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URBAN DEVELOPMENT, EXCESSIVE ENTRY OF FIRMS AND WAGE INEQUALITY IN DEVELOPING COUNTRIES

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Abstract

This paper examines the short- and long-term effects of urbanization, via favorable urban development policies, on income distribution and social welfare for a developing country. The urban manufacturing sector is characterized by imperfect competition and free entry. Urbanization shifts rural workers to the highly productive urban sector, while causing production in urban firms to expand because of scale economies. However, urbanization may worsen wage inequality between skilled and unskilled labor in the short term. In the long term, urbanization can attract new firms to the urban sector, and favorable urban development policies may result in excessive entry of firms, which can amplify wage inequality in the economy. This entry-amplifying effect is confirmed empirically, especially for low- and lower-middle-income countries. If the entry effect is not considered, the impact of urbanization on wage inequality could be understated by 18% for low- and lower-middle-income countries.

JEL Classification: J31, R23, R58

Contents

1. INTRODUCTION

Urbanization refers to a population influx from rural to urban areas to seek better opportunities, an unavoidable trend in both developed and developing economies. In 2015, 81.6% of the United States population lived in cities, with an annual growth of 1.02%, while urban population accounted for 55.6% in the People's Republic of China (PRC), with a 3.05% annual rate of urbanization.[1] The United Nations forecasted that by 2050, levels of urbanization will reach 86.9% in the United States and 64.1% in the PRC (*The Economist* 2012).

In developing countries, urbanization is necessary for economic development and is almost synonymous with modernization. Harris and Todaro (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 agriculture sector. In their 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 highly productive urban jobs, urbanization can increase production efficiency and hence national income (Restuccia and Rogerson 2013). This theory has been used to explain the economic advances made in some developed countries.

However, critics of the above theory view urbanization less favorably, because

(i)   urbanization results in urban unemployment, which can cause social problems that are detrimental to the economic welfare of society;

(ii)   urbanization via urban development policies benefits urban firms at the expense of the rural sector, which has a negative effect on rural workers; and

(iii) urbanization may attract new firms to the urban sector, leading to excessive entry of firms and thus to a higher demand for skilled labor and capital, which improves returns of skilled labor relative to the returns to unskilled labor.

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

The issues related to urbanization and urban development policies in developing economies are widely covered in the literature on the subject. Using a Heckscher–Ohlin framework with sector mobile labor and capital as production inputs, Khan (1980a) found that the economy can benefit from providing subsidies to labor and capital. However, the issue of wage inequality was not addressed in his model, because labor is assumed to be homogenous. With regard to production subsidies, Beladi and Marjit (1996) found that in a vertically linked Harris–Todaro model, a reduction of tariffs on urban goods can reduce capital costs and thus urban unemployment. Conversely, Chang, Kaltanic, Loayza (2009) claimed that in the urban sector, a reduction of tariffs improves production efficiency but worsens unemployment in a Harris–Todaro model that has labor as the only production input. These studies all assumed perfect competition in the urban sector, but in reality, imperfect competition prevails in the urban manufacturing sector in both developed and developing countries.

Urbanization can expand firm production because of improved scale economies (Krugman 1984), as well as attract new firms to the urban sector. However, favorable

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[1] CIA. The World Factbook. https://www.cia.gov/library/publications/the-world-factbook/ (accessed 29 March 2016).

urban development policies may lead to excessive entry of urban firms (Mankiw and Whinston 1986), which may increase the demand for capital and skilled labor and hence raise their returns, thereby widening the gap between the returns of skilled and unskilled labor. The effect of urbanization on wage inequality was discussed in Kuznets (1955), which indicated urbanization as one of the forces that may lead to an inverted U-shaped pattern of income inequality.

The main contribution of this paper is to study the impact of urbanization on income inequality under the imperfect competition setting by taking firm dynamics into consideration. To this end, the urbanization–excessive-entry argument is connected to the distortions literature by Bhagwati (1971). Specifically, based on the existence of the institutionally set minimum urban wage, the possibility of a second-best policy prescription is suggested, such as subsidies to urban production, to tackle monopoly and unemployment distortions, along with free mobility of production factors, which is in the national interest of social welfare. The focus is the effects of government development policies on the structural transformation of the developing economy by shifting rural workers to highly productive urban jobs and enhancing scale economies in the urban production sector.

This paper demonstrates empirically that the implementation of favorable urban development policies may widen the income inequality gap via the channel of firm dynamics. Thus, it differs from, but also is complementary to, the past literature examining the relationship between urbanization and income inequality, which has had mixed results. For example, Wheeler (2001) reported a 2.7% increase in a worker's hourly wage in the United States when the population in metropolitan areas doubles; using census and survey data, Baum-Snow and Pavan (2013) demonstrated a positive relationship between city size and income inequality in the United States. Focusing on the PRC, Cai, Chen, Zhou (2010) found that urbanization is a factor that accounts for the increase in income inequality in urban areas. However, using the survey data of four countries, Kanbur and Zhuang (2013) showed that urbanization has reduced income inequality in the PRC, although its impact has been negligible, and has widened the income inequality gap in India, Indonesia, and the Philippines.

In their study of eight countries in the Middle East and North Africa, Acar and Dogruel (2012) did not find a statistically significant relationship between urbanization and income inequality. As a control variable for their study on financial sector policies and income inequality, Johansson and Wang (2014) showed that urbanization has no impact (or a negative impact) on income inequality.

In this paper, however, using a sample based on 106 middle- and low-income countries, the theoretical predictions and implications derived in the theoretical model regarding both the positive direct and indirect effects of urbanization on income inequality are empirically supported. The results show that income inequality can be underestimated substantially by 17.5% if the positive indirect effect of firm dynamics is not taken into account.

2. THE MODEL

Urbanization is examined via urban development policies in a dual developing economy, which consists of an urban and rural sector. The former produces a manufactured good X by n monopolistic firms, and the latter produces agricultural commodity Y in a competitive market. Production of both types of goods requires unskilled labor and capital, while fixed inputs (and hence fixed costs) involving skilled labor and capital are needed for the production of the manufacturing good X. The

existence of fixed costs is a prerequisite for the imperfect competition of urban firms. 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' demands for manufacturing and agricultural goods are represented by D_X and D_Y with a quasilinear utility function: $U(D_X, D_Y) = u(D_X) + D_Y$, where $u' > 0$ and $u'' < 0$. Utility maximization, 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 quasilinear 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. For the goods market equilibrium, demand for the manufacturing good X is equal to its supply in the economy; that is, $D_X = X$. Note that there are n firms in the urban manufacturing sector, and, by imposing a symmetry condition, $X = nx$, where x denotes the output per manufacturing firm.

On the supply side of the economy, by employing unskilled labor (L_Y) and capital (K_Y), the rural sector produces agricultural commodity Y with a constant returns-to-scale production function, so $Y = Y(L_Y, K_Y)$. 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 labor and capital in rural sector Y are respectively expressed by $L_Y = g_w(w_R, r_R)Y$ and $K_Y = g_r(w_R, r_R)Y$, where the subscript represents the partial derivative. Assuming that the rural agricultural market is perfectly competitive in equilibrium, zero profit prevails:

$$g(w_R, r) = 1 \qquad\qquad (1)$$

where the price of good Y is normalized to unity.

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 labor, 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 labor 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 $C(w_S, w_U, r, x) = F(w_S, r) + m(w_U, r)x$.

Utilizing the envelope property, the employment of skilled and unskilled labor for each firm in the urban sector is given, respectively, by $l_s = F_w(w_S, r)$ and $l_x = m_w(w_U, r)x$. 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 maximization of each firm in the urban sector yields the equality of marginal revenue to marginal cost:

$$p(X) + p_x(X)x = m(w_U, r) - s \qquad\qquad (2)$$

Note that Cournot competition (i.e., output adjustment) among urban firms is assumed in deriving this first-order profit-maximization condition.

As noted by Harris and Todaro (1970), the dual developing economy is unevenly developed, as the urban manufacturing sector is more advanced than the rural agricultural sector, with an institutionally set minimum wage for unskilled labor, w_U,

which is higher than the market-determined rural wage rate, w_R. Due to the set minimum wage, urban 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 μ ($= L_U/L_X$) is a measure of the urban unemployment ratio, and L_X denotes employment in the urban sector (i.e., $L_X = nl_x$). Rural–urban migration stops when the perceived urban wage rate equals the rural wage rate:

$$\alpha \, w_U/(1 + \mu) = w_R \tag{3}$$

where $\alpha < 1$, a discounting factor to capture relevant migration costs, such as reallocation costs and policy barriers (e.g., the *hukou* system in the PRC). Note that in the original Harris–Todaro model, the expected urban wage rate was $w_U/(1 + \mu)$.

In equation 3, an increase in α signifies a reduction in migration costs or a relaxation in migration controls.[2] Using $\mu = L_U/L_X$, equation 3 can be rewritten as $\alpha w_U L_X = w_R(L_X + L_U)$, 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 labor in the economy (Neary 1981).

Figure 1: Harris–Todaro Curve and Labor Market Equilibrium

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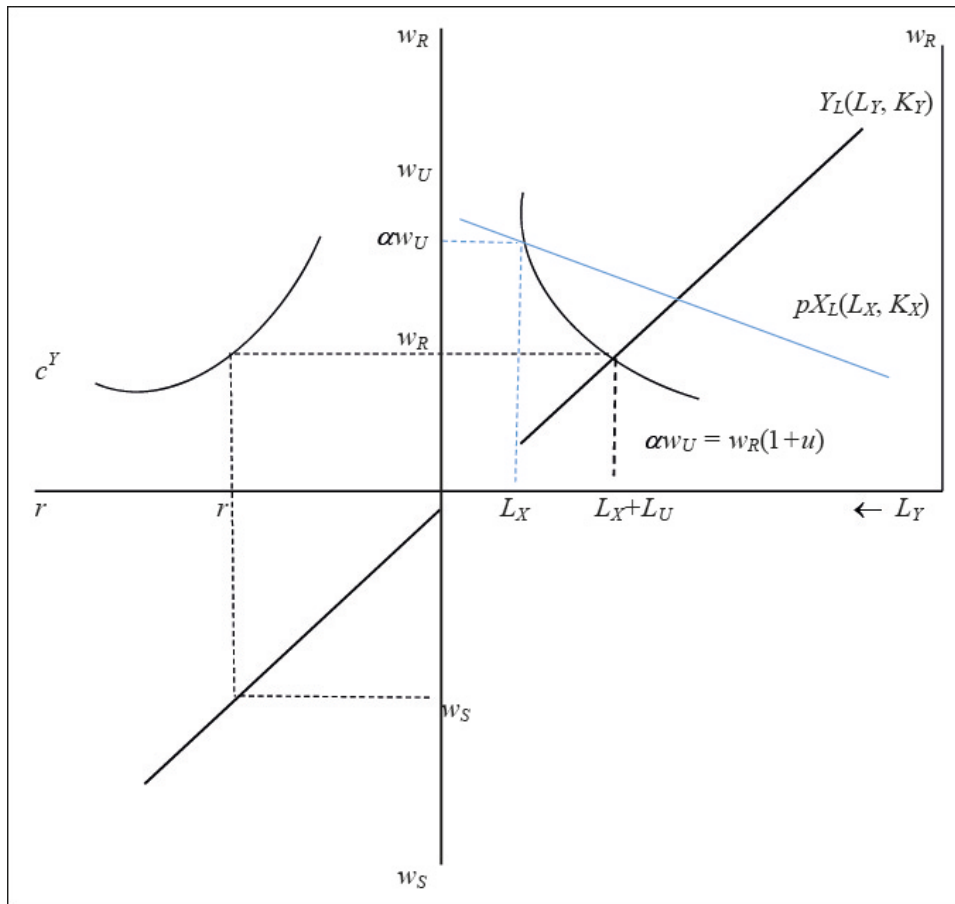
[2] For example, nonnative workers are not allowed to purchase homes without local *hukou* in many major cities, such as Beijing, Shanghai, and Shenzhen. See Bond, Riezman, Wang (2016) for a theoretical study regarding the *hukou* barrier on economic development in the PRC.

For the factor markets, the market-clearing conditions of skilled labor, unskilled labor, and capital are required by

$$nF_w(w_S, r) = L_S \tag{4}$$

$$(1 + \mu)nm_w(w_U, r)x + g_w(w_R, r)Y = L \tag{5}$$

$$n[F_r(w_S, r) + m_r(w_U, r)x] + g_r(w_R, r)Y = K + K^* \tag{6}$$

where L_S, L, and K denote, respectively, the exogenous supplies of skilled labor, unskilled labor, and domestic capital in the economy, while K^* represents the inflow of foreign capital. Note that in equation 4, full employment prevails in the market of skilled labor, which determines its wage rate w_S, with $w_s > w_U > w_R$.

To complete the setup 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 urban manufacturing until zero profit is reached.

$$p(X)x - F(w_S, r) - m(w_U, r)x + sx = 0 \tag{7}$$

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, μ, x, and Y, in the short term with a fixed number of urban firms n; 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 such as urban production subsidy s, urban migration access α, and foreign capital quota K^*. This framework can be used to examine the short- and long-term impacts of urban development policies on wage inequality and social welfare in the developing economy.

3. URBANIZATION, WAGE INEQUALITY, AND SOCIAL WELFARE

Changes in capital rentals affect the costs of production and hence outputs, influencing the wage rates of skilled and unskilled labor 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

$$\hat{w}_R = -(\theta_{KY}/\theta_{LY})\hat{r} \tag{8}$$

where θ_{jY} represents the cost share of the jth 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 of Figure 1.

Since the urban minimum wage (w_u) for unskilled labor is fixed, changes in the perception of urban earning levels (α) and the rural unskilled wage (w_R) will affect labor migration and hence the urban unemployment ratio. From equation 3,

$$\hat{\mu} = [(1 + \mu)/\mu](\hat{\alpha} - \hat{w}_R). \tag{9}$$

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 labor in determining the components in the fixed cost. From equation 4,

$$\hat{w}_S = \hat{r} + \hat{n}/s_{SX}^F \tag{10}$$

where s_{SX}^F expresses the substitution effect between skilled labor and capital in sector X.[3] 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 urbanization 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

$$-(1 + 1/n)\hat{x} = \hat{n} + \varepsilon b\, \theta_{KX}^m\, \hat{r} - \varepsilon h\hat{s} \tag{11}$$

where $b = m/p$ and $h = s/p$. Note that $\varepsilon = -p/p_x X$ is the price elasticity of demand for good x, and θ_{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 a subsidy will increase production.

In addition, totally differentiating the factor markets of unskilled labor and capital in equations 5 and 6 gives

$$(1 + \mu)\, \lambda_{LX}^m\, \hat{x} + \lambda_{LY}\hat{Y} =$$

$$-(1 + \mu)\, \lambda_{LX}^m\, \hat{\alpha} - (1 + \mu)\, \lambda_{LX}^m\, \hat{n} - [(1 + \mu)\, s_{LX}^m + s_{LY}]\hat{r} + [(1 + \mu)\, \lambda_{LX}^m + s_{LY}]\, \hat{w}_R \tag{12}$$

$$\lambda_{KX}^m\, \hat{x} + \lambda_{KY}\hat{Y} = \delta\widehat{K}^* - \lambda_{KX}\hat{n} + (s_{KX}^F + s_{KX}^m + s_{KY})\hat{r} - s_{KY}\hat{w}_R - s_{KX}^F\, \hat{w}_S \tag{13}$$

where λ_{jX}^m and λ_{jY} are, respectively, the allocative shares of variable factor j in sectors X and Y.[4] 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, $|\lambda^m| = \lambda_{KX}^m\, \lambda_{LY} - (1 + \mu)\, \lambda_{LX}^m\, \lambda_{KY} > 0.7$[5]

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[3] The unit fixed cost of an urban firm is $F(w_S, r_U)$, and the elasticity of factor substitution between skilled labor and capital is defined as $\sigma_X^F = FF_{wr}/F_wF_r$. Following Jones (1965), the substitution effect in demand for skilled labor is $s_{SX}^F = \sigma_X^F\, \theta_{KX}^F$, where θ_{KX}^F (= r_UF_r/F) is the cost share of capital in the fixed cost of sector X.

[4] Note that $s_{LY} = \sigma_Y\theta_{KY}\lambda_{LY}$, where $\sigma_Y = gg_{wr}/g_wg_r$.

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 labor and to 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.

3.1 Short-Term Effects

By taking into account capital-labor substitution and output effects from equations 8–13, the overall effects of increases in urban access, foreign capital, and production subsidy on the capital rental rate can be solved:

$$\hat{r}/\hat{\alpha} = -(1 + 1/n)(1 + \mu)\lambda_{KY}\theta_{KY}\lambda_{LX}^{m}/D < 0 \qquad (14)$$

$$\hat{r}/\widehat{K}^{*} = -\delta(1 + 1/n)\lambda_{LY}\theta_{LY}/D < 0 \qquad (15)$$

$$\hat{r}/\hat{s} = \varepsilon h\theta_{LY}|\lambda^{m}|/D > 0 \qquad (16)$$

where $D = (1 + 1/n)[A + \lambda_{LY}\theta_{LY}s_{KX}^{m} + (1 + \mu)\lambda_{KY}(\theta_{LY}s_{LX}^{m} + \theta_{KY}\lambda_{LX}^{m})] + \varepsilon b\theta_{LY}\theta_{KX}^{m}|\lambda^{m}| > 0$ and $A = \lambda_{KY}s_{LY} + \lambda_{LY}s_{KY}$. Therefore, the capital rental rate will be lowered if the supply of production factors in urban areas increases, regardless of unskilled labor 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 labor accordingly. From equations 8 and 10,

$$\hat{w}_{R}/\hat{\alpha} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{\alpha}) > 0 \qquad (17)$$

$$\hat{w}_{R}/\widehat{K}^{*} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{\alpha}) > 0 \qquad (18)$$

$$\hat{w}_{R}/\hat{s} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{s}) < 0 \qquad (19)$$

$$\hat{w}_{S}/\hat{\alpha} = \hat{r}/\hat{\alpha} < 0 \qquad (20)$$

$$\hat{w}_{S}/\widehat{K}^{*} = \hat{r}/\widehat{K}^{*} < 0 \qquad (21)$$

$$\hat{w}_{S}/\hat{s} = \hat{r}/\hat{s} > 0 \qquad (22)$$

These changes are demonstrated in capital rentals, unskilled wages, and skilled wages in Figures 2–4, in which the northeast quadrants represent the market of unskilled labor in the economy.

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[5] As shown in the Appendix, for the stability of the model, the urban manufacturing sector is relatively capital-intensive compared to the rural agricultural sector. This factor intensity condition of the Harris–Todaro model was stated by Khan (1980b) and used by Chao and Yu (1992).

Figure 2: Increase in Urban Migration Access α
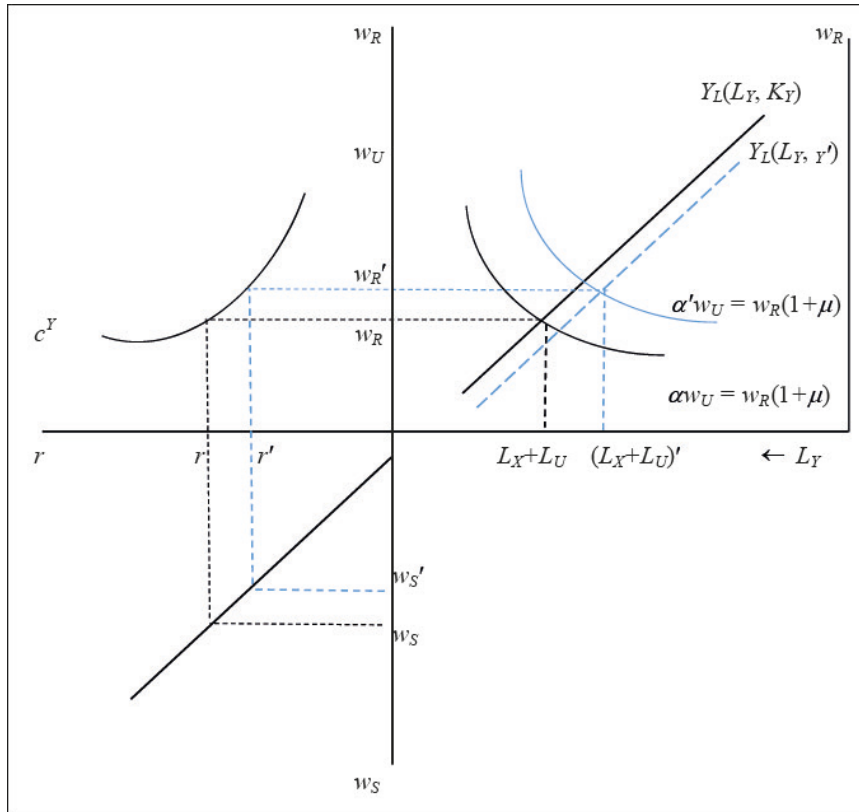
Figure 3: Increase in Foreign Capital K^*
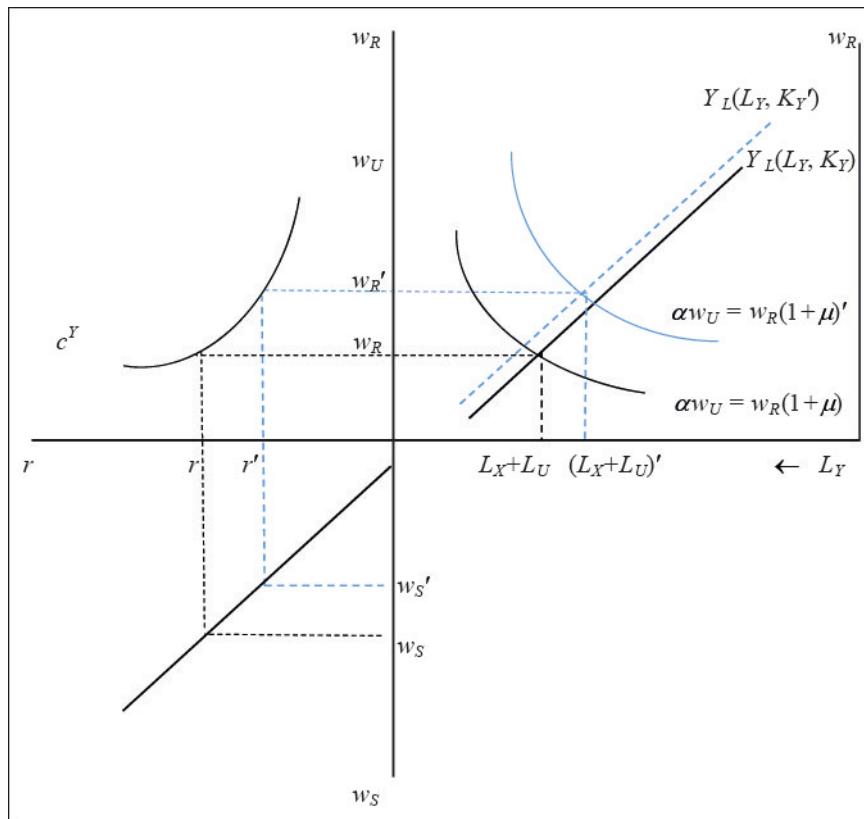
Figure 4: Increase in Urban Output Subsidy *s*
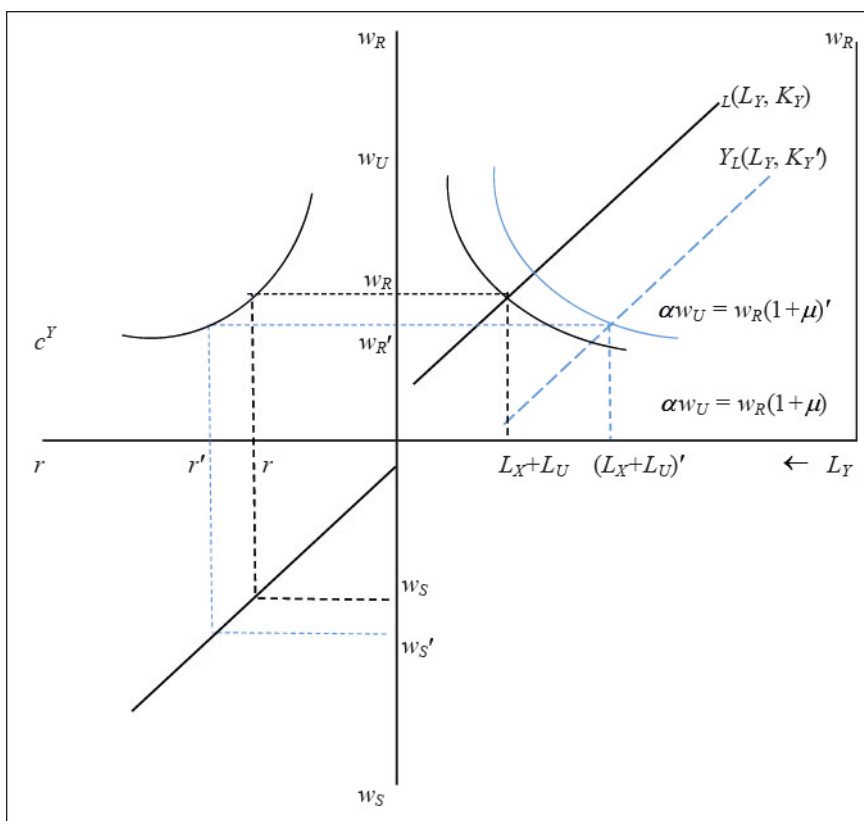
As indicated in equation 3, a rise in α, K^* or s for favorable urban development policies raises the demand for unskilled workers L_X in the urban sector. This causes a rightward shift of the Harris–Todaro migration curve, along with a downward or upward shift of the value-of-marginal-product curve of the agricultural sector (Y_L) by a decrease or increase in capital to the rural sector. The capital rental rate falls, rural wage rate rises, and urban skilled labor wage rate falls if the migration effect overrides the capital reallocation effect. This case applies to a rise in urban access α in equations 14, 17, and 20, or a rise in foreign capital K^* in equations 15, 18, and 21, but not for a rise in production subsidy s in equations 16, 19, and 22.

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,[6]

$$\hat{\mu}\,/\hat{\alpha} = [(1 +\mu)/\mu](1 - \hat{w}_R\,/\hat{\alpha}) > 0 \tag{23}$$

$$\hat{\mu}\,/\widehat{K^*} = -[(1 +\mu)/\mu](\hat{w}_R\,/\widehat{K^*}) < 0 \tag{24}$$

$$\hat{\mu}\,/\hat{s} = -[(1 +\mu)/\mu](\hat{w}_R\,/\hat{s}) > 0 \tag{25}$$

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[6] $\hat{\mu}\,/\hat{\alpha} = [(1 + \mu)/\mu]\{(1 + 1/n)[A + \lambda_{LY}\theta_{LY}\,s^m_{KX} + (1 + \mu)\lambda_{KY}\theta_{LY}\,s^m_{LX}] + \varepsilon b\theta_{LY}\theta^m_{KX}\,|\lambda^m|\}/D > 0.$

A rise in urban access or production subsidy increases the urban unemployment ratio indicated in equations 23 and 25 because the total capital available in the economy is given. However, an increase in foreign capital can create more urban jobs and thus lower the urban unemployment ratio in equation 24.

By solving equations 8–13, the output effects of favorable urban development policies can also be obtained:

$$\hat{x}/\hat{\alpha} = \varepsilon b\, \theta_{KX}^{m}\, \theta_{LY}\lambda_{KY}(1 + \mu)\, \lambda_{LX}^{m}\, /D > 0 \tag{26}$$

$$\hat{x}/\hat{K}^{*} = \delta\varepsilon b\, \theta_{KX}^{m}\, \theta_{LY}\lambda_{LY}/D > 0 \tag{27}$$

$$\hat{x}/\hat{s} = \varepsilon h\{\lambda_{LY}(s_{KY} + \theta_{LY}s_{KX}^{m}) + \lambda_{KY}[s_{LY} + (1 + \mu)\, \lambda_{LX}^{m}\,]\}/D > 0 \tag{28}$$

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

$$d\pi/d\alpha = -[F_w(dw_S/d\alpha) + F_r(dr/d\alpha) + xm_r(dr/d\alpha)] > 0 \tag{29}$$

$$d\pi/dK^{*} = -[F_w(dw_S/dK^{*}) + F_r(dr/dK^{*}) + xm_r(dr/dK^{*})] > 0 \tag{30}$$

$$d\pi/ds = x - [F_w(dw_S/ds) + F_r(dr/ds) + xm_r(dr/ds)] \gtreqless 0 \tag{31}$$

Note that $d\pi/ds > 0$ in equation 31 if the incremental gain in output exceeds the incremental loss due to a higher cost of production. In this case, the subsidy s promotes further entry of firms into the urban manufacturing sector.

Using the results on outputs and unemployment, the short-term welfare impact of urbanization in the dual developing economy can be evaluated. Social welfare is represented by the indirect utility function, $V = V(p, I)$, where national income, I, comes from factor incomes and profits of 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, the change in social welfare for the economy can be obtained:

$$dV = (1 - \alpha)w_U dL_X - K^{*}dr + n(p - m)dx - w_R L_X d\mu \tag{32}$$

where $p - m = -xp_x - s > 0$. This welfare expression captures four distortions in the economy, imperfect rural–urban migration of unskilled labor, 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 can be

$$\alpha^{o} = 1 \tag{33}$$

$$r^{o} = r^{*} \tag{34}$$

$$s^{o} = -xp_x - w_R L_X(d\mu/ds)/n(dx/ds) < -xp_x \tag{35}$$

That is, for the developing economy, the second-best coordinated policy set is (i) free mobility of labor domestically by letting α equal 1 in equation 32 to remove the barrier of rural–urban migration, (ii) perfect mobility of capital internationally until the domestic rental rate is equal to the world rate in equation 34, and (iii) a production

subsidy given to urban firms to correct the product market distortion adjusted by urban unemployment.

In summary, for a dual developing Harris–Todaro economy, by removing the barriers of rural–urban migration and relaxing the quota on foreign investment, urban development can benefit the economy by reducing wage inequality, reducing urban unemployment, and raising social welfare. However, increased urban development resulting from a subsidy to urban firms can widen wage inequality and raise urban unemployment, but it can still raise social welfare if the favorable output effect overrides the detrimental unemployment effect.

3.2 Excessive Entry of Urban Firms

In the previous section, the short-term case (in which the number of firms in the urban sector is exogenously given) was considered, showing that favorable 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, raising he capital rental rate in the economy. Solving equations 1–7,

$$\hat{r}/\hat{n} = \theta_{LY}\{(1 + 1/n)(|\lambda| + \lambda_{LY}s_{KX}^{F}/s_{SX}^{F})] - |\lambda^{m}|\}/D > 0, \tag{36}$$

where $|\lambda| > |\lambda^{m}|$ and $|\lambda| = \lambda_{KX}\lambda_{LY} - (1 + \mu)\lambda_{LX}\lambda_{KY} > 0$, expressing that in an average sense,[7] the urban manufacturing sector X is capital-intensive relative to the 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 labor, thereby reducing the wage rate in the rural sector:

$$\hat{w}_{R}/\hat{n} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{n}) < 0 \tag{37}$$

This result is depicted in the southwest quadrant of Figure 5. Rural labor consequently migrates to the urban area, and the urban unemployment ratio rises:

$$\hat{\mu}/\hat{n} = -[(1 + \mu)/\mu](\hat{w}_{R}/\hat{n}) > 0 \tag{38}$$

The new entry of urban firms increases the demand for skilled labor. This raises the skilled wage rate according to equation 10:

$$\hat{w}_{S}/\hat{n} = \hat{r}/\hat{n} + 1/s_{SX}^{F} > 0 \tag{39}$$

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

$$\hat{x}/\hat{n} = -[A + \lambda_{LY}\theta_{LY}s_{KX}^{m} + (1 + \mu)\lambda_{KY}(\theta_{LY}s_{LX}^{m} + \theta_{KY}\lambda_{LX}^{m})$$

$$+ \varepsilon b\theta_{LY}\theta_{KX}^{m}(|\lambda^{m}| + \lambda_{LY}s_{KX}^{F}/s_{SX}^{F})]/D < 0, \tag{40}$$

$$d\pi/dn = -[F_{w}(dw_{S}/dn) + F_{r}(dr/dn) + xm_{r}(dr/dn)] < 0 \tag{41}$$

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[7] See Chao and Yu (1997).

Figure 5: Increase in the Number of Urban Firms *n*
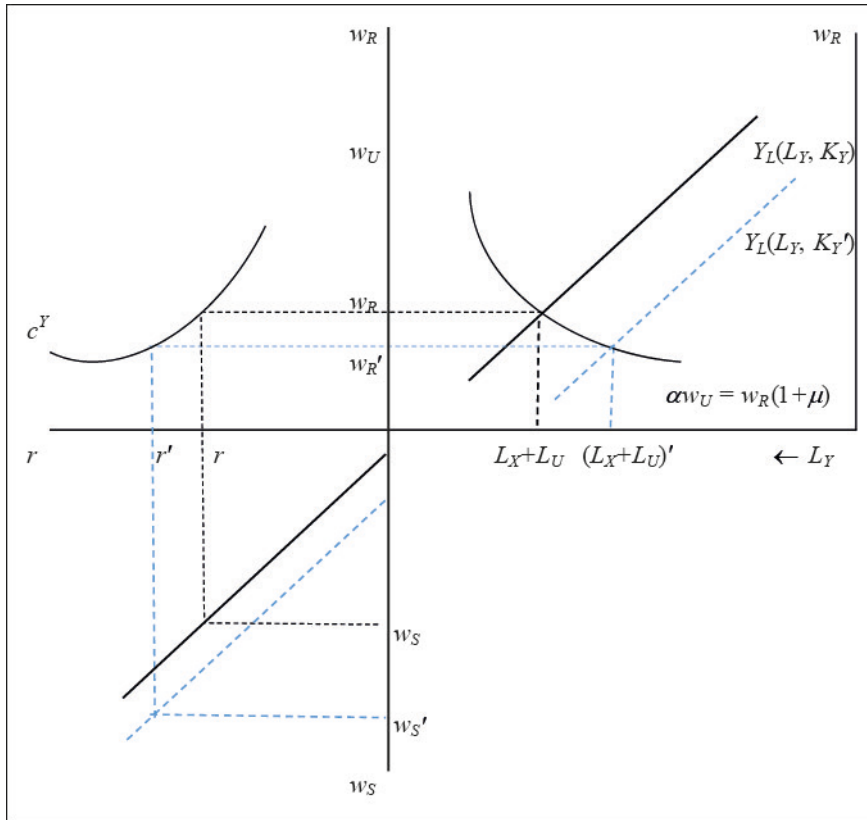
For the welfare effect of the new entry of firms to the urban sector, the indirect utility function can be differentiated, $V(p, I)$, to obtain:

$$dV/dn = (\pi - sx) + (1 - \alpha)w_U(dL_X/dn) - K^*(dr/dn)$$
$$+ n(p - m)(dx/dn) - w_R L_X(d\mu/dn) \qquad (42)$$

where $dx/dn < 0$ and $d\mu/dn > 0$. Setting $dV/dn = 0$ in equation 42 and evaluating it as 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 π^o:

$$\pi^o = sx - n(p - m)(dx/dn) + w_R L_X(d\mu/dn) > 0 \qquad (43)$$

This implies that owing to the business-stealing effect and 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.[8]

In summary, in a dual developing Harris–Todaro 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 labor in the urban sector and lowering the wage rate of unskilled labor in the rural sector. Although the new entry of firms can reduce the profit of urban firms, the optimal number of urban firms is at a level with a positive profit.

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[8] 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) showed that excessive entry can occur in an oligopolistic market for a developing economy.

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 8. This results in excessive entry of firms (from equation 43), which can affect wage inequality and social welfare in the economy.[9] To obtain the effect of urban development policies on firm entry to the urban sector, equation 8 is totally differentiated to have

$$[1+ \varepsilon(1-b)\,\theta_{SX}^F / s_{SX}^F]\hat{n} = -(1 - 1/n)\hat{x} - \varepsilon[(1-b) + b\,\theta_{KX}^m]\hat{r} + \varepsilon h\hat{s} \qquad (44)$$

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

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

$$\hat{n}/\widehat{K^*} = -\delta\varepsilon\theta_{LY}\lambda_{LY}[(1 + 1/n)(1 - b) + (2/n)b\,\theta_{LX}^m\,]/\Delta > 0, \qquad (46)$$

$$\hat{n}/\hat{s} = -\varepsilon h\{(2/n)[\lambda_{LY}(s_{KY} + s_{KX}^m) + \lambda_{KY}[s_{LY} + (1 + \mu)(\theta_{KY}\lambda_{LX}^m + \theta_{LY}s_{LX}^m)]$$
$$- \varepsilon\theta_{LY}(1 - b)|\lambda^m|\}/\Delta \gtreqless 0 \qquad (47)$$

where $\Delta < 0$ by the stability condition (Appendix). Note that $\hat{n}/\hat{s} > 0$ in equation 47 if ε is not too large.

In the long term, with free entry or exit of firms, favorable 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 labor for setting up fixed costs, which in turn raises the wage rate for skilled labor and hence widens the wage gap between skilled and unskilled wages.

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

$$\hat{r}/\hat{\alpha} = \theta_{LY}\lambda_{KY}(1 +\mu)\,\lambda_{LX}^m\,[2/n + (1 + 1/n)\varepsilon\,(1-b)\,\theta_{SX}^F / s_{SX}^F\,]/\Delta < 0 \qquad (48)$$

$$\hat{r}/\widehat{K^*} = \delta\lambda_{LX}\theta_{LY}[2/n + (1 + 1/n)\varepsilon\,(1-b)\,\theta_{SX}^F / s_{SX}^F\,]/\Delta < 0 \qquad (49)$$

$$\hat{r}/\hat{s} = -\varepsilon h\theta_{LY}\{[(2/n) + \varepsilon\,(1-b)\,\theta_{SX}^F / s_{SX}^F\,]\,|\lambda^m| + (2/n)\lambda_{LY}s_{KX}^F / s_{SX}^F\,]\}/\Delta > 0 \qquad (50)$$

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

$$\hat{w}_R/\hat{\alpha} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{\alpha}) > 0 \qquad (51)$$

$$\hat{w}_R/\widehat{K^*} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{\alpha}) > 0 \qquad (52)$$

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[9] Clementi and Palazzo (2016) found that firm entry and exit can amplify the effects of aggregate shocks.

$$\hat{w}_R / \hat{s} = -(\theta_{KY}/\theta_{LY})(\hat{r}/\hat{s}) < 0 \tag{53}$$

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 $\hat{w}_S = \hat{r} + \hat{n}/s_{SX}^F$ in equation 10,

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

$$= -\theta_{LY}\lambda_{KY}(1+\mu)\,\lambda_{LX}^m\,[(1 + 1/n)\varepsilon(1-b)\,\theta_{KX}^F / s_{SX}^F + (2/n)(\varepsilon b\,\theta_{KX}^m / s_{SX}^F - 1)]/\Delta \tag{54}$$

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

$$= -\delta\theta_{LY}\lambda_{LY}[(1 + 1/n)\varepsilon(1-b)\,\theta_{KX}^F / s_{SX}^F + (2/n)(\varepsilon b\,\theta_{KX}^m / s_{SX}^F - 1)]/\Delta \tag{55}$$

$$\hat{w}_S / \hat{s} = \hat{r}/\hat{s} + (1/s_{SX}^F)(\hat{n}/\hat{s}) > 0 \tag{56}$$

Hence, $\hat{w}_S / \hat{\alpha} > 0$ and $\hat{w}_S / \widehat{K}^* > 0$ when $\sigma_X^F < \varepsilon b\,\theta_{KX}^m / \theta_{KX}^F$. 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 new entry by urban firms that raises demand for skilled labor and consequently the fixed cost for manufactured good X.

Comparing equations 51–53 with equations 54–56,

$$\hat{w}_S / \hat{\alpha} - \hat{w}_R / \hat{\alpha} = -\lambda_{KY}(1+\mu)\,\lambda_{LX}^m\,[(1 + 1/n)\varepsilon(1-b)(\theta_{LY} - \theta_{SX}^F)/ s_{SX}^F$$

$$+ (2/n)(\varepsilon b\theta_{LY}\theta_{KX}^m / s_{SX}^F - 1)]/\Delta \tag{57}$$

$$\hat{w}_S / \widehat{K}^* - \hat{w}_R / \widehat{K}^* = -\delta\theta_{LY}\lambda_{LY}[(1 + 1/n)\varepsilon(1-b)(\theta_{LY} - \theta_{SX}^F)/ s_{SX}^F$$

$$+ (2/n)(\varepsilon b\theta_{LY}\theta_{KX}^m / s_{SX}^F - 1)]/\Delta \tag{58}$$

$$\hat{w}_S / \hat{s} - \hat{w}_R / \hat{s} > 0 \tag{59}$$

Hence, $\hat{w}_S / \hat{\alpha} > \hat{w}_R / \hat{\alpha} > 0$ in equation 57 and $\hat{w}_S / \widehat{K}^* > \hat{w}_R / \widehat{K}^* > 0$ in equation 58, if $\theta_{LY} > \theta_{SX}^F$ and $\sigma_X^F < \varepsilon b\theta_{LY}\theta_{KX}^m / \theta_{KX}^F$. Note that $\hat{w}_S / \hat{s} > 0 > \hat{w}_R / \hat{s}$ in equation 59.

In summary, for a dual developing Harris–Todaro economy, free entry or exit of firms in the urban sector results in excessive new entry of firms. Due to the excessive-entry effect, urbanization via favorable urban development policies can widen the wage gap between urban skilled and rural unskilled labor.

4. COMPLEMENTARY POLICY

As shown above, development policies favorable to the urban sector can 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.[10] In this section, the income distributional issue of a production subsidy to the rural agricultural sector is examined.

Letting z denote 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

$$g(w_R, r) = 1 + z \tag{60}$$

Note that the subsidy is financed by a tax on consumers. Totally differentiating equation 60 and expressing the variables in percentage change,

$$\theta_{LY}\,\hat{w}_R + \theta_{KY}\hat{r} = \tau\hat{z} \tag{61}$$

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 outward.

Figure 6: Increase in Rural Subsidy z

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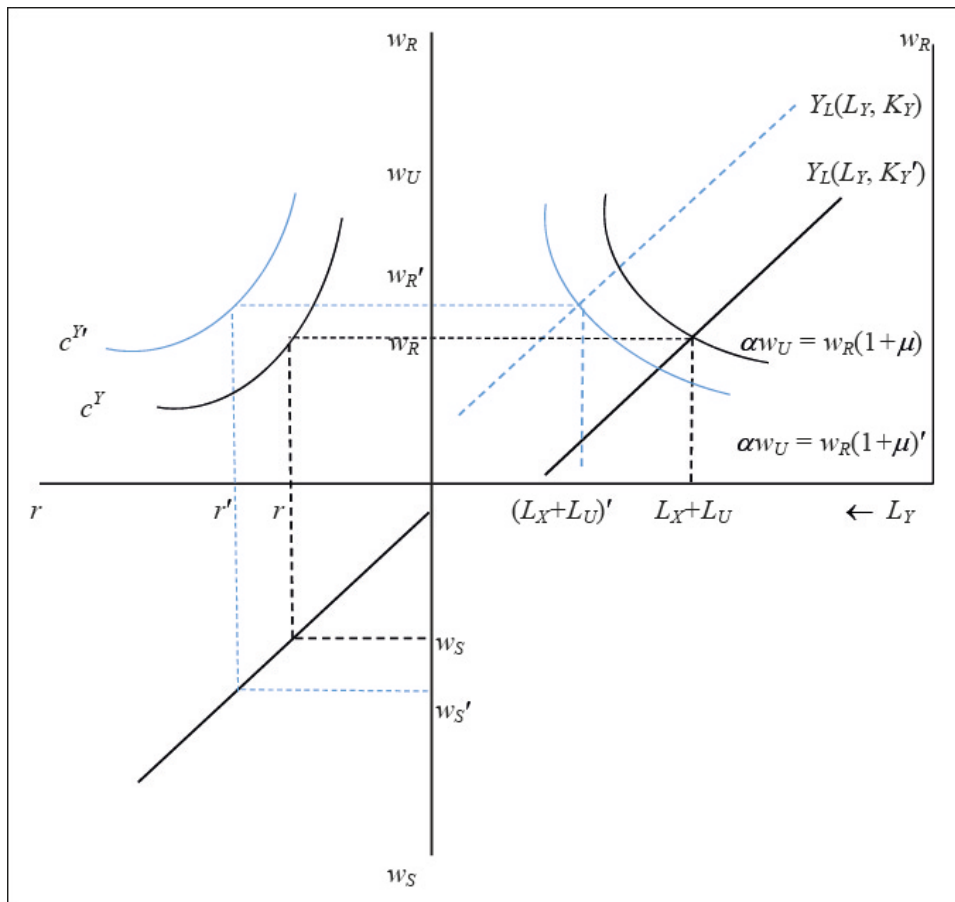
[10] See Chang, Kaltanic, Loayza (2009) for a discussion of the role of policy complementarities.

In the short term with a fixed number of urban firms, equation 61 can be solved together with equations 9–13 to obtain

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

$$\hat{w}_{R}/\hat{z} = \tau\{(1 + 1/n)[\lambda_{LY}(s_{KY} + s_{KX}^{m}) + \lambda_{KY}[s_{LY} + (1 + \mu)\,s_{LX}^{m}\,] + \varepsilon b\,\theta_{KX}^{m}\,|\lambda^{m}|\}/D > 0 \tag{63}$$

$$\hat{w}_{S}/\hat{z} = \hat{r}/\hat{z} > 0 \tag{64}$$

Hence, the rural agricultural sector benefits at the expanse of the urban manufacturing sector, as indicated by an inward shift of the Harris–Todaro migration equilibrium curve in the northeast quadrant of Figure 5. Consequently, both rural wage and capital rental rise in equations 62 and 63. Urban firms then substitute skilled labor for capital involved in fixed costs, causing an increase in skilled wages in equation 64. However, the higher capital rental and skilled wage reduce the profits of the urban firm:

$$d\pi/dz = -\,[f_{w}(dw_{S}/dz) + f_{r}(dr/dz) + xm_{r}(dr/dz)] < 0 \tag{65}$$

This incentivizes urban firms' exit from the urban sector in the long term, which can be seen by solving equations 63 and 9–13 to obtain

$$\hat{n}/\hat{z} = \tau[(1 + 1/n)\varepsilon(1 - b) + (2/n)\varepsilon b\,\theta_{KX}^{m}]\{\lambda_{LY}s_{KY} + \lambda_{KY}[s_{LY} + (1 + \mu)\,\lambda_{LX}^{m}\,]\}\Delta < 0 \tag{66}$$

In addition, the long-term effects of an agricultural subsidy on the capital rental and unskilled wage can be solved:

$$\hat{r}/\hat{z} = -\tau[2/n + \varepsilon(1 - b)\,\theta_{SX}^{m}/s_{SX}^{F}]\{\lambda_{LY}s_{KY} + \lambda_{KY}[s_{LY} + (1 + \mu)\,\lambda_{LX}^{m}\,]\}/\Delta > 0, \tag{67}$$

$$\hat{w}_{R}/\hat{z} = \tau/\theta_{LY} - (\theta_{KY}/\theta_{LY})(\hat{r}/\hat{z}) > 0 \tag{68}[11]$$

Since the agricultural subsidy increases the price of good Y, this benefits the production factors of capital and unskilled labor. Using equation 10, the long-term effects on the skilled wage rate in the urban sector can be obtained:

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

$$= (\tau/\Delta)[\varepsilon(1 - b)\,\theta_{KX}^{m}/s_{SX}^{F} + (2/n)(\varepsilon b\,\theta_{KX}^{m}/s_{SX}^{F} - 1)][A + \lambda_{KY}(1 + \mu)\,\lambda_{LX}^{m}\,] \tag{69}$$

Thus, $\hat{w}_{S}/\hat{z} < 0$ when $\sigma_{X}^{F} < \varepsilon b\,\theta_{KX}^{m}/\theta_{KX}^{F}$. That is, an agricultural subsidy can narrow the wage gap in the long term if σ_{X}^{F} is not too large.

In summary, for a dual developing Harris–Todaro economy, urbanization, accompanied by a subsidy to rural agriculture, may balance the wages between skilled and unskilled labor in the economy.

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[11] In the long term, $\hat{w}_{R}/\hat{z} = -\,(\tau/\Delta)\{(2/n)(B + \varepsilon b\,\theta_{KX}^{m}\,\lambda_{LY}s_{KX}^{F}/s_{SX}^{F}) + \varepsilon(1 - b)(1 + 1/n)[\lambda_{LY}s_{KX}^{F}/s_{SX}^{F} + B(\theta_{KX}^{F}/s_{SX}^{F})]\}$, where $B = A + \lambda_{LY}s_{KX}^{m} + \lambda_{KY}(1 + \mu)\,s_{LX}^{m} + \varepsilon b\,\theta_{KX}^{m}\,|\lambda^{m}|$.

5. EMPIRICAL ANALYSIS

In this section, the two main theoretical propositions are evaluated: (i) urbanization may cause an increase or decrease in wage inequality in the short term (i.e., proposition 1); and (ii) with the free entry of firms in the urban sector, urbanization increases wage inequality via the excessive-entry channel (i.e., proposition 3). To assess these two propositions, data were collected that measure wage inequality, urbanization, and firm entry.

5.1 Data and Measurement

To study the impact of urbanization on wage inequality, the sample selection procedure begins by focusing on middle- and low-income countries, based on World Bank classifications by income level. A dataset is employed comprising an unbalanced panel of observations from 106 developing countries from 2002 to 2013. To measure wage inequality, Deininger and Squire's (1996) Gini coefficient of income distribution derived from a Lorenz curve is used.[12] A high value of the Gini coefficient indicates greater income inequality.

The main independent variable, urbanization, is measured as the ratio of urban population to the total population. Past literature found that urbanization can be associated with income inequality positively (Cai, Chen, Zhou 2010; Wheeler 2001; Baum-Snow and Pavan 2013), negatively (Kanbur and Zhuang 2013, Johansson and Wang 2014), or not at all (Johansson and Wang 2014). The data for urbanization are obtained from the World Bank.[13]

To proxy for firm entry, the cost of starting a new business is estimated, expressed as the percentage of income per capita.[14] 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, a positive relationship between firm entry and the entry cost of starting a new business is conjectured. From proposition 3, the firm entry rate is hypothesized to have an indirect positive impact on income inequality through urbanization.

In line with other literature on the topic of income inequality, a set of control variables are considered that may affect income inequality: real gross domestic product (GDP) per capita growth, government expenditure, inflation, trade openness, level of foreign direct investment, (FDI), and level of financial development. Government spending is measured by the government consumption expenditure as a share of GDP. Inflation is measured by the logarithm of the growth rate of the GDP deflator. Trade openness as the proxy of trade liberalization is expressed by the logarithm of the sum of exports and imports as a percentage of GDP, while FDI is the logarithm of the net inflows of FDI as a share of GDP. Following the financial development literature (Beck, Demirguc-Kunt, Levine 2007), the level of financial development is measured by the logarithm of the

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[12] World Bank. World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators (accessed 2016).

[13] *Ibid.*

[14] World Bank. *Doing Business*. http://www.doingbusiness.org/ (accessed 2016).

value of credit provided to the private sector by financial intermediaries, divided by GDP. The data for control variables are collected from the World Bank.[15]

As recommended in the literature, data availability and the data over 3-year, nonoverlapping periods are considered to smooth short-term cyclical fluctuations, resulting in up to four observations per country. Countries with missing values in all four nonoverlapping periods are then removed. Table 1 presents summary statistics for all variables used in the analysis.

Table 1: Summary Statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Gini	265	41.32	9.27	16.64	69.47
Urbanization	424	45.69	18.66	8.91	86.36
Entry cost	405	82.09	117.33	0.83	983.4
GDP per capita growth	422	3.22	3.36	−11.99	27.26
Government expenditure	402	15.28	9.65	2.80	114.01
Inflation	415	1.84	0.78	−2.41	4.67
Trade openness	411	4.33	0.44	3.18	5.66
Foreign direct investment	413	1.08	1.14	−5.50	3.97
Financial development	417	3.09	0.88	−0.23	5.02

GDP = gross domestic product.

Notes: All variables are averaged over a 3-year, nonoverlapping period, and presented in percentage form. Inflation, openness, foreign direct investment, and financial development are the logarithm value of the original variables.

From Table 1, large variations across countries in all key variables are observed. For example, the Gini coefficient has an average value of 0.41 and ranges from 0.1664 in Azerbaijan (2005–2007) to 0.6947 in Bhutan (2002–2004). Likewise, the average value of the urbanization variable is 45.69% and has, as its minimum, 8.91% in Burundi (2002–2004), while its maximum of 86.36% is observed in Gabon (2011–2013). Firm entry cost has an average value of 82.09% and ranges from 0.83% in Kazakhstan (2011–2013) to 983.4% in Sierra Leone (2005–2007).

5.2 Estimation Strategy

The following baseline econometric specification is used to examine proposition 1; that is, the impact of urbanization on income inequality:

$$INEQ_{i,t} = \alpha_0 + \alpha_1 Urban_{i,t} + \boldsymbol{\alpha}_2' \boldsymbol{X}_{i,t} + \gamma_i + \varphi_t + \varepsilon_{i,t} \tag{70}$$

where i indicates country and t indicates year. The dependent variable $INEQ_{i,t}$ is the income inequality of country i in year t measured by the Gini coefficient. The independent variable $Urban_{i,t}$ represents urbanization. $\boldsymbol{X}$ is a set of control variables for income inequality, as follows: (i) real GDP per capita growth rate, (ii) government expenditure, (iii) trade openness, (iv) FDI, (v) inflation rate, and (vi) financial development. γ_i and φ_t are the vectors of dummy variables that account for the country and period fixed effect, and $\varepsilon_{i,t}$ is the error term. Robust standard errors are employed to correct for heteroscedasticity.

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[15] World Bank. World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators (accessed 2016).

For equation 70, the sign of the coefficient α_1 is of concern. A positive (or negative) α_1 indicates a positive (or negative) relationship between the level of urbanization and income inequality. In other words, income inequality increases (or decreases) as the level of urbanization increases.

Apart from the baseline specification, to examine proposition 3, the impact of firm entry (proxied by the entry cost) on the level of urbanization is allowed by introducing an interaction term for urbanization:

$$\alpha_1 = \theta_1 + \theta_2 EntryCost_{i,t-1} \qquad (71)$$

where $EntryCost_{i,t-1}$ is the 1-year lag of firm entry cost as measured by the cost of starting a business enterprise as a percentage of income per capita.

Substituting equation 71 into equation 70 yields

$$INEQ_{i,t} = \alpha_0 + \theta_1 Urban_{i,t} + \theta_2 EntryCost_{i,t-1} * Urban_{i,t} + \boldsymbol{\alpha}'_3 \boldsymbol{X}_{i,t}$$
$$+ \gamma_i + \varphi_t + \varepsilon_{i,t} \qquad (72)$$

where $EntryCost_{i,t-1} * Urban_{i,t}$ is the interaction term for urbanization.

By re-arranging equation 72, the following specification is obtained:

$$INEQ_{i,t} = \alpha_0 + (\theta_1 + \theta_2 EntryCost_{i,t-1}) * Urban_{i,t} + \boldsymbol{\alpha}'_3 \boldsymbol{X}_{i,t} + \gamma_i + \varphi_t + \varepsilon_{i,t}, \quad (73)$$

where the combined coefficient $(\theta_1 + \theta_2 EntryCost_{i,t-1})$ of urbanization consists of the direct effect (θ_1) and indirect effect via the 1-year lag entry cost ($\theta_2 EntryCost_{i,t-1}$) 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, the coefficient of the level of urbanization is negative, although it is not statistically significant at 1% or 10%. This result implies that the level of urbanization 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 countries in the Middle East and North Africa.

Column 2 shows that urbanization has a positive and statistically significant coefficient, indicating that countries with a higher level of urbanization tend to have high income inequality. The positive coefficient estimate of urbanization θ_1 measures the direct effect of the level of urbanization on income inequality. So, a 1% increase in the level of urbanization is associated with a 0.35% increase in income inequality. Further, the coefficient estimate of the interaction term θ_2 is 0.0008 and statistically significant at 1%. This result indicates that the effect of urbanization on income inequality is stronger in countries with a higher firm entry cost (or a higher firm entry rate). In terms of the economic effect, since the average 1-year lag of entry cost is 92.28%, for a 1% increase in urbanization, income inequality increases by 0.074% (0.0008 × 92.28%). Thus, the total effect of urbanization on income inequality is approximately equal to 0.424% (0.35% + 0.074%). The results suggest that the economic effect of urbanization on income inequality is underestimated by 17.5% (0.074/0.424) if firm

entry is not taken into account. These empirical findings appear to be consistent with proposition 3.

Table 2: Direct and Indirect Effects of Urbanization on Income Inequality

Dependent Variable: Income Inequality	Equation 70	Equation 72
Urbanization	−0.0253	0.3457
	(0.2161)	(0.1903)*
Entry cost (t–1) × urbanization		0.0008
		(0.0003)***
GDP per capita growth	−0.0514	0.0451
	(0.0815)	(0.1019)
Government expenditure	−0.0136	−0.1437
	(0.1528)	(0.1596)
Inflation	−0.3606	−0.0974
	(0.5141)	(0.5788)
Trade openness	−1.2634	1.4481
	(2.2809)	(2.5786)
Foreign direct investment	−0.6587	−0.9142
	(0.4939)	(0.6700)
Financial development	−0.3601	−0.063
	(1.1925)	(1.2923)
Constant	51.9555	19.6025
	(17.3617)***	(10.6398)*
Country dummies	Y	Y
Period dummies	Y	Y
R^2	0.2224	0.4685
Countries	103	92
Obs.	247	176

GDP = gross domestic product.

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

5.4 Income Inequality and Development Levels

To determine whether the impact of urbanization on income inequality differs for countries at different development levels, the full sample is split into two groups: (i) low- and lower-middle-income countries, and (ii) upper-middle-income countries. Equations 70 and 72 are then re-estimated, using these two groups separately. Table 3 shows that the impact of urbanization (with or without the firm entry cost channel) seems to be driven by low and lower middle-income countries.

The coefficients for urbanization in equations 70 and 72 are observed, and the interaction terms are not statistically significant for the upper-middle income countries. However, the results obtained for low- and lower-middle-income countries are consistent with those obtained for the full sample. In particular, the panel results for low- and lower-middle-income countries provide greater evidence of the effect of urbanization on income inequality. The coefficient representing the direct effect of urbanization is 0.6861, while the indirect effect via the firm entry cost channel is 0.0012. Given that the average 1-year lag of firm entry cost for low- and lower-middle income countries is 127.97%, the total effect of urbanization on income inequality is 0.8397% (0.6861 + 0.0012 * 127.97). In other words, on average, a 1% increase

in urbanization will lead to an average increase of 0.8397% in income inequality in low- and lower-middle-income countries. In addition, the underestimation of the effect of urbanization on income inequality is 18% (0.1536/0.8397) if the firm entry cost channel is not considered.

Table 3: Impact on Income Inequality at Different Development Levels

Dependent Variable: Income Inequality	Low- and Lower-Middle-Income		Upper-Middle-Income	
	Equation 70	Equation 72	Equation 70	Equation 72
Urbanization	−0.4556 (0.6521)	0.6861 (0.3641)*	0.2108 (0.1556)	0.3934 (0.2687)
Entry cost (t–1) × urbanization		0.0012 (0.0003)***		−0.0002 (0.0003)
GDP per capita growth	−0.068 (0.1658)	−0.1411 (0.1834)	0.0222 (0.0596)	0.0749 (0.1081)
Government expenditure	0.2507 (0.2036)	−0.1697 (0.1807)	−0.4069 (0.2159)*	−0.3143 (0.2993)
Inflation	−0.0323 (1.0243)	−0.2226 (0.7345)	−0.4658 (0.476)	−0.6318 (0.6724)
Trade openness	0.2129 (2.8683)	2.7334 (4.2525)	0.6841 (2.8536)	−0.1188 (2.0262)
Foreign direct investment	−0.8816 (0.7769)	−0.8226 (0.8492)	−0.3265 (0.5559)	−0.9754 (0.9000)
Financial development	−2.3692 (2.1646)	−1.3790 (1.7335)	1.1491 (1.0184)	−0.0574 (1.8077)
Constant	62.1211 (27.9677)**	6.2385 (15.5746)	31.2830 (13.9229)**	26.6628 (15.1063)*
Country dummies	Y	Y	Y	Y
Period dummies	Y	Y	Y	Y
R^2	0.2539	0.5875	0.3685	0.4326
Countries	65	57	38	35
Obs.	135	96	112	80

GDP = gross domestic product.

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

6. CONCLUSIONS

Using a general-equilibrium framework for a dual developing economy, this paper examined the short- and long-term effects of urbanization, via favorable urban development policies, on income distribution and social welfare of the economy. The developing economy is characterized by an imperfectly competitive urban sector together with a perfectly competitive rural sector. Urbanization not only shifts rural workers to highly productive urban jobs, but also expands firm production to realize benefits from scale economies. Most significantly, urbanization attracts new firms to the urban manufacturing sector. Nevertheless, in the long term, favorable 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 labor 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 urbanization on wage inequality could be understated by as much as 18%.

This argument can also be connected to the distortions literature. Based on the existence of the institutionally set minimum urban wage, the possibility of a second-best policy prescription is considered, 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, urbanization, accompanied with a subsidy to rural agriculture, can balance the differences in wages for skilled and unskilled workers.

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APPENDIX

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

$$
\begin{pmatrix} \dot{X} \\ \dot{Y} \\ \dot{w}_R \\ \dot{r} \\ \dot{n} \end{pmatrix} = H \begin{pmatrix} \hat{x} \\ \hat{Y} \\ \hat{w}_R \\ \hat{r} \\ \hat{n} \end{pmatrix}
$$

where the *H* matrix is

$$
\begin{bmatrix}
-(1+1/n) & 0 & 0 & -\varepsilon b\theta_{KX}^{m} & -1 \\
0 & 0 & -\theta_{LY} & -\theta_{KY} & 0 \\
(1+\mu)\lambda_{LX}^{m} & \lambda_{LY} & -[s_{LY}+(1+\mu)\lambda_{LX}^{m}] & s_{LY}+(1+\mu)s_{LX}^{m} & (1+\mu)\lambda_{LX}^{m} \\
\lambda_{KX}^{m} & \lambda_{KY} & s_{KY} & -(s_{KY}+s_{KX}^{m}) & \lambda_{KX}+s_{KX}^{F}/s_{SX}^{F} \\
-(1-1/n) & 0 & 0 & -\varepsilon[(1-b)+b\theta_{LX}^{m}] & -[1+\varepsilon(1-b)\theta_{SX}^{F}/s_{SX}^{m}]
\end{bmatrix}
$$

The principal minors of the above coefficient matrix are given by

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

$\Delta_2 = 0,$

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

$\Delta_4 = D = (1 + 1/n)[A + \lambda_{LY}\theta_{LY}s_{KX}^{m} + (1 + \mu)\lambda_{KY}(\theta_{LY}s_{LX}^{m} + \theta_{KY}\lambda_{LX}^{m})]$

$\qquad + \varepsilon b\theta_{LY}\theta_{KX}^{m}|\lambda^{m}| > 0,$ and

$\Delta_5 = \Delta.$

The stability condition requires that the odd principal minors are nonpositive and even principal minors are nonnegative. Hence, for stability of the model, $|\lambda^{m}| > 0$ and $\Delta > 0$ are needed.