s^F_{SX} > 0.$$  

In addition, the new entry of urban firms leads to a business-stealing effect by crowding out the production of the existing urban firm and lowering its profit:

$$\hat{x}/\hat{n} = -[A + \lambda_{LY}\theta_{LY}s^m_{KX} + (1 + \mu)\lambda_{KY}(\theta_{LY}s^m_{LX} + \theta_{KY}s^m_{LY}) + \epsilon b\theta_{LY}\theta_{LY}^m(|\lambda^m| + \lambda_{LY}s^F_{KX}/s^F_{SX})]/D < 0.$$  

$$^10$$See Chao and Yu (1997).  

---

**FIGURE 5** An increase in the number of urban firms $n$ [Colour figure can be viewed at wileyonlinelibrary.com]
\[ d\pi/dn = -[F_w(dw_x/dn) + F_r(dr/dn) + xm_r(dr/dn)] < 0. \] (41)

For the welfare effect of the new entry of firms to the urban sector, we can differentiate the indirect utility function, \( V(p, I) \), to obtain the following:

\[ dV/dn = (\pi - sx) + (1 - \alpha)w_U(dL_\lambda/dn) - K^*(dr/dn) + n(p - m)(dx/dn) - w_RL_\lambda(d\mu/dn), \] (42)

where \( dx/dn < 0 \) and \( d\mu/dn > 0 \). Setting \( dV/dn = 0 \) in Equation (42) and evaluating it at the second-best urban development policy (i.e., \( \alpha = 1 \) and \( r = r^* \)), the socially optimal number of firms in the urban sector is determined at a positive level of profit \( \pi^o \):

\[ \pi^o = sx - n(p - m)(dx/dn) + w_RL_\lambda(d\mu/dn) > 0. \] (43)

This implies that owing to the business-stealing effect and the urban unemployment problem, free entry to zero profits results in too much entry relative to the socially optimal number of firms in the urban sector.\(^{11}\)

In summary, we have the following proposition for firm entry to the urban sector:

**Proposition 2:** In a dual developing H-T economy, the new entry of urban firms raises the capital rental rate of the economy. This widens wage inequality by raising the wage rate of skilled labour in the urban sector but lowering the wage rate of unskilled labour in the rural sector. Although the new entry of firms can reduce the profit of the urban firms, the optimal number of urban firms is at a level with a positive profit.

### 3.3 Long-term effects with free entry

However, in the long term, individual firms will continue to enter the urban sector until profit is reduced to zero as expressed in Equation (7). This results in excessive entry of firms (from Equation (43)), which can affect wage inequality and social welfare in the economy.\(^ {12}\)

To obtain the effect of urban development policies on firm entry to the urban sector, we totally differentiate Equation (7) to have the following:

\[ [1 + \varepsilon(1-b)\theta^F_{SX}/\hat{s}_{SX}][\hat{n}] = -(1-1/n)\hat{x} - \varepsilon[(1-b) + b\theta^m_{XX}][\hat{r}] + \varepsilon\hat{h}\hat{s}. \] (44)

Equation (44) states that the new entry by urban firms will be encouraged when the existing firm output is small, the capital cost is low and the production subsidy is high. By solving Equations (8)–(13) and (44), we can obtain the effects of urban development policies on the number of urban firms:

\[ \hat{n}/\hat{\alpha} = -\varepsilon\theta_{LY}\lambda_{KY}(1 + \mu)\lambda^m_{LY}[(1 + 1/n)(1-b) + (2/n)b\theta^m_{LY}]/\Delta > 0, \] (45)

\[ \hat{n}/\hat{s} = -\varepsilon\theta_{LY}(1-b)\lambda^m_{LY}/\Delta \geq 0, \] (46)

\(^{11}\)Note that “excessive firm entry” is defined in a similar manner to “excessive capacity,” in which the equilibrium unit cost exceeds the minimum average cost. McGuire and Ohta (2005) and Ohta and McGuire (2015) show that excessive entry can occur in an oligopolistic market for a developing economy.

\(^{12}\)Clementi and Palazzp (2016) find that firm entry and exit can amplify the effects of aggregate shocks.
\[
\hat{n}/\hat{K}^* = -\delta \varepsilon \theta_{LY} \lambda_{LY} [(1 + 1/n)(1 - b) + (2/n)b \theta^n_{LY}]/\Delta > 0,
\]

where \(\Delta < 0\) by the stability condition.\(^{13}\) Note that \(\hat{n}/\hat{s} > 0\) in Equation (46) if \(\varepsilon\) is not too large. In the long term, with free entry or exit of firms, favourable urban development policies always attract new firms to the urban sector. Nevertheless, in the presence of urban unemployment and the business-stealing effect, free entry to a level of zero profits yields excessive entry. Consequently, excessive new entry of urban firms increases the demand for skilled labour for setting up fixed cost, which in turn raises the wage rate for skilled labour and hence widens the wage gap between skilled wages and unskilled wages. We show this result below.

The long-term effect of urban development policies on the capital rental rate can be obtained from Equations (8)–(13) and (44) as follows:

\[
\dot{r}/\dot{\alpha} = \theta_{LY} \lambda_{KY} (1 + \mu) \lambda_{LY}^m [2/n + (1 + 1/n)\varepsilon(1 - b)\theta^F_{SX}/s^F_{SX}] \Delta < 0,
\]

\[
\dot{r}/\dot{s} = -\varepsilon h \theta_{LY} \{[(2/n) + \varepsilon(1 - b)\theta^F_{SX}/s^F_{SX}]|\lambda^m| + (2/n)\lambda_{LY} \theta^F_K/s^F_{SX})\}/\Delta > 0,
\]

\[
\dot{r}/\dot{K}^* = \delta \lambda_{LY} \theta_{LY} [2/n + (1 + 1/n)\varepsilon(1 - b)\theta^F_{SX}/s^F_{SX}] \Delta < 0.
\]

These give the changes in the unskilled wage rates in the rural agricultural sector:

\[
\dot{w}_R/\dot{\alpha} = -(\theta_{KY}/\theta_{LY})(\dot{r}/\dot{\alpha}) > 0,
\]

\[
\dot{w}_R/\dot{s} = -(\theta_{KY}/\theta_{LY})(\dot{r}/\dot{s}) < 0,
\]

\[
\dot{w}_R/\dot{K}^* = -(\theta_{KY}/\theta_{LY})(\dot{r}/\dot{\alpha}) > 0.
\]

Note that these long-term impacts of urban development policies on capital rental rates and rural unskilled wage rates are qualitatively the same as the ones obtained for the short-term cases.

For the long-term impact on the skilled wage rate, by using \(\dot{w}_S = \dot{r} + \hat{n}/s^F_{SX}\) in Equation (10), we have the following:

\[
\dot{w}_S/\dot{\alpha} = \dot{r}/\dot{\alpha} + (1/s^F_{SX})(\hat{n}/\dot{\alpha})
\]

\[= -\theta_{LY} \lambda_{KY} (1 + \mu) \lambda_{LY}^m [(1 + 1/n)\varepsilon(1 - b)\theta^F_{SX}/s^F_{SX} + (2/n)(eb \theta^n_{FK}/s^F_{SX} - 1)]/\Delta,
\]

\[
\dot{w}_S/\dot{s} = \dot{r}/\dot{s} + (1/s^F_{SX})(\hat{n}/\dot{s}) > 0,
\]

\[
\dot{w}_S/\dot{K}^* = \dot{r}/\dot{K}^* + (1/s^F_{SX})(\hat{n}/\dot{K}^*)
\]

\[= -\delta \theta_{LY} \lambda_{LY} [(1 + 1/n)\varepsilon(1 - b)\theta^F_K/s^F_{SX} + (2/n)(eb \theta^n_{FK}/s^F_{SX} - 1)]/\Delta.
\]

Hence, \(\dot{w}_S/\dot{\alpha} > 0\) and \(\dot{w}_S/\dot{K}^* > 0\) when \(\sigma^F_X < eb \theta^n_{FK}/\theta^F_{FK}\). That is, urban development policies, via increases in urban access, foreign capital or production subsidy, can raise skilled wage rates in the urban sector in the long term if the urban firm’s factor substitution effect involved in the fixed cost is not too large. This result is mainly due to the new entry by urban firms that raises demand for skilled labour and consequently the fixed cost for manufactured good \(X\).

We are now ready to examine the wage gap between skilled and unskilled labour in the long term. Comparing Equations (51)–(53) with Equations (54)–(56), we have the following:

\(^{13}\)See the Appendix.
\[ \hat{w}_S/\alpha - \hat{w}_R/\alpha = -\lambda_{KY}(1 + \mu)\lambda_{LY}^m[(1 + 1/n)\varepsilon(1 - b)(\theta_{LY} - \theta_{SX}^F)/s_{SX}^F + (2/n)(\varepsilon b\theta_{LY}\theta_{KX}^m/s_{SX}^F - 1)])/\Delta, \]  
\[ (57) \]

\[ \hat{w}_S/\hat{s} - \hat{w}_R/\hat{s} > 0, \]  
\[ (58) \]

\[ \hat{w}_s/\hat{\lambda} - \hat{w}_R/\hat{\lambda} = -\delta\theta_{LY}\lambda_{LY}[(1 + 1/n)\varepsilon(1 - b)(\theta_{LY} - \theta_{SX}^F)/s_{SX}^F + (2/n)(\varepsilon b\theta_{LY}\theta_{KX}^m/s_{SX}^F - 1)])/\Delta. \]  
\[ (59) \]

Hence, \( \hat{w}_S/\hat{\alpha} > \hat{w}_R/\hat{\alpha} > 0 \) in Equation (57) and \( \hat{w}_S/\hat{s} > 0 > \hat{w}_R/\hat{s} \) in Equation (58). Note that we have \( \hat{w}_S/\hat{\lambda} > \hat{w}_R/\hat{\lambda} > 0 \) in Equation (59), if \( \theta_{LY} > \theta_{SX}^F \) and \( \theta_{KX}^m < eb\theta_{LY}\theta_{KX}^m/\theta_{KX}^F \).

We have the following proposition:

**Proposition 3:** For a dual developing H-T economy, free entry of firms in the urban sector results in excessive entry of firms. Due to the excessive entry effect, urbanisation via favourable urban development policies can widen the wage gap between urban skilled labour and rural unskilled labour.

### 4 | COMPLEMENTARY POLICY

As shown above, development policies favourable to the urban sector could lead to excessive entry of new urban firms and hence worsen wage inequality in the long term. To avoid this problem of unbalanced development in the economy, a complementary policy for helping the rural agricultural sector can be considered.\(^{14}\) In this section, we examine the income distributional issue of a production subsidy to the rural agricultural sector.

Letting \( z \) denotes a per unit subsidy to the production of good \( Y \), the equilibrium condition for a firm in sector \( Y \) stated in Equation 1 can be modified as follows:

\[ g(w_R, r) = 1 + z. \]  
\[ (60) \]

Note that the subsidy is financed by a tax on consumers. Totally differentiating Equation (60) and expressing the variables in percentage change, we have the following:

\[ \theta_{LY}\hat{w}_R + \theta_{KY}\hat{r} = \tau\hat{z}, \]  
\[ (61) \]

where \( \tau = z/(1 + z) \). As illustrated in the northwest quadrant of Figure 6, an increase in agricultural subsidy \( z \) shifts the agricultural unit cost curve outwards.

In the short term with fixed number of urban firms, we can solve Equation (61) together with Equations (9)–(13) to obtain the following:

\[ \hat{r}/\hat{z} = \tau(1 + 1/n)[\lambda_{LY}s_{KY} + \lambda_{KY}[s_{LY} + (1 + \mu)\lambda_{LY}^m]]/D > 0, \]  
\[ (62) \]

\[ \hat{w}_R/\hat{z} = \tau(1 + 1/n)[\lambda_{LY}(s_{KY} + s_{KX}^m)] + \lambda_{KY}[s_{LY} + (1 + \mu)s_{LY}^m] + eb\theta_{KX}^m/\lambda_{KX}^m]/D > 0, \]  
\[ (63) \]

\[ \hat{w}_S/\hat{z} = \hat{r}/\hat{z} > 0. \]  
\[ (64) \]

\(^{14}\)See Chang et al. (2009) for a discussion of the role of policy complementarities.
Hence, the rural agricultural sector benefits at the expense of the urban manufacturing sector, as indicated by an inward shift of the H-T migration equilibrium curve in the northeast quadrant of Figure 6. Consequently, both rural wage and capital rental rise in Equations (62) and (63). Urban firms then substitute skilled labour for capital involved in fixed cost. This causes an increase in skilled wages in Equation (64). However, the higher capital rental and skilled wage reduce the profits of the urban firm:

\[ \frac{d\pi}{dz} = \frac{dz}{C_0} \left( \frac{f_w(dw_s/dz) + \lambda m_r(dr/dr)}{C_1} + \lambda x_m(r/dz) \right) < 0. \]  

(65)

This incentivises urban firms exit from the urban sector in the long term, which can be seen by solving Equations (63) and (9)–(13), to obtain the following:

\[ \hat{n}/z = \tau[(1 + 1/n)\epsilon(1 - b) + (2/n)\epsilon b \theta_{KX}^m \{\lambda_{LY}s_{KY} + \lambda_{KY}[s_{LY} + (1 + \mu)\lambda_{LY}^m]\}] \Delta < 0. \]  

(66)

In addition, we can solve for the long-term effects of an agricultural subsidy on the capital rental and unskilled wage as follows:\(^{15}\)

\[ \hat{r}/z = -\tau[2/n + \epsilon(1 - b)\theta_{SX}^m / s_{SX}^E \{\lambda_{LY}s_{KY} + \lambda_{KY}[s_{LY} + (1 + \mu)\lambda_{LY}^m]\}] / \Delta > 0, \]  

(67)

\[ \hat{w}_R/z = \tau / \theta_{LY} - (\theta_{KY}/\theta_{LY}) (\hat{r}/z) > 0. \]  

(68)

\(^{15}\)In the long term, we can obtain the following: \( \hat{w}_R/z = -\tau / \Delta \left( (2/n)B + \epsilon b \theta_{KX}^m \lambda_{LY}s_{KY}/s_{SX}^E \right) + \epsilon(1 - b)(1 + 1/n) \left[ \lambda_{LY}s_{KY}^2 / s_{SX}^E + B(\theta_{SX}^m / s_{SX}^E) \right], \) where \( B = A + \lambda_{LY}s_{KY}^2 + \lambda_{KY}(1 + \mu) s_{LY}^2 + \epsilon b \theta_{KX}^m / s_{SX}^E. \)
Since the agricultural subsidy increases the price of good $Y$, this benefits the production factors of capital and unskilled labour. Using Equation (10), we can obtain the long-term effects on the skilled wage rate in the urban sector:

$$\hat{w}_S/\hat{z} = \hat{r}/\hat{z} + (1/s_{SX}^F)(\hat{n}/\hat{z})$$

$$= (\tau/\Delta)\left[e(1-b)\theta^m_{KX}/s_{SX}^F + (2/n)(\epsilon b \theta^m_{KX}/s_{SX}^F - 1)\right][A + \lambda_{KY}(1 + \mu)\lambda_{LX}].$$

(69)

Thus, $\hat{w}_S/\hat{z} < 0$ when $\sigma^F_x < \epsilon b \theta^m_{KX}/\theta^*_{KX}$. That is, an agricultural subsidy can narrow the wage gap in the long term if $\sigma^F_x$ is not too large.

We have the following proposition:

**Proposition 4:** For a dual developing H-T economy, urbanisation, accompanied by a subsidy to rural agriculture, might balance the wages between skilled and unskilled labour in the economy.

## 5 EMPIRICAL ANALYSIS

In this section, we empirically evaluate the two main theoretical propositions: Proposition 1 and Proposition 3 regarding urbanisation on wage inequality in developing countries. Following past studies (e.g., Cai et al., 2010; Kanbur & Zhuang, 2013; O'Neill, Ren, Jiang, & Dalton, 2012; Sadorsky, 2013), we use the ratio of urban population to total population as a proxy of our main independent variable, urbanisation. In our theoretical analysis, urbanisation (i.e., an increase in urban population) can be either from a rise in labour supply by reducing the migration barrier represented by $\alpha$ in Equation (3) or an increase in labour demand by subsidising urban firms expressed by $s$ in Equation (2). The theoretical results on wage inequality by urbanisation are, however, mixed because the former lowers wage inequality as predicted in Equations (17) and (20) whereas the latter raises the inequality by Equations (18) and (21).

Based on the theoretical analysis, we have the following testable hypothesis on urbanisation to wage inequality in the short run.

**Hypothesis 1:** Given the number of urban firms in the short run, a rise in urbanisation may cause

1. a fall in wage inequality if the wage effect from the reduction in migration barriers outweighs the effect from the urban output subsidy;
2. a rise in wage inequality if the wage effect the urban output subsidy outweighs the effect from the reduction in migration barriers; and
3. no impact on wage inequality if the wage effect from the urban output subsidy offsets the effect from the reduction in migration barriers.

Note that in the literature, empirical results are diverse but consistent with the theoretical prediction: Urbanisation can be associated with income inequality positively (Baum-Snow & Pavan, 2013; Cai et al., 2010; Su et al., 2015; Wheeler, 2001), negatively (Johansson & Wang, 2014; Kanbur & Zhuang, 2013; Su et al., 2015) or not at all (Johansson & Wang, 2014; Su et al., 2015).
Nonetheless, in the long run, urbanisation can attract firms to enter, and this firm-entry effect brings another channel to affect wage inequality. Thus, we have the following testable hypothesis:

**Hypothesis 2:** In the long run with free entry of firms in the urban sector, urbanisation may raise wage inequality.

To assess the two hypotheses, we collect data for wage inequality, urbanisation, firm entry and other control variables. This section first describes the data, presents the estimation strategy and then discusses the empirical results.

### 5.1 Data and measurement

To study the impact of urbanisation on wage inequality, we begin our sample selection procedure by focusing on middle and low-income countries, based on World Bank classifications by income level. We employ a data set comprising an unbalanced panel of observations from 53 developing countries (including upper-middle, lower-middle, and low-income countries) over the period 2002 to 2013. To measure wage inequality, we follow the literature by using Deininger and Squire's (1996) Gini coefficient of income distribution derived from a Lorenz curve, which is obtained from the database of *World Development Indicators, The World Bank*. A high value of the Gini coefficient indicates greater income inequality. The Gini coefficient captures not only wage income, but also capital income. Nonetheless, the return to capital moves in the same direction as the return to skilled labour, as depicted in Equation (10). Therefore, the Gini coefficient serves as a broad measure for income inequality, which can be used as the proxy for wage inequality studied in the model.

Our key independent variable, urbanisation, is defined as the ratio of urban population to total population. The data for urbanisation are obtained from the database of *World Development Indicators, The World Bank*. As for firm entry, we use the cost of starting a new business estimated by *World Bank Doing Business* as the proxy. The cost of starting a new business is expressed as the percentage of income per capita. The rationale of using the cost of starting a new business as the proxy is that the higher the firm-entry rate of an industry, the more competitive the industry becomes. Hence, more firms compete for limited resources (financial and physical) and this raises the costs of using the resources. In other words, we conjecture a positive relationship between the firm entry and the entry cost of starting a new business. From Proposition 3, we hypothesise that the firm-entry rate has an indirect positive impact on income inequality through urbanisation.

In line with other literature on the topic of income inequality, we also consider a set of control variables that may affect income inequality. Following Jaumotte, Lall, and Papageorgiou (2013) and Deyshappriya (2017), we include physical capital, FDI, and information and communications technology (ICT). Physical capital is the gross fixed capital formation as a percentage of GDP (cf., Haan & Sturm, 2017), and FDI is the logarithm of the net inflows of foreign direct investment as a share of the GDP. In addition, the logarithm of the ratio of the contribution of capital services by ICT assets to GDP is used as the proxy of ICT.

Apart for capital and technology, other control variables that affect wage inequality include real gross domestic product (GDP) per capita growth, government expenditure, financial development, inflation and trade openness. Government spending is measured by the logarithm of the government consumption expenditure as a share of the GDP. Inflation is measured by the logarithm of the growth rate of the GDP deflator. Trade openness as the proxy of trade liberalisation is expressed by the logarithm of the sum of exports and imports as a percentage of GDP. Following
the financial development literature (e.g., Beck, Demirguc-Kunt, & Levine, 2007; Beck, Levine, & Loayza, 2000; Braun & Raddatz, 2008; Levine, Loayza, & Beck, 2000), we measure the level of financial development by the logarithm of the value of credit provided to the private sector by financial intermediaries, divided by GDP. The data for most control variables are taken from the database of World Development Indicators, The World Bank, while ICT is obtained from Total Economy Database.

As recommended in the literature, we take into consideration the data availability and average the data over 3-year non-overlapping periods, to smooth short-term cyclical fluctuations. This results in up to four observations per country. We then remove countries with missing values in all four non-overlapping periods. Table 1 presents summary statistics for all variables used in the analysis. From Table 1, we observe large variations across countries in all key variables. For example, the Gini coefficient has an average value of 41.51 and ranges from 16.64 in Azerbaijan (2005–07) to 69.47 in Bhutan (2002–04). Likewise, the average value of urbanisation is 46.20% and has as its minimum 8.91% in Burundi (2002–04), while its maximum of 91.21% is observed in Argentina (2011–13). Firm-entry cost has an average value of 80.34% and ranges from 0.9% in Kazakhstan (2011–13) to 983.4% in Sierra Leone (2005–07).

### Table 1 Summary statistics

| Variables                  | Obs. | Mean   | SD   | Min.  | Max.  |
|----------------------------|------|--------|------|-------|-------|
| Gini                       | 271  | 41.51  | 9.25 | 16.64 | 69.47 |
| Urbanisation               | 436  | 46.20  | 19.05| 8.91  | 91.21 |
| Entry cost                 | 418  | 80.34  | 117.63| 0.90  | 983.40|
| GDP per capita growth      | 434  | 3.24   | 3.37 | −9.78 | 27.26 |
| Government expenditure     | 412  | 2.62   | 0.42 | 1.03  | 4.74  |
| Inflation                  | 427  | 1.91   | 0.79 | −2.41 | 4.67  |
| Trade openness             | 423  | 4.31   | 0.43 | 3.18  | 5.66  |
| FDI                        | 423  | 1.05   | 1.13 | −5.50 | 4.11  |
| Financial development      | 421  | 3.08   | 0.87 | −0.23 | 5.02  |
| Physical capital           | 413  | 22.78  | 7.98 | 5.39  | 61.18 |
| ICT                        | 206  | −1.35  | 1.10 | −6.19 | 0.64  |

Notes: All variables are averaged over a 3-year non-overlapping period and presented in percentage form. Government expenditure, inflation, openness, FDI, financial development and ICT are the logarithm value of the original variables. Obs., SD, Min. and Max. refer to observations, standard deviation, minimum and maximum.

We use the following baseline econometric specification to examine Hypothesis 1 (i.e., Proposition 1), that is, the impact of urbanisation on income inequality:

\[
INEQ_{i,t} = \alpha_0 + \alpha_1 \text{Urban}_{i,t} + \alpha_2 X_{i,t} + \gamma_t + \varphi_t + \varepsilon_{i,t},
\]

where the subscript \(i\) indicates country and subscript \(t\) indicates 3-year period. The dependent variable \(INEQ_{i,t}\) is the income inequality of country \(i\) in period \(t\) measured by the Gini coefficient. The independent variable \(\text{Urban}_{i,t}\) represents urbanisation. Note that \(X\) is a set of control variables for income inequality, consisting of physical capital, FDI and ICT, real GDP per...
capita growth rate, government expenditure, inflation, trade openness and financial development, while \( \gamma_i \) and \( \varphi_t \) are the vectors of dummy variables that account for the country and period fixed effect and \( \varepsilon_{it} \) is the error term. We employ the robust standard errors to correct for heteroscedasticity.

For Equation (70), we are concerned with the sign of the coefficient \( \alpha_1 \). A positive (or negative) \( \alpha_1 \) indicates a positive (or negative) relationship between the level of urbanisation and income inequality. In other words, income inequality increases (or decreases) as the level of urbanisation increases. Apart from the baseline specification, to examine Hypothesis 2 (i.e., Proposition 3), we allow for the impact of firm entry (proxied by entry cost) on the level of urbanisation, by introducing an interaction term for urbanisation as follows:

\[
\alpha_1 = \theta_1 + \theta_2 \text{EntryCost}_{i,t-1},
\]

where \( \text{EntryCost}_{i,t-1} \) is the one-period lag of firm-entry cost as measured by the cost of starting a business enterprise as a percentage of income per capita. Substituting (71) into (70) yields:

\[
\text{INEQ}_{it} = \alpha_0 + \theta_1 \text{Urban}_{it} + \theta_2 \text{EntryCost}_{i,t-1} \times \text{Urban}_{it} + \alpha_2 X_{it} + \gamma_i + \varphi_t + \varepsilon_{it},
\]

where \( \text{EntryCost}_{i,t-1} \times \text{Urban}_{it} \) is the interaction term for urbanisation. Note that the combined coefficient \( (\theta_1 + \theta_2 \text{EntryCost}_{i,t-1}) \) of urbanisation consists of the direct effect \( (\theta_1) \) and the indirect effect conditioned on the one-period lag entry cost \( (\theta_2 \text{EntryCost}_{i,t-1}) \) on income inequality.

5.3 | Empirical results

The results of the fixed effect regression are reported in Table 2. In column (1), which shows the results for the baseline model for full sample, the coefficient of the level of urbanisation is positive and not statistically significant at 1%, 5% and 10%. This result implies that the level of urbanisation has no impact on income inequality, which is consistent with the result obtained for one of the specifications in Johansson and Wang (2014) and the findings in Acar and Dogruel (2012) for eight selected MENA countries. This finding seems to suggest that the reduction in the barriers of rural–urban migration arisen from urbanisation might be offset by the urban output-subsidy effect, if the firm-entry channel is not taken into consideration. Note that the coefficient of physical capital, FDI and ICT are not statistically significant, implying that they have no impact on income inequality.

Column (2) shows that urbanisation has a positive and statistically significant coefficient, indicating that countries with a higher level of urbanisation tend to have high income inequality. The positive coefficient estimate of urbanisation \( \theta_1 \) measures the direct effect of the level of urbanisation on income inequality. This can be interpreted as follows: A 1% increase in the level of urbanisation is associated with a 0.54% increase in income inequality. Further, the coefficient estimate of the interaction term \( \theta_2 \) is 0.001 and statistically significant at 1%. This result indicates that the effect of urbanisation on income inequality is stronger in countries with higher firm-entry cost (or a higher firm-entry rate). In terms of the economic effect, since the average one-period lag of entry cost is 89.15%, for a 1% increase in urbanisation, income inequality increases by 0.089% \((0.001 \times 89.15\%)\). Thus, the total effect of urbanisation on income inequality is approximately equal to 0.629\% \((0.54\% + 0.089\%)\). Moreover, our results suggest that the economic effect of urbanisation on income inequality is underestimated by 14\% \((0.089/0.629\) if firm entry is not taken into account. These empirical findings appear to be consistent with Hypothesis 2 (i.e., Proposition 3).
5.4 | Income inequality and development levels

To determine whether the impact of urbanisation on income inequality differs for developing countries at different development levels, we split our full sample into two groups: (i) low and lower-middle-income countries and (ii) upper-middle-income countries. We then re-estimate Equations (70) and (72), using these two groups separately. Table 3 shows that the impact of urbanisation (with or without the firm-entry cost channel) seems to be driven by low- and lower-middle-income countries. From columns (3) and (4), we observe that the coefficients for urbanisation in Equations (70) and (72) and the interaction term are not statistically significant for the upper-middle-income country group. However, the panel results for low and lower-middle-income country group

Table 2: Direct and indirect effects of urbanisation on income inequality

| Dependent variable: Income inequality | Hypothesis 1 | Hypothesis 2 |
|--------------------------------------|-------------|-------------|
| Urbanisation                        | 0.179       | 0.54        |
|                                     | (0.163)     | (0.274)*    |
| Entry cost \((t-1) \times \text{urbanisation}\) | 0.001       | (0.0003)*** |
| GDP per capita growth                | 0.214       | 0.06        |
|                                     | (0.151)     | (0.165)     |
| Government expenditure               | -2.568      | -5.483      |
|                                     | (2.780)     | (2.116)**   |
| Inflation                            | 0.183       | 0.421       |
|                                     | (0.827)     | (0.9)       |
| Trade openness                       | -2.429      | -2.69       |
|                                     | (2.843)     | (2.413)     |
| FDI                                  | -0.410      | -0.872      |
|                                     | (0.812)     | (0.918)     |
| Financial development                | -2.890      | 1.947       |
|                                     | (1.579)*    | (1.669)     |
| Physical capital                     | -0.140      | -0.104      |
|                                     | (0.098)     | (0.097)     |
| ICT                                  | -0.449      | -0.04       |
|                                     | (0.346)     | (0.729)     |
| Constant                             | 41.17       | 31.87       |
|                                     | (10.24)***  | (19.45)     |
| Country dummies                      | Y           | Y           |
| Period dummies                       | Y           | Y           |
| \(R^2\)                              | 0.336       | 0.610       |
| Countries                            | 53          | 50          |
| Obs.                                 | 138         | 105         |

Notes: The robust standard error is reported in parentheses. *, ** and *** indicate statistical significance at 10%, 5% and 1%, respectively.
provide greater evidence of the effect of urbanisation on income inequality than those of full sample reported in Table 2. In contrast to the results for full sample in column (1) of Table 2, column (1) of Table 3 shows that the coefficient of urbanisation for the model without entry cost is now positive and statistically significant in the lower-middle-income country group. This shows that an increase in urbanisation is associated with the increase in income inequality when firm entry is not taken into account. This result appears to suggest that the output-subsidy effect might be a dominant force through which urbanisation affects income inequality.

### Table 3: Analysing the impact on income inequality at different development levels

| Dependent variable: income inequality | Low- and lower-middle-income | Upper-middle-income |
|--------------------------------------|-----------------------------|---------------------|
|                                       | (1)                         | (2)                |
| Urbanisation                         | 1.131                       | 1.651              |
|                                       | (0.47)**                    | (0.446)**          |
| Entry cost \((t-1) \times \text{urbanisation}\) | 0.002                       | 0.001              |
|                                       | (0.0004)**                  | (0.001)            |
| GDP per capita growth                 | 0.604                       | 0.082              |
|                                       | (0.138)**                   | (0.215)            |
| Government expenditure                | −1.65                       | −0.057             |
|                                       | (2.68)                      | (2.606)            |
| Inflation                             | −1.927                      | −1.954             |
|                                       | (1.377)                     | (1.576)            |
| Trade openness                        | −7.846                      | −5.38              |
|                                       | (4.953)                     | (4.521)            |
| FDI                                   | −0.293                      | −1.251             |
|                                       | (0.685)                     | (0.963)            |
| Financial development                 | 4.584                       | 6.211              |
|                                       | (2.453)*                    | (2.533)**          |
| Physical capital                      | −0.143                      | 0.216              |
|                                       | (0.044)**                   | (0.095)**          |
| ICT                                   | −0.732                      | 0.375              |
|                                       | (0.321)**                   | (1.071)            |
| Constant                              | 22.34                       | −28.15             |
|                                       | (10.61)**                   | (11.91)**          |
| Country dummies                       | Y                           | Y                  |
| Period dummies                        | Y                           | Y                  |
| \(R^2\)                               | 0.540                       | 0.839              |
| Countries                             | 28                          | 26                 |
| Obs.                                  | 62                          | 47                 |

Notes: The robust standard error is reported in parentheses. *, ** and *** indicate statistical significance at 10%, 5% and 1%, respectively. Columns (1) and (3) report the estimation results to test Hypothesis 1 while columns (2) and (4) present the ones for Hypothesis 2.
In column (2), we see that the coefficient representing the direct effect of urbanisation is 1.651, while the indirect effect via the firm-entry cost channel is 0.002. Given that the average one-period lag of firm-entry cost for low and lower-middle-income country group is 125.45%, the total effect of urbanisation on income inequality is 1.902% (1.651 + 0.002*125.45). In other words, on average, a 1% increase in urbanisation is associated with an average increase of 1.902% in income inequality in the low- and lower-middle-income country group. In addition, the underestimation of the effect of urbanisation on income inequality is 13% (0.251/1.902) if the firm-entry channel is not considered. Overall, our results for low- and lower-middle-income countries support the prediction in Hypotheses 1 and 2 (i.e., Propositions 1 and 3).

5.5 | Direct effect of firm entry on income inequality

To test the prediction in Hypothesis 2, in previous section, we do not take into account the direct impact of firm entry on income inequality in Equation (72). In this section, we now modify Equation (72) by including the direct effect of firm entry and re-estimate the models:

\[ \text{INEQ}_{i,t} = \alpha_0 + \theta_1 \text{Urban}_{i,t} + \theta_2 \text{EntryCost}_{i,t-1} \times \text{Urban}_{i,t} + \theta_3 \text{EntryCost}_{i,t-1} + \alpha_2 X_{i,t} + \gamma_i + \phi_t + \epsilon_{i,t}, \]

(73)

The regression results are provided in Table 4, and the results for regressions using Equation 73. We find that the results continue to be qualitatively similar to our main findings in Tables 2 and 3. In addition, we find that the lagged one-period entry cost has no direct impact on income inequality.

6 | CONCLUSIONS

Using a general-equilibrium framework for a dual developing economy, this paper has examined the short- and long-term effects of urbanisation, via favourable urban development policies, on income distribution and social welfare of the economy. We have found that the developing economy is characterised by an imperfectly competitive urban sector together with a perfectly competitive rural sector. Urbanisation not only shifts rural workers to urban highly productive jobs, but also expands firm production to realise benefits from scale economies. Most significantly, urbanisation attracts new firms to the urban manufacturing sector. Nevertheless, in the long term, favourable urban development policies can result in excessive entry of firms to the urban sector, which may widen the wage inequality gap between skilled and unskilled labour in the economy. This entry-amplifying effect has been confirmed empirically, especially for low and lower-middle-income countries. If the firm = entry effect is not considered, the impact of urbanisation on wage inequality could be understated by at least 13%.

We can also connect this argument to the distortion literature. Based on the existence of the institutionally set minimum urban wage, we have considered the possibility of a second-best policy prescription, such as subsidies for urban production to tackle monopoly and unemployment distortions, along with free mobility of production factors, which can help improve social welfare. Although the focus has been on the effects of government development policies on the structural transformation of the developing economy, we have argued that urbanisation, accompanied with a subsidy to rural agriculture, can balance the differences in wages for skilled and unskilled workers.

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TABLE 4 Direct effect of firm entry on income inequality

| Dependent variable: income inequality | Full sample | Low and lower-middle-income | Upper-middle-income |
|--------------------------------------|-------------|-----------------------------|---------------------|
| Urbanisation                         | 0.540* (0.281) | 1.654*** (0.446) | 0.657 (0.485) |
| Entry cost (t−1)                     | −0.006 (0.013) | −0.001 (0.010) | 1.261 (0.813) |
| Entry cost (t−1) × urbanisation      | 0.001* (0.001) | 0.002*** (0.0003) | −0.0179 (0.012) |
| GDP per capita growth                | 0.0535 (0.166) | 0.0789 (0.213) | 0.210 (0.267) |
| Government expenditure               | −5.409*** (2.117) | −0.055 (2.624) | −5.661 (4.409) |
| Inflation                            | 0.501 (0.998) | −1.934 (1.712) | 0.828 (1.272) |
| Trade openness                       | −2.506 (2.368) | −5.294 (4.707) | −6.694 (4.049) |
| FDI                                  | −0.900 (0.938) | −1.264 (1.026) | −1.300 (1.326) |
| Financial development                | 1.713 (1.545) | 6.090* (3.018) | 1.925 (3.412) |
| Physical capital                     | −0.106 (0.095) | 0.214** (0.092) | −0.172 (0.184) |
| ICT                                  | −0.057 (0.744) | 0.356 (1.162) | −0.954 (1.441) |
| Constant                             | 31.28 (20.31) | −28.27*** (11.99) | 31.76 (55.68) |
| Country dummies                      | YES         | YES                         | YES                |
| Period dummies                       | YES         | YES                         | YES                |
| R-squared                            | 0.611       | 0.839                       | 0.583              |
| Countries                            | 50          | 26                          | 24                 |
| Observations                         | 105         | 47                          | 58                 |

Notes: The robust standard error is reported in parentheses. *, ** and *** indicate statistical significance at 10%, 5% and 1%, respectively.

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APPENDIX

Letting a dot over a variable represent the time derivative (e.g., $\dot{X} = \frac{dX}{dt}$), the adjustments of the model in Equations (1), (2), (5), (6) and (7) can be approximated linearly as follows:

$$
\begin{pmatrix}
\dot{X} \\
\dot{Y} \\
\dot{w_R} \\
\dot{r} \\
\dot{n}
\end{pmatrix} = H
\begin{pmatrix}
\ddot{X} \\
\ddot{Y} \\
\ddot{w_R} \\
\ddot{r} \\
\ddot{n}
\end{pmatrix},
$$

where the $H$ matrix is:

$$
\begin{pmatrix}
-(1 + 1/n) & 0 & 0 & -\varepsilon b\theta^m_{LK} & -1 \\
0 & 0 & -\theta_{LY} & -\theta_{KY} & 0 \\
(1 + \mu)\lambda^m_{LK} & \lambda_{LY} & -[s_{LY} + (1 + \mu)\lambda^m_{LK}] & s_{LY} + (1 + \mu)s_{LK} & (1 + \mu)\lambda^m_{LY} \\
\lambda^m_{KY} & \lambda_{KY} & s_{KY} & -(s_{KY} + s_{KK}) & \lambda_{KY} + s_{KK}/s_{SX} \\
-(1 - 1/n) & 0 & 0 & -\varepsilon [(1 - b) + b\theta^m_{LK}] & -[1 + \varepsilon(1 - b)\theta^F_{SX} / s_{SX}]
\end{pmatrix}.
$$

The principal minors of the above coefficient matrix are given by the following:

$$
\Delta_1 = -(1 + 1/n) < 0,
$$

$$
\Delta_2 = 0,
$$

$$
\Delta_3 = -\lambda_{LY}\theta_{LY}(1 + 1/n) < 0,
$$

$$
\Delta_4 = D = (1 + 1/n)[A + \lambda_{LY}\theta_{LY}s^m_{KK} + (1 + \mu)\lambda_{KY}(\theta_{LY}s^m_{LK} + \theta_{KY}\lambda^m_{LK})] + \varepsilon b\theta_{LY}\theta^m_{KK}|\lambda^m| > 0,
$$

$$
\Delta_5 = \Delta.
$$

The stability condition requires that the odd principal minors are non-positive and the even principal minors are non-negative. Hence, for stability of the model, we need $|\lambda^m| > 0$ and $\Delta > 0$. 
