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Guanghua Wan, Zhi Luo,
and Xun Zhang

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Guanghua Wan is the director of research at the Asian Development Bank Institute.

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Please contact the authors for information about this paper.

Email: gwan@adbi.org

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

Urbanizing with Equity Consideration

Guanghua Wan[$], Zhi Luo[#], Xun Zhang[†]

Abstract: Research has not yet been undertaken on the optimal level of urbanization, notwithstanding the pioneering work of Au and Henderson (2006) on optimal urban concentration. This paper develops two-sector general equilibrium models of urbanization, with and without equity consideration, respectively. It is shown that considering equity will result in a higher level of urbanization than otherwise, when urban inequality is sufficiently small or migration costs are sufficiently large. Such a theoretical prediction is confirmed by empirical modeling results using panel data from People's Republic of China (PRC). Provincial governments that paid attention to the inequality issue are found to have higher urbanization levels than those that did not. Finally, we explore possible equity consideration-to-urbanization transmission channels, and empirically establish that equity consideration in PRC (e.g., government initiatives towards combating rural poverty or the urban-rural gap) is positively correlated with road density, which helps reduce migration costs, and with bank lending to the manufacturing sector, which helps enhance the pulling force of migration. Thus, policymakers in the developing world should reverse their prevailing anti-urbanization attitudes and practices that tend to slow down urbanization or restrict rural-to-urban migration.

Keywords: Urbanization; Income inequality; Social welfare function; Optimization

JEL: O18; E61; D63

[$] Asian Development Bank Institute, Japan.
[#] Wuhan University, People's Republic of China.
[†] Beijing Normal University, People's Republic of China.

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1. Introduction

It is accepted that urbanization is mainly driven by the large urban-rural gap (Lewis 1954; Harris and Todaro 1970), which accounts for a significant share of the overall income inequality in developing countries (Shorrocks and Wan 2005; Wan 2007; Asian Development Bank (ADB) 2012b, Young 2013). Meanwhile, the overall inequality is closely associated with urbanization or industrialization (Kuznets 1955) although the direction of causality remains debatable. Despite the well-established correlation between urbanization and income distribution, the equity issue has been largely overlooked in urbanization research, at least from the economic optimization perspective.

On the other hand, as pointed out by Henderson (2003) and Au and Henderson (2006), a sizable volume of economic literature assumes the existence of an optimal level of urbanization or urban concentration but little effort had been made to examine such assumptions. Consequently, Au and Henderson (2006) developed a model to analyze optimal urban concentration, leaving the issue of optimal level of urbanization unaddressed. It is important to note that the equity or inequality issue was not considered by Au and Henderson (2006) either.

This gap in economics on the role of equity consideration in urbanizing economies may have contributed to the anti-urbanization stance of many national governments in the developing world.[1] Particularly notorious are the formerly planned economies where migration restrictions were strictly enforced. For example, the household registration (*Hukou*) system in the People's Republic of China (PRC) remains effective even today, severely constraining the rural-to-urban mobility. Apart from possible efficiency losses (Glaeser 2011; Spence, Annez and Buckley 2009), a serious consequence of this passive government position lies in the persistent and large urban-rural gap because many rural residents are discouraged from emigrating to cities from the countryside where resources and job opportunities are scarce. In short, the lack of research on the optimal level of urbanization with equity consideration may have contributed to a loss-loss outcome in

[1] This stance, as pointed out by Quigley (2008) and implicitly referred to by the Commission on Growth and Development (2008, p.57), may also be attributable to the well-recognized urban bias (Lipton 1977) and growing congestion, noise and pollution in cities (ADB 2012a).

terms of both efficiency and equity that are potentially associated with higher levels of, or faster, urbanization.

As unprecedented urbanization is taking place around the globe, and, while the subject of income distribution attracts more and more attention, especially after the publication of Piketty (2014), how equity consideration may affect urbanization is becoming an important research topic, as well as an urgent policy issue that can no longer be overlooked. Resultant findings may help persuade policymakers, and the general public, to alter their long-standing anti-urbanization stance, which could benefit billions of people, particularly the rural poor in the developing world.

This paper contributes to the literature by filling two important gaps. First, we develop theoretical models of urbanization that shed light on the optimal levels of urbanization. This complements Au and Henderson (2006), who developed models of optimal urban concentration under efficiency maximization, where efficiency is indicated by labor productivity. Second, we incorporate equity consideration in addition to efficiency in one of our models by maximizing the social welfare function of Sen and Foster (1997), where equity is represented by the well-known relative income inequality measure – the Theil-L index (Theil 1967). The corresponding optimal level of urbanization is then compared with what is derivable without equity consideration. In addition to these theoretical contributions, we provide empirical evidence to support the prediction of our theoretical models. For this purpose, we construct a provincial level panel data set from the PRC and estimate a set of regression models to evaluate the impact of equity consideration on the level of urbanization. Finally, we explore possible transmission mechanisms from equity consideration to urbanization, and empirically establish two transmission channels.

Our major theoretical finding is that considering equity, in addition to efficiency, leads to higher levels of, or faster, urbanization than otherwise, when inequality within the urban sector is sufficiently small or when migration costs are sufficiently large. This finding is supported by robust empirical modeling results from the PRC. Provinces that were concerned about the equity issue are found to have higher urbanization rates by a margin of around two percentage points, on average. Regarding the transmission

mechanism, any policy interventions that exert impacts on the pulling or pushing forces or costs of migration are expected to affect urbanization. And there are many such equity-related (e.g., pro-poor and pro-rural) interventions including the popular conditional cash transfer and micro-credit programs in rural areas. These programs are expected to help improve agricultural productivity and the human capital of the rural poor, both producing positive effects on migration or urbanization (Young 2013). Empirically, in this paper, we focus on the provision of urban-rural connectivity and government industrialization drive in the PRC. The former helps reduce migration costs, whereas the latter helps enhance the pulling force of migration. Our regression results confirm that road density and bank lending to the manufacturing sector are significantly correlated with equity consideration in the PRC.

The plan of the paper is as follows. Section 2 constructs general equilibrium models of urbanization with and without equity consideration, and compares optimal levels of urbanization. Empirical regression models are specified and estimated in Section 3, producing robust results that confirm the theoretical prediction of the urbanization models. In Section 4, we explore the equity consideration-to-urbanization transmission mechanisms. Section 5 presents a summary and policy implications, highlighting an important message: to maximize social welfare in urbanizing economies, governments and other stakeholders should switch from being passive to being proactive in managing and promoting urbanization.

2. Theoretical Models

Our theoretical framework begins with a standard dynamic two-sector model. The modeled economy consists of a rural or agricultural sector and an urban or industrial sector and is populated by overlapping generations of two-period-lived agents. All agents are born in the rural area and work in the first period and live off savings in the second period. In the first period, they decide which sector to work in. Choosing the urban sector encounters various migration costs.

In what follows, we first construct the laissez-faire urbanization model without

considering the distributional issue, followed by a socially optimal urbanization model that takes into account the inequality or equity dimension.

2.1 Production and Preference

Let *t* index time, *r* index the rural sector, *Y* denote output and *L* denote labor input, the agricultural sector produces output with labor:

$$Y_{rt} = L_{rt}^{\eta} \tag{2.1}$$

where $0 < \eta \leq 1$ is a parameter representing the output elasticity of labor. The technology defined by equation (2.1) is a generalized version of the commonly-used production function for agriculture that assumes $\eta = 1$ (see Gollin, Parente and Rogerson 2002, Yang and Zhu 2013). Following conventional wisdom, the price of the agricultural product is set as the numeraire. In addition, the agricultural good cannot be stored and must be consumed in the same period of production. To permit within-sector income inequality (see Section 2.3 for more details), the agricultural wage variable is assumed to follow a statistical distribution with its mean, denoted by w_r, to be equal to the marginal product of labor:

$$w_r = E(w_{rt}) = \eta L_{rt}^{\eta-1} \tag{2.2}$$

The industrial sector is characterized by the following Cobb-Douglas production function:

$$Y_{ut} = AK_t^{\alpha} L_{ut}^{\gamma} \ (0 < \alpha, \gamma < 1) \tag{2.3}$$

where the subscript *u* indexes the urban sector; α and γ are parameters that denote the output elasticities of capital and labor, respectively; and *A* denotes the total factor productivity. Capital stock, denoted by K_t, is assumed to be accumulated using the industrial output, Y_{ut}, and is fully depreciated within the first period. Note that the technology defined by equation (2.3) is also a generalized version of the commonly used production function that assumes constant returns to scale or $\alpha + \gamma = 1$.[2]

Again, to incorporate inequality into the socially optimal urbanization model, to be

[2] This generalization was strongly recommended by Professor Fujita

presented in Section 2.5, the industrial wage is assumed to be randomly distributed with its mean, w_u, to be equal to the value of the marginal product of labor:

$$w_u = E(w_{ut}) = p_t \gamma A K_t^{\alpha} L_{ut}^{\gamma-1} \tag{2.4}$$

where p_t denotes the relative price of the industrial good. It is noted that no statistical assumption is made or required regarding the distributions of the rural/industrial wage or income variables.

Using r_t to denote the nominal return to capital, we have:

$$r_t = p_t \alpha A K_t^{\alpha-1} L_{ut}^{\gamma} \tag{2.5}$$

The total labor supply L is:

$$L = L_{rt} + L_{ut}. \tag{2.6}$$

Therefore, the total population is $2L$, half of which are working and the remaining half are retirees.

The level of urbanization or urbanization rate v_t is defined as the proportion of urban residents in the total population:

$$v_t = \left(L_{u,t-1} + L_{ut}\right)/2L. \tag{2.7}$$

The modeled economy is populated with overlapping-generation agents. At the beginning of time *t*, the *t*-th generation of agents is born and they decide in which sector to work, based on the difference in the expected utility between the two sectors. Those choosing the industrial or urban sector would encounter migration costs or a reduction in utility (more details are provided in the next subsection).[3] During time *t*, agents work in the chosen sector and consume part of individual wage incomes, which are most likely to deviate from the expected value of the relevant income distribution. At time *t+1*, the agents retire.

Following Cao and Birchenall (2013), the agents are characterized with time separable and non-homothetic preference defined over the per capita consumption of

[3] Using utility rather than wage difference as the criteria for migration decision in this paper was strongly suggested by Professor Venables.

agricultural and industrial goods:

$$U_{i,t} = \mu ln\left(c_{i,r,t}^{t}\right) + (1-\mu) ln\left(c_{i,u,t}^{t}\right) + \beta\left[\mu ln\left(c_{i,r,t}^{t+1}\right) + (1-\mu) ln\left(c_{i,u,t}^{t+1}\right)\right], \qquad i = r, u \tag{2.8}$$

where $c_{r,u,t}^{t+1}$ denotes the consumption of the industrial good (u) at time $t+1$ by the t-th generation of agents working in the agricultural sector (r). Other notations are defined similarly. The parameter, β, is the rate of time preference, and μ is the utility weight of the agricultural good.

Agents make the migration decision and then the consumption decision. Conditional on his/her migration decision and realized wage or income, w_{it}, the agent maximizes expected utility $E\left(U_{i,t}\middle|w_{it}\right)$ subject to the budget constraint:

$$\frac{c_{i,r,t}^{t}}{p_t} + c_{i,u,t}^{t} + \frac{1}{r_{t+1}}\left(c_{i,r,t}^{t+1} + p_{t+1} c_{i,u,t}^{t+1}\right) = \frac{w_{it}}{p_t}. \tag{2.9}$$

The solutions to the utility maximization problem are given by

$$\begin{cases} c_{i,r,t}^{t} = \frac{\mu}{1+\beta} w_{it} \\ c_{i,u,t}^{t} = \frac{1-\mu}{(1+\beta)} \frac{w_{it}}{p_t} \\ c_{i,r,t}^{t+1} = \frac{\mu\beta r_{t+1}}{1+\beta} \frac{w_{it}}{p_t} \\ c_{i,u,t}^{t+1} = \frac{(1-\mu)\beta r_{t+1}}{(1+\beta) p_{t+1}} \frac{w_{it}}{p_t} \end{cases} \tag{2.10}$$

Agent saving is:

$$s_{it} = \frac{w_{it}}{p_t} - \frac{c_{i,r,t}^{t}}{p_t} - c_{i,u,t}^{t} = \frac{\beta}{1+\beta} \frac{w_{it}}{p_t}. \tag{2.11}$$

2.2 Migration Decision

Once an agent decides to migrate to the urban sector, he/she will not return to the rural area in the second period, because this will bring him/her no benefits at all but another set of migration costs. Agents know the expected wage in each sector and make the migration decision based on the difference in the expected utility between the two

sectors.[4] By manipulating equation (2.10), it can be shown that this utility difference is equivalent to the difference between the expected wages. Therefore, in the absence of migration costs, labor migration will continue as long as $E(w_{ut}) > E(w_{rt})$.

As argued by Sjaastad (1962), Harris and Todaro (1970) and Chau (1997), however, migration is not cost-free. In addition to the usual financial cost, migration may encounter psychological and search costs before relocation, loss of social capital and adjustment cost to the new living or working environment and intangible costs arising from life-style changes after relocation (Lewis 1954). In this paper, we use D (> 0) to represent the reduction in the expected utility arising from both tangible and intangible migration costs. Thus, in equilibrium, we have:

$$E(U_{r,t}) = E(U_{u,t}) - D \tag{2.12}$$

Combining equation (2.12) with equations (2.8) and (2.10), we can obtain the labor market equilibrium condition as:

$$E(w_{ut}) = \tau E(w_{rt}) \tag{2.13}$$

where $\tau \triangleq exp[D/(1+\beta)] > 1$. Equation (2.13) is similar to an assumption made by Ros (2000, p. 71). But we derive it by solving the utility maximization problem. By coincidence, τ is equivalent to the urban/rural wage or income ratio, as equation (2.13) shows. It is clear that the presence of migration costs has distributive implications. The larger the total migration cost, *D,* is, the larger τ is, and the larger the urban-rural income gap would be.[5]

2.3 Measure of Income Inequality

Under our two-sector model, income inequality consists of three components: within-rural and within-urban inequalities plus the urban-rural income gap. Within-sector inequality exists because both agricultural and industrial wages are random variables and the actual wages for individual *k,* denoted by w_{itk}, usually deviate from their expected values such that:

[4] This assumption was suggested by Professor Barro.
[5] For easy exposition, we refer to τ as the migration cost hereafter in this paper.

$$w_{itk} = E(w_{it}) + \varepsilon_{itk} = w_i + \varepsilon_{itk,} \quad i = u, r \tag{2.14}$$

where $E(\varepsilon_{itk}) = 0$. Agents make migration decisions based on the difference between the expected wages (or, equivalently, the difference between the expected utilities), which are independent of the random variables, ε_{itk}.

Turning to inequality measurement, we make the following assumption.

Assumption 1. Inequality is measured by the Theil-L index (Theil 1967), with I_r and I_u, respectively denoting the within-rural and within-urban inequalities ($I_i > 0, i = u, r$).

It is useful to note that the choice of the Theil-L index as the inequality indicator is driven by three considerations: maintaining consistency with the form of the social welfare function to be used later in this paper; its benign property of "clean" decomposition into three components mentioned at the beginning of Section 2.3, as shown by equation (2.15) or (2.16) below; and the high correlation between different indicators of inequality (see Shorrocks and Wan 2005).

Under Assumption 1, the overall inequality *I* can be written as (Shorrocks and Wan 2005, equation 3):

$$I = (1 - v)I_r + vI_u + (1 - v)\ln\left(\frac{w}{w_r}\right) + vln(\frac{w}{w_u}) \tag{2.15}$$

where *w* denotes the weighted average wage or income of w_r and w_u, with urban and rural population shares as weights. Combined with equation (2.13), equation (2.15) can be expressed as:

$$I = (1 - v)I_r + vI_u + ln(1 - v + \tau v) - vln\tau. \tag{2.16}$$

In both equations (2.15) and (2.16), the first term on the right hand side represents the within rural inequality, the second term represents the within urban inequality and the remaining two terms represent the urban-rural gap or the between component of total inequality.

2.4 Laissez-faire Equilibrium without Equity Consideration

The first equilibrium refers to the product market for the agricultural output, which is consumed by agents who are born in the current and last period:

$$E\left(c_{r,r,t}^{t}\right)L_{rt}+E\left(c_{u,r,t}^{t}\right)L_{ut}+E\left(c_{r,r,t-1}^{t}\right)L_{r,t-1}+E\left(c_{u,r,t-1}^{t}\right)L_{u,t-1}=L_{rt}^{\eta} \quad (2.17)$$

where $c_{u,r,t-1}^{t}$ represents agricultural product that is consumed by generation *t-1* of the urban household at time *t*. Other notations in equation (2.17) are similarly defined. Now, equation (2.10) can be manipulated to obtain:

$$(1-g_t)^{\eta}L^{\eta-1}=\frac{\mu}{1+\beta}\Big\{[(1-g_t)E(w_{rt})+g_tE(w_{ut})] + \frac{\beta r_t}{p_{t-1}}\left[(1-g_{t-1})E\left(w_{r,t-1}\right)+g_{t-1}E\left(w_{u,t-1}\right)\right]\Big\} \quad (2.18)$$

where $g_t(=L_{ut}/L)$ denotes the urbanization rate for the *t*-th generation.

The capital market equilibrium is given by the capital accumulation function:

$$E(K_{t+1})=E(s_{rt})L_{rt}+E(s_{ut})L_{ut} \quad (2.19)$$

Re-write equation (2.19) into per capita form:

$$p_tE(k_{t+1})=\frac{\beta}{1+\beta}[(1-g_t)E(w_{rt})+g_tE(w_{ut})] \quad (2.20)$$

where k_t denotes capital stock per capita.

Definition 1. The general equilibrium of the two-sector economy, $\{k_t, v_t, g_t, w_{rt}, w_{ut}, p_t, r_t\}$, is characterized by equations (2.2), (2.4), (2.5), (2.13), (2.18), and (2.20).

The steady-state equilibrium can be obtained by solving the following equations:

$$w_u=\tau w_r=\tau\eta(1-v)^{\eta-1}L^{\eta-1} \quad (2.21a)$$

$$w_u=p\gamma Ak^{\alpha}v^{\gamma-1}L^{\alpha+\gamma-1} \quad (2.21b)$$

$$r=p\alpha Ak^{\alpha-1}v^{\gamma}L^{\alpha+\gamma-1} \quad (2.21c)$$

$$(1-v)^{\eta}L^{\eta-1}=\frac{\mu}{1+\beta}\left(1+\frac{\beta r}{p}\right)[(1-v)w_r+vw_u] \quad (2.21d)$$

$$pk=\frac{\beta}{1+\beta}[(1-v)w_r+vw_u] \quad (2.21e)$$

Equations (2.21a)-(2.21e) are the expressions, respectively related to the labor market

equilibrium, the industrial product equilibrium, equilibrium for the nominal return to capital, the rural product equilibrium and the capital market equilibrium. It is useful to note that, in the steady state, the urbanization rate for the whole society is identical to the urbanization rate for the current generation, that is, $v = g$.

We can solve for $\{k, v, r, p, w_u, w_r\}$ using equation (2.21). The solution for the steady-state urbanization is:

$$v_{market} = \left[\frac{1+\beta}{\mu\eta} - 1 + \tau + \frac{\alpha}{\gamma}(1+\beta)\tau\right]^{-1}\left(\frac{1+\beta}{\mu\eta} - 1\right) = e/(e+\tau) \tag{2.22}$$

where

$$e = \left(\frac{1+\beta}{\mu\eta} - 1\right)/\left[1 + \frac{\alpha}{\gamma}(1+\beta)\right] > 0. \tag{2.23}$$

It is not difficult to show that $v'_{market}(\tau) < 0$. Thus, the smaller the overall migration cost is, *ceteris paribus*, the higher the urbanization rate would be. Specifically, we have $v_{market}(\tau = \infty) = 0$, and $v_{market}(\tau = 1) = \varphi < 1$. These results are in line with intuitions and expectations. In particular, the last result is consistent with reality in the sense that the agricultural sector exists in all economies almost without any exception. In fact, even city states such as Hong Kong, China and Singapore retain agriculture as a minor sector of their economies.

2.5 Socially Optimal Equilibrium with Equity Consideration

A social planner who maximizes social welfare may well incorporate income inequality into her/his objective function. For example, many national governments, civil societies and international institutions take inclusive growth as their overarching goal, forcefully demonstrating the importance of the inequality issue in the context of policy making. Consequently, we use the following social welfare function of Sen and Foster (1997) to represent the objective function of the social planner:

$$SW = w\,exp(-I) = [(1-v)w_r + vw_u]exp(-I), \tag{2.24}$$

subject to:

$$w_r = \eta(1-v)^{\eta-1}L^{\eta-1} \tag{2.25a}$$

$$w_u = p\gamma A k^{\alpha} v^{\gamma-1} L^{\alpha+\gamma-1} \tag{2.25b}$$

$$r = p\alpha A k^{\alpha-1} v^{\gamma} L^{\alpha+\gamma-1} \tag{2.25c}$$

$$(1-v)^{\eta} L^{\eta-1} = \frac{\mu}{1+\beta}\left(1+\frac{\beta r}{p}\right)[(1-v)w_r + vw_u] \tag{2.25d}$$

$$pk = \frac{\beta}{1+\beta}[(1-v)w_r + vw_u] \tag{2.25e}$$

Substituting equation (2.25) into equation (2.24), after some manipulations, the social welfare function of equation (2.24) can be expressed as:

$$SW(v) = exp[ln\eta + (\eta-1)lnL - I_r]\, exp[\Pi(v)] \tag{2.26}$$

where

$$\Pi(v) = (\eta - 1 + v)ln(1-v) + vlne - vlnv + v(I_r - I_u) \tag{2.27}$$

and e is defined by equation (2.23). The first-order condition for maximizing equation (2.26) with respect to *v* is:

$$\Pi'(v) = I_r - I_u + lne - 1 + ln(1-v) - lnv - \frac{\eta-1+v}{1-v} = 0 \tag{2.28}$$

It can be shown that $\Pi'(v=0) \to +\infty$, $\Pi'(v=1) \to -\infty$, and $\Pi''(v) = -\frac{1-v+\eta}{v(1-v)^2} < 0$. In other words, $\Pi'(v)$ is monotone decreasing in *v*, from being positive to negative. Thus, there exists a unique and socially optimal urbanization rate v_{social} at which $\Pi'(v_{social}) = 0$.

In the absence of an explicit solution for the socially optimal urbanization rate, it is still possible to compare it with the optimal urbanization rate under Laissez-faire. This comparison is given by Proposition 1:

Proposition 1. Whether the socially optimal urbanization rate is larger than the Laissez-faire counterpart depends on the values of the within urban inequality, I_u and the migration cost, τ:

a. When $I_u \leq I_r - \eta(1+e)$, that is, when the within urban inequality is sufficiently small, the socially optimal urbanization rate is always larger than the Laissez-faire counterpart;

b. When $I_u > I_r - \eta(1+e)$, for every I_u, there exists a threshold value of τ^* that makes no difference between the two urbanization rates. When $\tau \geq \tau^*$, the socially optimal urbanization rate is larger, and *vice versa*.

Proof:

Because $\Pi'(v)$ is monotone decreasing in v and $\Pi'(v_{social}) = 0$, the comparison simply requires checking whether $\Pi'(v_{market}) > 0$, or, equivalently, v_{market} is to the left of v_{social}. If either of these conditions holds then $v_{market} < v_{social}$, and *vice versa*.

Combining equations (2.22) and (2.28), we have:

$$\Pi'(v_{market}) = I_r - I_u - \eta + ln\tau - \frac{\eta e}{\tau} \tag{2.29}$$

Obviously, $ln\tau - \frac{\eta e}{\tau}$ is monotone increasing in τ, so $\Pi'(v_{market})$ is also monotone increasing in τ.

When $I_u \leq I_r - \eta(1+e)$, using equation (2.29) we obtain:

$$\Pi'(v_{market}) \geq ln\tau + \left(1 - \frac{1}{\tau}\right)\eta e \tag{2.30}$$

Because $\tau \geq 1$, we have $\Pi'(v_{market}) \geq 0$. Therefore, the socially optimal urbanization rate is larger than or equal to that in the Laissez-faire case.

When $I_u > I_r - \eta(1+e)$, we have $\Pi'[v_{market}, (\tau = 1)] = I_r - I_u - \eta - \eta e < 0$. It is also noted that $\Pi'[v_{market}, (\tau \to \infty)] \to +\infty$. Therefore, there exists a threshold value τ^* such that $\Pi'[v_{market}, (\tau = \tau^*)] = 0$. When $\tau > \tau^*$, we have $\Pi'(v_{market}) > 0$ which means that the socially optimal urbanization rate is larger than the Laissez-faire counterpart; and *vice versa*. Q.E.D.

It appears that Proposition 1 is quite intuitive and makes sense. When the within urban inequality is sufficiently low, the social planner with equity consideration has strong incentives to move rural residents to the urban area to improve the overall income distribution, resulting in a higher urbanization rate than otherwise. Conversely, when the within urban inequality is not very low, the social planner is less incentivized to intervene in the urbanization process, especially when the overall migration cost, or, equivalently, the urban-rural income gap, is small. A small urban-rural gap means small efficiency

gains from urbanization. Furthermore, a small migration cost means less necessity for government interventions. In this case, the government can take a neutral position and let urbanization proceed naturally (i.e., driven by market forces). On the contrary, if the overall migration cost or, equivalently, the urban-rural gap is large, it is justified for the social planner to promote urbanization for welfare gains because urbanization or migration, in this case, not only helps increase aggregate productivity but also has the potential to significantly bridge the urban-rural income gap, a significant component of total inequality in many developing economies (Shorrocks and Wan 2005, Young 2013). As a consequence, the urbanization rate would be higher than that under Laissez-faire.

3. Empirical Evidence

The PRC offers an excellent opportunity to examine the equity consideration-urbanization relationship using panel data. Migration cost, especially its intangible component in the form of household registration, has been quite high. On the other hand, the PRC has been experiencing rapid urbanization as well as dramatic changes in inequality along different dimensions in the last four decades (Wan 2007, 2008, 2013). However, not until the late 1990s did the central or local governments gradually began to devote serious attention to the distributional issue. In addition, significant heterogeneity or variations exist across provinces in terms of the speed or level of urbanization, and the seriousness of the inequality issue. These rich variations across space and over time, particularly those in the timing of equity consideration by different provinces, constitute a unique laboratory, helping both the identification and estimation of the relationship between urbanization and equity consideration.

3.1 Modeling Strategy and Data

Given our research focus, the empirical model is specified as:

$$v_{it} = \beta_0 + \beta_1 E_{it} + \gamma X_{i,t} + \phi_i + \varphi_t + \mu_{it} \qquad (3.1)$$

where i indexes province; t indexes year; E_{it} indicates equity consideration by provincial governments; $X_{i,t}$ denotes control variables; ϕ_i represents the provincial fixed effect; φ_t the year fixed effect; and μ_{it} represents random error.

The model of equation (3.1) will be applied to the provincial panel data from the PRC. The urbanization rate is defined as the proportion of urban residents.[6] Migrants, of the order of 270 million now, were counted as urban residents so long as they lived or worked in a city or town for six months or more in a year. Note that large-scale migration in the post-reform period of the PRC only began in the mid-1990s because food, clothing and other rations strictly prohibited population movements until the early 1990s. Mainly for this reason, the data are limited to the period of 1991-2010 (the latest we could obtain data for several variables).

The key variable of equity consideration is defined as a dummy variable, taking value 1 if a provincial government considered the distributional issue in setting its policies and strategies, and 0 otherwise. The values of equity consideration are determined by searching for equity-related words in the annual reports delivered by provincial governors at the provincial People's Congress, usually held in March of each year.[7] Entitled "Annual Report on Socio-economic Development and Planning" (hereafter, the Planning Report), the most important government document in any context, it reviews achievements in the previous year and sets out development objectives and crucial targets for the current year.

Unfortunately, for some provinces pre-1999 Planning Reports are not available to us. The corresponding observations for equity consideration are set to be 0. This is justified on two accounts. First, local governments draw up their reports by following the templates of the central government Planning Report, which never mentioned equity or distributional issues before 1999. Second, based on the 180 Planning Reports for 1991-1999 that are available to us, only four reports mentioned distributional issues.

[6] There are two sets of population data in China: the resident and the *Hukou* populations. According to the NBS (various years), all post-1981 observations refer to the resident population who stayed in the relevant locations for six months or more, and the observations up to 1981 refer to the population with formal *Hukou* status. Since rural-urban migration did not occur in China until after the early 1990s, the official population data used in this paper are consistent.

[7] The words include "narrowing down the income gap", "devoting efforts to increase the income of the middle- and low-income group", "inequality", "income distribution", "poverty", "poor" and the like.

Turning to the control variables, it is rather surprising to find that previous efforts to model determinants of urbanization are scarce, despite considerable literature on urban concentration (Hofmann and Wan 2013). Notable exceptions are Pandey (1977) and Moomaw and Shatter (1996). The independent variables used by Pandey (1977) include population density, industrialization (as measured by non-agricultural employment), cropping intensity (as a proxy for agricultural development), per worker income, literacy rate, and population growth. In addition to these variables, Moomaw and Shatter (1996) included export orientation, foreign assistance, and political factors. The classic dual-economy models highlight the effects of trade, migration restrictions, the urban-rural gap and infrastructure on migration flows (Harris and Todaro 1970; Renaud 1981).

It is worth noting some of the prominent studies on determinants of urban concentration or primacy. Krugman (1991) examined the conditions under which manufacturing and population agglomerations concentrated in one region, rather than spreading over several regions. Black and Henderson (1999) emphasized the importance of knowledge accumulation in driving city expansions.

Based on the above literature and data availability (all data are from the National Bureau of Statistics (NBS), unless indicated otherwise), the following control variables are included in the model of equation (3.1): *Education and health care spending* per capita, measured in Yuan (in logarithms); *Industrial concentration* measured by the provincial share in the national industrial output; *GDP per capita* in Yuan (in logarithms); *Rural income*, measured as net rural income per capita in Yuan as a proxy for agricultural development (in logarithms); Foreign direct investment or *FDI per capita*, converted into Yuan using official exchange rates (in logarithms); *Industrial employment share* in the provincial total labor force, measured in percentage; *Infrastructure*, measured by the ratio of the length of railways and highways to provincial land area (Km/Km^2); *Schooling*, defined as the average years of schooling; *Income gap*, defined as the urban-rural income ratio; *Population density*, defined as the number of persons per square kilometer; *Population growth*, measured as the percentage growth rate of provincial population. All nominal money variables were appropriately deflated.

One important determinant of urbanization that has been overlooked in previous empirical studies is food availability, which strictly binds the level of urbanization (Zhang and Wan 2015). Since the founding of the PRC, food self-sufficiency has been one of the top priorities of the government. Even in the mid-1990s, the provincial governor's "grain bag responsibility system" was instituted to ensure self-sufficiency of staple food items within each province. This system has been in place since then and was recently re-emphasized by the current leadership. For this reason, *Grain* defined as per capita grain output (Kg/head) is added to the model or equation (3.1).

Furthermore, the initial urbanization level in 1983 could be added to accommodate possible convergence or divergence in urbanization. Because the initial urbanization level is perfectly collinear with the provincial fixed effect, we interact it with the time trend variable and include this interactive variable in the model, potentially capturing the effect of time-varying convergence or divergence in urbanization. Table 3.1 presents the summary statistics.

Table 3.1: Summary Statistics

Variables	Obs	Mean	SD	Min	Max
Urbanization Rate	525	42.93	17.49	15.85	88.95
Equity Consideration	550	0.22	0.42	0.00	1.00
ln (Education & Health Care Spending)	516	4.81	0.74	3.43	7.32
Industrial Concentration	580	3.28	3.02	0.02	12.29
ln (GDP per capita)	580	8.39	0.77	6.80	10.44
ln (Rural Income)	580	7.13	0.53	6.10	8.67
ln (FDI per capita)	560	3.18	1.63	-1.95	6.61
Industrial Employment Share	580	23.69	10.54	3.68	59.04
Infrastructure	558	0.44	0.35	0.02	1.97
Schooling	560	7.54	1.16	4.61	11.17
Income Gap	576	2.69	0.78	0.26	4.76
Population Density	580	5.18	1.51	0.61	8.20
Population Growth	579	7.37	4.21	-3.24	17.04
Grain	580	0.37	0.18	0.04	1.31

Sources: China Compendium of Statistics 1949-2008 (NBS 2010) and China Statistical Yearbooks (NBS various years).

3.2 Model Estimation and Empirical Results

Three estimation issues deserve separate discussions. First, according to the theoretical model, equity consideration by policymakers affects urbanization. On the other hand,

governments of more urbanized provinces might be more capable, at least financially, to tackle inequality. Therefore, reverse causality from urbanization to equity consideration might be an issue with our empirical model defined by equation (3.1). This possible endogeneity will be dealt with later. To alleviate possible endogeneity in general, we lag all independent variables except the variable of equity consideration by one year in all models to be estimated. The key variable of equity consideration is not lagged because the Planning Reports are delivered early in the year. Thus, the current level of urbanization is unlikely to generate any impact on the equity variable.

Second, the error term may suffer from both heteroskedasticity and autocorrelation. For instance, if a given shock hits a province, its impact often lasts for several periods. To account for these, we cluster errors at the province level and use heteroskedascity and autocorrelation robust standard errors.

Third, the regressions include possibly non-stationary variables such as per capita GDP, industrialization, foreign direct investment, education and road infrastructure. Although non-stationarity constitutes a possible concern, our analysis uses a panel of 31 provinces spanning 20 years. This implies that the variations used to estimate the coefficients of interest mainly come from cross-province differences, rather than variations over time. Nevertheless, we follow McCoskey and Kao (1999) and test for co-integration of the most encompassing model or model (14) in Table 3.2 (see below). Many co-integration tests are available in the literature. See Baltagi and Kao (2000) and Breitung and Pesaran (2005) for surveys. Since unbalanced panel data are used in this paper, the Fisher-type test is preferred (see Stata manual and Choi 2001). Using this test procedure, the residual of model (14) in Table 3.2 is found to be stationary under all possible lengths of lag[8].

The empirical results are presented in Table 3.2. Column (1) only includes the key variable of equity consideration and in subsequent models the control variables are added one by one. It is clear that equity consideration is found to be positively correlated with

[8] For lag lengths of 1-6 years, the test statistic (inverse χ^2) values are respectively 109.14, 90.18, 82.73, 61.26, 55.66 and 39.34, all indicating rejection of unit roots. The test becomes infeasible with lag length exceeding 6.

urbanization under every model in Table 3.2. Particularly worth noting is that the magnitude of the coefficient estimates for the equity variable is fairly stable, varying within a small range of 1.83-2.16 among the significant estimates. The insignificance of equity consideration in columns (1)-(5) of Table 3.2 is most likely to be caused by omission of relevant variables. These results indicate that where governments paid attention to the equity or inequality issue, the level of urbanization would be higher, by a margin of about 2 percentage points.

The signs of estimated coefficients for most control variables are as expected. For example, the initial urbanization level (interacted with time trend) is found to be negatively correlated with urbanization rate, implying convergence with time-varying speed. FDI is positively correlated with urbanization, reflecting the anticipated impact of globalization. As a matter of fact, the megacity of Shenzhen would not have been created or developed so fast in the absence of the PRC's globalization strategy. Also, in line with a priori expectation, more developed provinces with higher per capita GDP are more urbanized.

The insignificance of some of the parameters in Table 3.2 may be caused by omission of relevant variables in earlier models and multicollinearity in latter models. For example, the parameter estimates for infrastructure are insignificant under models (11)-(14) although it is always positive. As shown in Section 4 below, road density is positively and significantly affected by equity consideration. In other words, equity consideration and infrastructure are collinear which may have undermined the significance of the latter variable. As another example, the coefficient estimates for the spatial agglomeration variable (industrial concentration) are all insignificant and mostly negative. This can be caused by the high correlation between industrial concentration, GDP per capita and industrial employment share. These latter two variables are likely to capture the effect of spatial agglomeration too. After controlling for these two variables, industrial concentration may well reflect capital allocation across provinces or capital intensity. As many studies suggest (e.g., Hicks 1932; Acemoglu 2002, 2007), technical progress in more capital-intensive provinces tend to be capital-biased, leading to substitution of labor by capital. For a given economic structure and per capita GDP (both are controlled in our models), more capital-intensive provinces are expected to employ

less labor than others, implying less migration or lower urbanization. These perhaps help explain why the coefficient estimates of industrial concentration turned out to be negative in Table 3.2.

Table 3.2: Empirical Results

Urbanization Rate	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Equity Consideration	1.45 (1.31)	1.83 (1.51)	2.26 (1.86)	2.04 (1.59)	2.25## (1.39)	1.84* (1.08)	1.99* (1.10)
Initial Urbanization*Trend		-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.03* (0.02)	-0.03 (0.02)	-0.02 (0.02)
L. ln (Education & Health Care Spending)			-3.42 (14.80)	-3.66 (15.05)	-13.85 (16.44)	-10.63 (13.69)	-9.62 (13.00)
L. Industrial Concentration				0.99 (2.47)	-5.14 (3.71)	-4.47 (3.43)	-4.24 (3.73)
L. ln (GDP per capita)					45.39* (26.63)	38.90 (24.34)	31.35 (25.57)
L. ln (Rural Income)						10.01 (10.08)	13.78 (10.34)
L. ln (FDI per capita)							2.79* (1.47)
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	497	458	406	406	406	406	389
adj. R^2	0.10	0.10	0.07	0.06	0.16	0.17	0.17

Note: Standard errors are given in parentheses. The asterisks, *, **, *** and ##, denote significance at the 10%, 5%, 1% and 11.9% levels, respectively.

Table 3.2 Empirical Results (continued)

Urbanization Rate	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Equity Consideration	2.05* (1.15)	2.10* (1.18)	2.07* (1.22)	2.03* (1.12)	2.08* (1.12)	2.15* (1.12)	2.16* (1.18)
Initial Urbanization*Trend	-0.02 (0.02)	-0.03 (0.03)	-0.03 (0.03)	-0.04 (0.03)	-0.04 (0.03)	-0.05 (0.03)	-0.05 (0.03)
L. ln (Education & Health Care Spending)	-9.72 (12.91)	-13.29 (12.69)	-13.82 (12.31)	-17.36 (11.33)	-17.66 (11.97)	-16.31 (11.98)	-16.33 (12.07)
L. Industrial Concentration	-3.96 (4.25)	-3.67 (4.03)	-3.74 (4.03)	-4.40 (3.67)	-4.44 (3.69)	-5.30 (3.84)	-5.24 (4.18)
L. ln (GDP per capita)	31.08 (25.91)	30.10 (25.07)	30.74 (24.94)	39.17* (22.76)	39.18* (22.88)	42.37* (22.90)	42.15* (23.80)
L. ln (Rural Income)	14.55 (11.55)	12.30 (11.10)	12.00 (11.14)	14.90 (10.14)	15.37 (10.29)	16.94* (9.59)	17.02* (9.77)

L. ln (FDI per capita)	2.86* (1.46)	2.91* (1.45)	2.84* (1.49)	2.78* (1.55)	2.74* (1.46)	2.99* (1.49)	3.00* (1.52)
L. Industrial Employment Share	-0.13 (0.45)	-0.30 (0.45)	-0.34 (0.46)	-0.53 (0.51)	-0.51 (0.53)	-0.60 (0.49)	-0.61 (0.51)
L. Infrastructure		14.69** (5.64)	14.35** (5.44)	8.22 (5.32)	8.19 (5.21)	10.40 (6.66)	10.62 (7.14)
L. Schooling			3.19 (4.71)	-0.15 (3.22)	-0.18 (3.32)	-0.67 (2.97)	-0.62 (2.90)
L. Grain				-50.80* (26.35)	-51.36* (26.11)	-44.44* (26.10)	-44.52* (26.09)
L. Income Gap					1.09 (4.63)	1.58 (4.75)	1.56 (4.70)
L. Population Density						34.61 (46.19)	35.17 (46.61)
L. Population Growth							-0.07 (0.59)
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	389	385	385	385	385	385	385
adj. R^2	0.17	0.21	0.21	0.27	0.27	0.28	0.27

Note: Standard errors are given in parentheses. The asterisks, *, **, and ***, denote significance at the 10%, 5% and 1% levels, respectively.

In Tables 3.3 and 3.4, we tabulate results of robustness check. Because past equity considerations may also affect current urbanization, the lagged variable of equity consideration are added to the most encompassing model of Table 3.2 (reproduced in column (1) of Table 3.3), yielding results in column (2) of Table 3.3. They confirm the positive impacts of equity consideration on urbanization although the lagged term is not significant. As the four city-provinces (Beijing, Shanghai, Tianjin and Chongqing) may be outliers as far as urbanization is concerned, we drop them and re-estimate the model with results shown in columns (3) and (4) of Table 3.3. The coefficient estimate for the equity variable in column (3) is positive and marginally significant. The lagged term in column (4) becomes positive and significant at the 10% level.

Table 3.3: Robustness Check

Urbanization Rate	(1)	(2)	(3)	(4)
Equity Consideration	2.16*	2.10*	2.25##	2.03

	(1.18)	(1.16)	(1.37)	(1.33)
L. Equity Consideration		2.11 (1.43)		2.69* (1.43)
Initial Urbanization*Trend	-0.05 (0.03)	-0.05* (0.03)	-0.06 (0.06)	-0.07 (0.05)
Controls	No	Yes	No	Yes
Provincial FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
City-Provinces Included	Yes	Yes	No	No
N	385	371	335	321
adj. R^2	0.27	0.27	0.26	0.25

Note: Standard errors are given in parentheses. The asterisks, *, **, *** and ##, denote significance at the 10%, 5%, 1% and 11.7% levels, respectively. The control variables include education and health care spending, industrial concentration, GDP per capita, rural income, FDI per capita, industrial employment share, infrastructure, schooling, grain, income gap, population density, and population growth (see Table 3.1).

3.3 Migration between or within Provinces?

Migration may take place between as well as within provinces. Inter-provincial rural-to-urban migration increases the urbanization rate of the origin province that did not necessarily consider the equity issue in government policy making. To ensure our results are robust to this problem, we obtained data on migration flows both within and between provinces from the Ministry of Public Security of China (various years). Within-province migration rate (*within*) and between-province migration rate (*between*) are defined, respectively as migration flows within a province and from other provinces divided by the provincial total population. Total migration rate (*total*) is thus the sum of within-province and between-province migration rates.

Table 3.4 reports regression results where within- and between- and total migration rates are regressed on the equity consideration variable, with the same control variables that were used to estimate model (14) of Table 3.2. Columns (1)-(3) of Table 3.4 are obtained using data from all provinces. Columns (4)-(6) are obtained when city-provinces of Shanghai, Beijing, Tianjin and Chongqing are excluded. The results show that equity consideration did help attract migrants or promote urbanization irrespective of the nature of migration flows. These results also help confirm the robustness of the earlier regression results.

Table 3.4: Migration within and between Provinces

Migration Rate	(1) within	(2) between	(3) total	(4) within	(5) between	(6) total

Equity Consideration	0.16* (0.08)	0.84## (0.53)	1.17** (0.50)	0.22** (0.09)	0.43** (0.19)	0.65** (0.27)
Initial Urbanization*Trend	-0.00 (0.00)	0.02** (0.01)	0.03*** (0.01)	0.00 (0.00)	0.01 (0.00)	0.01 (0.01)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City-Provinces Included	Yes	Yes	Yes	No	No	No
N	273	279	273	244	244	244
adj. R^2	0.52	0.65	0.65	0.57	0.46	0.51

Note: China's Ministry of Public Security collects information on temporary resident population or floating population. Standard errors are given in parentheses. The asterisks, *, **, *** and ##, denote significance at the 10%, 5%, 1% and 12.6% levels, respectively. The control variables include education and health care spending, industrial concentration, GDP per capita, rural income, FDI per capita, industrial employment share, infrastructure, schooling, grain, income gap, population density, and population growth (see Table 3.1).

3.4 Endogeneity

To further address the possible endogeneity problem mentioned in Section 3.2, we examine whether the level of urbanization affects the government's concern about inequality by estimating the following regression:

$$E_{it} = \beta_0' + \beta_1' v_{i,t-1} + \gamma' X_{i,t-1} + \phi_i + \varphi_t + \mu_{it}' \qquad (3.2)$$

The lagged term of urbanization rate is used because, as argued above, the current level of urbanization is unlikely to affect current equity consideration. Again, all the control variables are lagged.

Table 3.5 presents empirical estimates for the model of equation (3.2). Columns (1)-(3) contain Probit regression results while columns (4)-(6) contain Logit regression results. Models in columns (1)-(2) and (4)-(5) were estimated using the full sample of data while those in columns (3) and (6) were obtained without the four city-provinces. The last row reports *p*-values for the coefficient of urbanization rate. Clearly, the level of urbanization had no significant effect on distributional concerns. Thus, it appears that reverse causality was not a serious problem with our empirical models.

Table 3.5: Endogeneity Check

Equity Consideration	(1) Probit	(2) Probit	(3) Probit	(4) Logit	(5) Logit	(6) Logit
L. Urbanization Rate	-0.00 (0.01)	0.02 (0.02)	0.00 (0.02)	-0.01 (0.02)	0.03 (0.03)	0.00 (0.04)
Initial Urbanization*Trend		0.00 (0.01)	-0.01 (0.01)		0.01 (0.01)	-0.02 (0.02)

Controls	No	Yes	Yes	No	Yes	Yes
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City-Provinces Included	Yes	Yes	No	Yes	Yes	No
N	257	184	158	257	184	158
Prob (L. Urbanization Rate = 0)	0.84	0.31	0.87	0.80	0.39	0.99

Note: Standard errors are given in parentheses. The control variables include education and health care spending, industrial concentration, GDP per capita, rural income, FDI per capita, industrial employment share, infrastructure, schooling, grain, income gap, population density, and population growth (see Table 3.1).

It is note that, in Table 3.2, we considered as many control variables as the relevant literature indicates. Even extra control variables from the concentration and agglomeration literature were included (see earlier discussions on control variables). This is to minimize the probability of omitting relevant variables, which, in turn, can help minimize the probability of endogeneity that might be caused by omitted variables. The stability of parameter estimates for the equity variable in the latter columns of Table 3.2 also helps demonstrate the robustness of our estimates.

4. From Equity Consideration to Urbanization: Exploring Possible Transmission Channels

As is known, any initiative that affects the pulling force, the pushing force or the costs of migration affects urbanization. There are many such government initiatives and policies. What is needed here is to establish the connection between equity consideration and these initiatives or policy measures.

Before proceeding further, it is important to highlight two points in relation to Proposition 1 which states that equity consideration will result in a higher level of urbanization than otherwise. First of all, Proposition 1 relies on equilibrium solutions to the optimal urbanization rates. Thus, initiatives or interventions arising from equity consideration must be sustainable to be consistent with Proposition 1. To be sustainable, they must not be anti-migration because, as a stylized fact, the GDP share of the rural sector in developing countries declines in the long run, so does the share of rural employment. In other words, anti-migration initiatives or policies are considered to be inconsistent with our proposition. Second, this proposition comes with two conditions:

sufficiently large urban-rural gap or migration cost, and sufficiently small urban inequality. In reality, the latter condition is rarely met whereas a large urban-rural gap is almost the rule rather than the exception in developing economies (Kuznets 1955, Young 2013). Thus, government initiatives that target the urban-rural gap or migration costs are consistent with Proposition 1.

In this context, two stylized facts are important. First, it is well-known that abject poverty is largely a rural phenomenon and poverty is essentially a distributional issue in many developing countries.[9] Meanwhile, poverty reduction has ranked highly on government agendas for decades, especially since 2000 when 192 heads of states jointly agreed and declared the Millennium Development Goals. Second, in many developing countries, the urban-rural gap constitutes a significant portion of the overall income inequality, particularly in the early stages of development (Shorrocks and Wan 2005, ADB 2012b, Young 2013). These stylized facts naturally prompt governments that are concerned about equity to initiate and implement interventions that are pro-rural or pro-farmers. As highlighted below, two of the most popular forms of such interventions are the urban-rural connectivity and job creation through development of non-farm activities or industrialization.

Regarding connectivity, many in the development community, including development economists, have been arguing that lack of market access by farmers is a major cause of rural poverty and the large urban-rural gap. It deprives farmers of income-earning opportunities and hinders the use of modern inputs including high-yielding seeds, chemical fertilizers, pesticides, etc. Provision of market access, of course, requires physical connectivity, particularly transport and telecommunication infrastructures. Such infrastructure development would not only facilitate migration or urbanization directly (Renaud 1981), but also generate spillover effects and enhance capital deepening (Barro 1990), which, according to equation (2.4) in this paper, would lead to higher urban wages.

[9] The poor are those at the bottom of the income distribution.

Conversely, the importance of job creation in the context of combating poverty and inequality requires little elaboration. For those living in poverty or at the bottom of the income ladder, labor is the main, if not the only, asset they possess and the very initial step for them to step out of poverty and improve their lives is to find jobs. This is particularly true for the unemployed or underemployed farmers in developing countries where social protection is largely absent. It is commonly recognized that industrialization is the key to job creation in developing economies, which helps attract rural migrants.

In the case of the PRC, to bridge the urban-rural gap, the central and local governments have, for many years, implemented a strategy, called "*santong*" or three connectivities, namely, providing transport, electricity and telecommunication infrastructures to support rural the PRC. Regarding the transport infrastructure, we focus on roads only. Railways are not considered as it is not part of the "*santong*" campaign and because railways do not directly target the rural communities. Turning to the industrialization drive, the PRC is well-known for her success in generating jobs for the underemployed or unemployed agricultural labor force, as reflected by the presence of more than 270 million migrant workers in the PRC today. Although there are many determinants of industrialization, bank lending to manufacturing firms is certainly crucial. In what follows, we attempt to empirically establish that, in the PRC, equity consideration exerted positive impacts on the urbanization drivers of road density and bank lending to the industrial sector.

Relying on provincial panel data from the PRC, Table 4.1 reports empirical results where the road density and industrial loan variables are regressed on equity consideration. The dependent variable in columns (1)-(3) is road density measured in Km/Km^2 (*Road*). The dependent variable in columns (4)-(6) is bank lending (*Loan*) to the industrial sector (in logarithms). The control variables include GDP growth, GDP per capita (in logarithms), industrial employment share, and industrial concentration. The empirical results show that equity consideration is positively and significantly correlated with road infrastructure and industrial loans. These findings hold whether city-provinces are considered or not and they help establish the equity consideration–to–urbanization transmission mechanisms.

Table 4.1: From Equity Consideration to Urbanization

	(1) Road	(2) Road	(3) Road	(4) Loan	(5) Loan	(6) Loan
Equity Consideration	0.08***	0.07**	0.05##	0.05*	0.04**	0.05**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
Controls	No	Yes	Yes	No	Yes	Yes
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City-Provinces Included	Yes	Yes	No	Yes	Yes	No
N	550	521	464	494	465	414
adj. R^2	0.66	0.68	0.69	0.59	0.63	0.63

Note: Standard errors are given in parentheses. The asterisks, *, **, *** and ##, denote significance at the 10%, 5%, 1% and 14% levels, respectively. The control variables include GDP per capita, GDP growth, industrial employment share, and industrial concentration (see Table 3.1).

5. Summary and Conclusions

An unaddressed but important question in both development practice and development economics is how equity consideration may affect urbanization. Exploring this question is crucial for the welfare of more than 5.9 billion people in the developing world whose governments generally disfavor large scale of migration and unprecedented urbanization in human history (Quigley 2008; ADB 2012a). Added to this background is the overwhelming and growing attention being directed toward issues of inequality and inclusive growth. These appeal for both analytical and empirical research on the urbanization-inequality nexus that so far has been largely overlooked in the economics literature.

Complementing Au and Henderson (2006), who pioneered the work on optimal urban concentration, this paper represents a first attempt to develop two-sector equilibrium models for analyzing the optimal level of urbanization. In particular, our social welfare optimizing model explicitly incorporates the equity dimension into the objective function, leading to the theoretical prediction that when the urban-rural gap or migration cost is large or when urban inequality is low, the socially optimal level of urbanization would be higher than what could be derived without considering equity. In reality, the cost of internal migration in the developing world is large, particularly when both tangible and intangible costs are considered (Lewis 1954; Sjaastad 1962). This is indicated by the well-known urban bias and the dominant role of the urban-rural gap in

constituting national inequalities in the developing world, as documented by Shorrocks and Wan (2005), Wan (2007) and Young (2013), among others.

Our theoretical prediction is then confirmed by empirical modeling of the urbanization process in the PRC, using provincial level panel data. The key explanatory variable of "equity consideration" is constructed by scanning words related to inequality or distribution in the most important policy document – the annual government report delivered by provincial governors (the Prime Minister for the national report) in early March of each year. The regression results confirm the theoretical prediction: the equity consideration leads to a higher rate of, or faster, urbanization. Our modelling results are robust to various model specifications, different migration flows and possible endogeneity.

Finally, the transmission mechanisms from equity consideration to urbanization are explored. Policymakers are well aware of the dominant role of the urban-rural divide in constituting national inequality and poverty in developing economies. To bridge this gap, urban-rural connectivity and jobs for underemployed or unemployed farmers are most crucial. Both require investment in road infrastructure and industrial development, which are expected to promote migration and urbanization. Our empirical findings on the significant correlation between equity consideration and road density or industrial loan in the PRC help establish two equity consideration-to-urbanization transmission channels.

The policy implication of this paper is clear: actively promoting urbanization could lead to gains in the overall social welfare when the tangible or intangible migration costs are large. This implication may not have been realized by policy makers and other stakeholders. Consequently, the prevailing practice of most developing countries to restrict or slow down migration and urbanization should be reversed. Needless to say, being proactive in promoting urbanization requires careful crafting and implementation of urbanization strategies, policies and planning, in order to alleviate or even avoid various urban diseases.

This paper could be extended in several directions. First, our theoretical framework can be adapted to explore the relationship between regional or world inequality and cross-border migration, drawing implications for globalization or regional integration.

Second, firms are assumed to be homogenous in this paper but agent heterogeneity in terms of wage differences within and between sectors is considered. However, incorporating firm heterogeneity is not expected to change the main findings of our paper. Third, market failures and various externalities such as environmental consequences of urbanization are not considered in this paper. And finally, one could extend our theoretical models by allowing migration costs and inequality to vary as urbanization proceeds, notwithstanding the potentially complex and highly non-linear relationship between inequality and urbanization (Wan 2013).

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