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**A Simple Model of the Chinese Hukou  
System and Some Ongoing Reforms**

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# **A Simple Model of the Chinese *Hukou* System and Some Ongoing Reforms**

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**Abstract:** We model the Chinese *Hukou* (household registration) system, from the Mao era when it was strictly enforced to the early reform era (Deng Xiaoping era) when peasants were allowed to migrate to cities for work only. We document some stylized characteristics of *Hukou* control, and based on which build a rigorous model of the dual labor market generated by it. The model can explain the urban-rural divide, and the fact that rural migrant workers not only made important contributions to China's export boom, but also reversed the Chinese trade pattern—from exporting primary products to manufactured goods, because they are the labor force in “the manufacturing center of the world”. Reform recovers some of the deadweight losses from Mao's strict *Hukou* control, but the gains from reform are unevenly distributed. We also apply the model to examine the impacts of various policies and some ongoing reforms such as special economic zones, export-tax refund, urbanization, privatization, one-child policy, etc.

**Keywords:** Chinese Institutions, Discrimination, *Hukou*, Rural-Urban Migration, Earnings Inequality, Trade Policy, Special Economic Zones, Urbanization

**JEL Classification:** F1, J4, P2, P3

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*“Living conditions that to me looked close to prison life: 10 or 15 workers in one room, 50 people sharing a single bathroom, days and nights ruled by the factory clock. Everyone they knew lived in similar circumstances, and it was still better than the dormitories and homes of rural China.”* (from *The Voice of China’s Workers* by Leslie T. Chang, author of *Factory Girls*—

*From Village to City in a Changing China*)

## 1. Introduction

They make shoes, socks, shirts, handbags, electronic appliances, smart phones, smart pads and computers that are sold worldwide; they build highways, railroads, trains, ports, ships, cars and skyscrapers, and etc. and so on; in a word, they are the labor force in “the Manufacturing Center of the World”. They, are the migrant workers in China. In 2013, the official figure for them was .26 billion (China Daily web, March 6, 2013), bigger than the combined total population of England, France, Germany and Italy! More astoundingly, about 100 million children are left behind them in the countryside in early 2016, usually to relatives (e.g., grandparents).<sup>1</sup> A recent survey paper on China’s family planning policy by Wang, Zhao and Zhao (2016) shows that the rural-urban migration has reversed the population aging pattern in China: while coastal cities had lower fertility rates and stricter family planning policy implementation, the population aging rates are lower there than in inner provinces.

It is no coincidence that in 2012, China became world #1 in terms of trade volume, reaching \$3.87 trillion in goods trade, earning a surplus of \$2000 billion. Even the previous #1, the U.S., felt hard its impact in various ways such as unemployment, wages, prices, labor force participation and even political voting behavior (see Autor, Dorn and Hanson, 2013; Che, Lu,

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<sup>1</sup> Fa Zhi Wan Bao (Law Evening News): <http://www.jdnews.com.cn/jdpd/syxw/62119634.html>

Pierce, Schott and Tao, 2016).<sup>2</sup> More surprisingly, the Chinese trade pattern has been completely reversed from 30 years ago: in 1980, the share of primary exports was roughly 50 percent, but by 2011, it had fallen to merely 4.5 percent.

Steady urbanization is also observed during this period. In 1982, urban population (including both urban and rural status) was only 20.91 percent of the total population, but the ratio reached 26.44 percent in 1990, 36.22 percent in 2000, and 49.68 percent in 2010.<sup>3</sup> And this trend is expected to increase because one of the goals of the central government's plan for the period 2014--2020 is urbanization. New migrants may work in township businesses, as part-timers in publically owned firms, or even open their own small businesses such as repairs, delivery, construction, homecare, cleaning, sales, etc. However, in a recent study with 2005 countrywide data, Fu, Li and Yang (2015) find that rural migrants benefit much less from China's urbanization than do workers with urban status. There exists "double discrimination", against residents who carry both rural and migrant status (vs. local rural status). In fact, *Hukou* restrictions take away a big part of migrants' contributions and redistribute them to residents with urban status. Knight and Song (1995) call employees in state-owned enterprises "insiders", and Chan (2009) terms the discrimination and exploitation generated by *Hukou* the "secret recipe" for China's recent success in economic growth.<sup>4</sup>

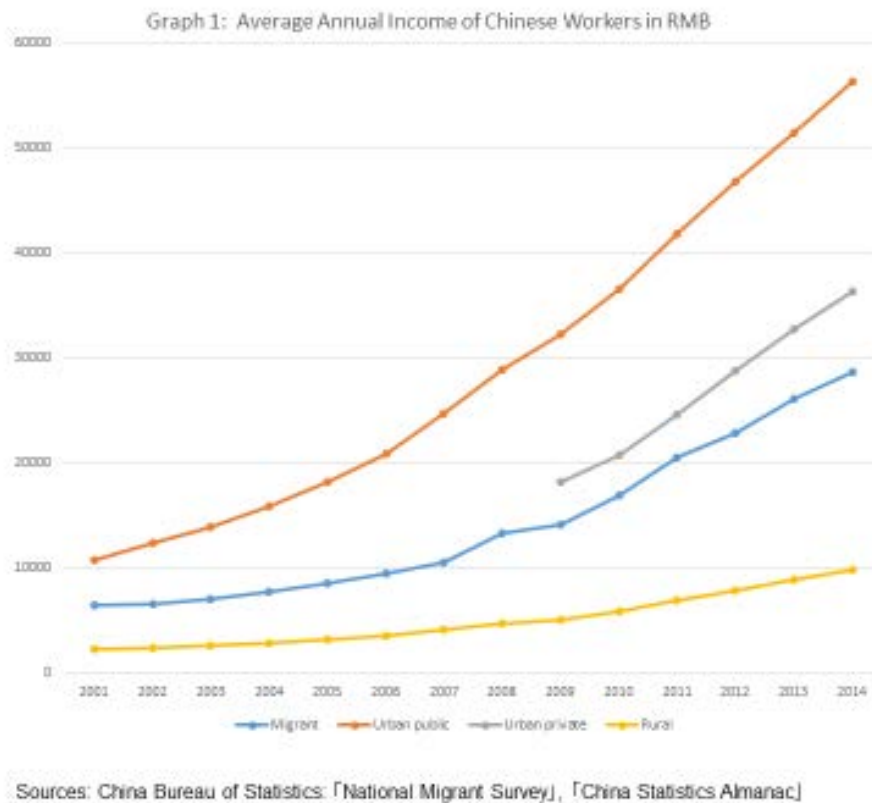
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<sup>2</sup> Keller and Utar (2016) find that import competition from China caused job polarization in Denmark through shifts from manufacturing to services, increasing income inequality.

<sup>3</sup> Source: Chinese government: <http://www.stats.gov.cn/tjsj/Ndsj/2011/html/D0305e.htm>

<sup>4</sup> In some remote and backward provinces, nowadays it is easy to change from rural *Hukou* to urban *Hukou*, but real differences remain in that the status changers obtain a much lower "minimum pension", and it may be hard for them to find jobs.

Graph 1 presents the earnings for workers of different status from 2001 to 2014. It clearly shows that urban workers in public (state- and local public-owned) enterprises earn the highest income, rural workers earn the least, and migrant workers earn slightly higher than rural workers. And the gap appears to be increasing. However, this is not the whole story, because residents with urban status possess housing properties in China's booming cities, a privilege most rural residents have been deprived off, though this is gradually being changed in some small cities.



In this paper, we argue that the Chinese migrant workers are to a large extent responsible for the recent boom of Chinese exports and the reversal of its trade pattern. These migrant workers are created by an important institutional factor, namely, the loosening of the Chinese

household registration system (*Hukou*). *Hukou* control generates a segmented, dual labor market—rural vs. urban, associated with two different types of status and earnings. We first document some stylized characteristics of *Hukou*, then build a simple model of the resulted dual labor market, and link it to China's recent export changes. We demonstrate that during the transition period when rural workers are allowed to work in the cities, *Hukou* rationing keeps migrant wages at low levels, enabling urban manufacturing firms to increase output and exports, and raise the income of those residents with urban status.<sup>5</sup>

Reform certainly recovers some of the deadweight losses due to Mao's strict *Hukou* control, but the gains of reform are unevenly distributed. In particular, a big part of the migrant workers' contributions is taken away by residents with urban status. In other words, the recent Chinese urban expansion rests on the countrywide, systematic sacrifice and exploitation of rural residents. We also extend the model to incorporate seasonal migration, when peasants work in the countryside during busy seasons but migrate to cities for work during off-seasons.

More interestingly, we apply the basic model to examine the impacts of various Chinese policies and ongoing reforms such as “special economic zones (SEZs)”, export-tax refund, urbanization, foreign direct investment (FDI), privatization of the state-owned firms, the creation of a service sector using migrant labor, one-child policy and the “demographic dividend”, etc. Specifically, we investigate how these reforms and policies affect the rural and urban wages, peasant migration and exports. We find that the mass migration movement from rural villages to expanding cities made China “the manufacturing center of the world”, and it has been

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<sup>5</sup> In reality, the income increase of urban residents may exist in different forms, such as the surge of housing assets, etc.

transforming Chinese society in many different ways, in essence much as immigration to America's shores remade the U.S. a century also ago. However, as the "demographic dividend" is gradually eroding, China may lose its competitive edge in manufacturing.

There is an abundance of empirical literature and documentation on the *Hukou* system and its influence on Chinese economic development, such as Lin, Cai and Li (1994), Knight and Song (1995), Knight, Song and Jia (1997), Solinger (1999), Zhao (1999a, 1999b), Wang (2005), Au and Henderson (2006), Naughton (2007), Brandt and Rawski (2008), Ito (2008), Dong and Xu (2009), Cai (2010), Chan (2009, 2010a, 2010b), Knight, Deng and Li (2011), Li, Li, Wu and Xiong (2012), Meng (2012), and Fu, Li and Yang (2015). The vast empirical literature deals with rural-urban migration, earnings inequality, rural and urban employment etc. under *Hukou* control. For in-depth surveys of the *Hukou* system, see Knight and Song (1995) and Chan (2009), the latter of which especially argues that this system has become an obstacle for China's further modernization.

However, one can hardly find any rigorous theoretical work on the *Hukou* system. Recently, Fields and Song (2015) study the Chinese dual labor market, using a job-search approach and focusing on search costs and benefits of different worker options. They analyze the effects of labor policies on Chinese welfare using criteria like first-order stochastic dominance and an abbreviated social welfare function. In contrast, the present paper adopts a simple approach, but is able to tie *Hukou* to the recent Chinese trade boom ('manufacturing center') and trade pattern reversal, and unify various ongoing reforms such as special economic zones, urbanization, one-child policy, privatization and their effects on the Chinese economy.

The paper is also closely related to the literature on dual labor markets and migration in general, such as the classic works by Lewis (1954), Harris and Todaro (1970), Jones (1971), Mussa (1974), Fields (1975) and Stiglitz (1982). Becker (1971) pioneers the research on the economics of discrimination; Feenstra (1980) studies factor market distortions in an open economy; Bulow and Summers (1986) show the necessity to segregate the labor market when employers pay more to some workers to elicit effort; and Hsieh and Klenow (2009), Huang and Tao (2010) and Brandt, Tombe and Zhu (2013) examine factor and resource distortions in China.

The reminder of the paper proceeds as follows. Section 2 briefly reviews the Hukou system; Section 3 sets up the basic model with Hukou control and labor market segmentation; Section 4 incorporates rural-urban migration into the model and establishes the “partial migration” equilibrium under *Hukou*; Section 5 analyzes the gains and distribution of gains from reform; Section 6 introduces trade into the model and shows how migrants create the Chinese trade pattern reversal and trade boom; Section 7 examines some ongoing reforms such as special economic zones, export tax refund, urbanization and one-child policy; Finally, Section 8 includes concluding remarks.

## **2. A Brief Review of Some Historical Facts**

One sometimes sees harsh discrimination in the labor market against foreign citizens. But in China, it is used to systematically discriminate against rural residents. Soon after the communists took over China, a new constitution was established in 1954, and it actually stated that citizens have the freedom to migrate, across region and occupation. However, in January 1958, a new regulation changed all that: a very rigid household registration system, *Hukou*, was imposed, which segments the population into two status groups: agriculture (rural) and non-agriculture



(urban). Each and every resident must reside and work in the registered village or community and firm premises (“danwei” in Chinese). It is almost impossible to change status or residency, especially from rural status to urban status, or from small towns to big cities. Urban citizens enjoy a range of social, economic and cultural benefits that rural citizens do not receive. To be more exact, urban earnings in fact include food and clothing rations, health care, retirement pension, housing benefits, guaranteed admittance to an urban school up to high school, theatres, parks, libraries, sports and other entertainment facilities, etc., which are privileges a resident with rural status is deprived off.

The intended goal was threefold: to reduce urban unemployment caused by the regime changeover, and to lock most of the population into agriculture in order to provide life support for the minority living in the cities, and to accumulate surplus for industrial development, just as explained in Lewis (1954). In 1957, urban population was 99.49 million, roughly about 15.4% of the total population in the country (China Statistic Almanac, 1987, p.89). Under the new *Hukou* rationing, migration was banned and those who dared to move without official permit would be charged and even put into prison for serious offenses.

*Hukou* control was the most fundamental and effective tool for China’s command economy during the Mao era. Its impact would be so overwhelming that Tian (2003) calls the *Hukou* book “China’s No. 1 Document.” Historians argue that *Hukou* control heavily aggravated the death toll during the so-called “Great Leap Forward” period (1958-1960), when peasants were locked to their villages and over 30 million were starved to death by officially published Chinese figures (See Cao (2005)).

Also, almost immediately after the Communists overthrew the Nationalists in 1949, land was taken away from landlords and capital was confiscated from capitalists by the central

government through a series of land reforms and commercial and industrial reforms. Then *collective ownership* was imposed such that all land and all capital belong to the whole country (i.e., the central government).<sup>6</sup> Consequently, all profits from industry and commerce were collected by the government, and peasants must pay taxes every year. In essence, the return to capital in the urban regions and the return to land in the countryside were collected by the government. Under *Hukou* control, while rural residents work in the countryside, urban residents work in state-owned enterprises (SOEs) or local government owned businesses.

However, the strict household registration system was not unique to the communist regime. In fact, about 2370 years ago in Qin-Dynasty China, a similar system was adopted---the so-called “Shang Yang reform”, whose goal was to develop agriculture though. The population was locked to land, commerce was prohibited and no travelling was allowed without official permit. Households were organized to monitor each other, and one would be punished for a neighbor’s violations. Meanwhile, the rigid system also helped to collect taxes, draft for war and public projects and strictly control the flow of information. Even this part is also very similar to the Mao era, when China had “railroad soldiers” and “construction soldiers”, most of whom consisted of young men from the countryside.

### **3. Basic Model Setup**

Based on the historical facts, we can construct a framework that is roughly a combination of the Harris-Todaro model, the Lewis model and the Ricardo-Viner model, with some twists. The

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<sup>6</sup> In practice, only the residents in a certain village have the privilege to use the land there, and only the workers with urban status in a certain company can claim ownership to profits and rents there.

monopolistic competition model in the spirits of Dixit-Stiglitz-Krugman can also deal with labor migration to some extent, but land is not a factor in that model, agriculture production exhibits constant returns to scale and capital is either nonexistent or can be owned by anybody in a country in principle, which are far from the Chinese reality where peasants are abundant and have not been allowed to own properties in urban regions until very recently. In contrast, our setup incorporates various aspects of recent Chinese institutions and thus is relevant in analyzing the Chinese economy, as will become clear soon.

Consider an economy consisting of two sectors: manufacturing ( $x$ ) and agriculture ( $y$ ), with  $y$  as the numeraire good. Perfect competition prevails in both sectors. The country is endowed with a total labor of  $L = L^R + L^U$ , initially with  $L^R$  and  $L^U$  of them living in the rural and urban areas respectively.

Manufacturing uses labor and sector-specific capital  $K$ :

$$x = x(L^U, K). \quad (1a)$$

In contrast, agricultural production uses labor and sector-specific land  $T$ :

$$y = y(L - L^U, T). \quad (1b)$$

### 3.1 Labor market segmentation in the Mao era

Under China's strict *Hukou* system in the Mao era, the number of residents with urban status,  $L^U$ , is determined by the government, and the rest of the population,  $L^R = L - L^U$ , is given rural status and must reside and work in the countryside. Urban status comes with many

benefits such as better medical benefits, guaranteed urban education up to high school,<sup>7</sup> retirement pension, guaranteed job opportunities in state-owned or publicly owned businesses, renting or buying apartments with substantial government subsidies, etc. In contrast, rural residents have none of them.

Given the above facts, the rural and urban earnings under a simple *Hukou* system can be respectively written as,

$$w_0^R = y_L(L^R, T), \quad (2a)$$

$$w_0^U = x_L(L^U, K)p, \quad (2b)$$

where  $p$  is the relative price of good  $x$ , assuming a closed economy initially. Note that  $p$  is to be determined in (8) by consumer utility maximization, as explained in Section 6 in order not to interfere with the flow of the paper here.

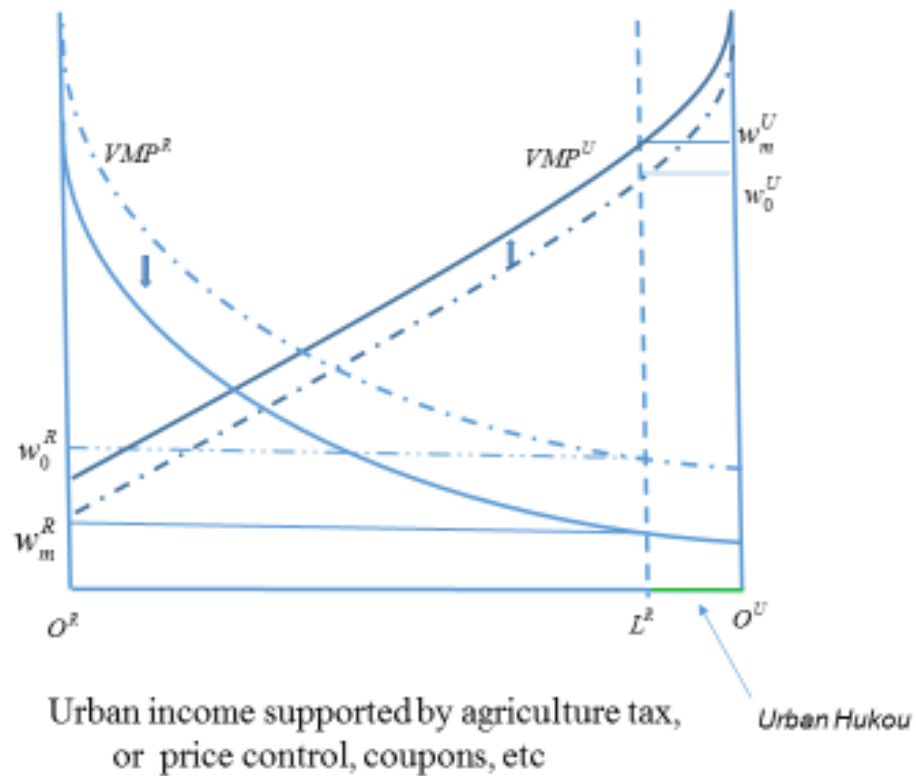
In Figure 1, the horizontal and vertical axes denote respectively labor employment (rural from the left and urban from the right) and earnings (the value marginal products of labor). In the absence of labor market impediments, the wages would be equalized by labor migration between the two sectors. But due to *Hukou* rations, there exists a large gap between  $w_0^U$  and  $w_0^R$ . The strict *Hukou* system creates severe overemployment in the countryside, leading to extremely low productivity and low earnings. Note that in the classic Lewis model (1954), the marginal product

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<sup>7</sup> *Hukou* control not only creates an urban-rural divide, but also an inter-city divide. Even today, the chances of getting into Peking University or Tsinghua University (arguably the top 2 universities in China) would be 30 to 50 times higher (which can be easily calculated based on the ratio of enrollment over the number of college entrance exam takers), if the student has a Beijing *Hukou* rather than a *Hukou* from a remote province such as Guizhou, Henan, Jiangxi, Sichuan or Yunnan.

of labor in agriculture is assumed to be zero, while in the present model, the earnings gap is caused endogenously by the government policy, *Hukou*, and labor supply in the countryside is not unlimited. Also, we abstract from modeling urban unemployment which is not essential for our purpose. Readers are referred to Harris and Todaro (1970) for the treatment of urban unemployment and rural-urban migration.

Figure 1. *Hukou*—Mao Era Income Gap:  $w_m^U - w_m^R$



In addition to the *Hukou* restrictions, peasants must pay an agriculture tax, which was only abolished on January 1, 2006. In Figure 1, the agriculture tax shifts the  $VMP^R$  curve downward, and as a consequence, the rural wage is forced down from  $w_0^R$  to  $w_m^R$ . On the other

hand, the collected tax is used to support construction of roads, factories or simply parks and entertainment facilities in urban areas, that can shift up the  $VMP^U$  curve and the urban earnings from  $w_0^U$  to  $w_m^U$ , enlarging the urban-rural gap. It is interesting to note that even without the agriculture tax, large urban-rural earnings gap can be maintained similarly with other institutions, such as price controls and rations, which were rampant in the Mao era (including different coupons for rice, wheat, cloth, meat, oil, etc.). China abolished most coupons in 1993, fifteen years after Deng Xiaoping started the reform.

#### **4. The Reform Era and Rural–Urban Migration**

In the past 35 years also, gradually rural residents have been allowed to migrate to cities, for work only. Until very recently, migrants do not enjoy the aforementioned benefits as city residents, and usually return to the countryside when their work is finished. That is, while *status discrimination* is maintained, peasants are now allowed to use their labor in urban areas, increasing their productivity as a consequence. In practice, they can be hired as part-time workers in publically owned firms and township firms (“xiang zhen qi ye” in Chinese) such as construction workers, or even open their own small businesses such as in services (repairs, vending, homecare, delivery, doorman, etc.). In some cases, a tiny fraction of them can obtain urban status, by for instance, joining the military and then retiring to work in a state-owned firm, or going to college and then changing the registration status given at birth, or passing exams when the state-owned sector expands and hires workers from the countryside.<sup>8</sup>

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<sup>8</sup> In the last couple of years, in the most industrialized coastal regions such as the Pearl river delta and the Shanghai-Zhejiang regions, rural migrant workers have been allowed to enjoy partial benefits of urban residents, such as allowing their children to

Denote  $L_y^R$  and  $L_x^R$  as the residents with rural status but working in the rural and urban regions respectively, satisfying  $L_x^R + L_y^R = L^R$ . In addition, among those migrant rural residents, the government chooses a tiny fraction  $\rho$  to obtain urban status, i.e.,  $\rho L_x^R$  qualifies as city residents, while  $(1 - \rho)L_x^R$  of them work in cities but retain rural status. Then the total number of urban residents becomes  $L^U + \rho L_x^R$  in the reform era.

As a result, there exist three types of workers with three wages in the whole country under migration: the urban residents who earn the urban income  $w^U$ , the rural workers who do not migrate and earn the rural income  $w^R$ , and the migrant workers who return to rural areas after work and receive the migrant income  $w_x^R$ .

#### 4.1 Quasi-migration equilibrium

When the urban sector expands, even though the government may act first by announcing the ratio or quota of recruitment for new urban employees, each migrant is not certain that he or she will be able to change status from rural to urban. The expected probability of obtaining urban status is  $\rho \in (0,1)$ , and with probability  $1 - \rho$ , he/she retains rural status and earn a reservation wage,  $\delta w^R$ , where  $\delta \geq 0$  is a constant. If  $\delta = 1$ , then the migrant's reservation wage is the rural wage; but in reality  $\delta > 1$  is more likely, as shown by the income gaps in Table 1.

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enter local schools without extra payment and allowing them to take local college entrance exams instead of sending them back to their hometowns for such exams.

Given the above description, the migrant's expected gross wage,  $w_x^R$ , can be written as follows

$$w_x^R = \rho w^U + (1 - \rho)\delta w^R. \quad (3)$$

Note that  $w^U$  is not fixed; rather,  $w^U \equiv w^U(L^U + \rho L_x^R)$ .

We also assume that each migrant must pay  $c (>0)$  as the migration cost. This cost is non-negligible, because it can include costs of travelling, search cost for jobs, and costs for living away from home, etc. When choosing to migrate or not, the typical rural resident compares  $w_x^R - c$  and  $w^R$ . Apparently, if  $w_x^R - c > w^R$ , peasants will keep moving to cities for work. So migration reaches an equilibrium when

$$w_x^R - c = w^R, \quad (4)$$

which can be combined with (3) to yield the equilibrium rural and migrant earnings as

$$w^R = \frac{\rho}{1 - (1 - \rho)\delta} w^U(\cdot) - \frac{1}{1 - (1 - \rho)\delta} c, \quad (5a)$$

$$w_x^R = \frac{\rho}{1 - (1 - \rho)\delta} w^U(\cdot) - \frac{(1 - \rho)\delta}{1 - (1 - \rho)\delta} c. \quad (5b)$$

In the case of  $\delta = 1$ , the above can be simplified to

$$w^R = w^U(\cdot) - \frac{1}{\rho} c, \quad (6a)$$



$$w_x^R = w^U(\cdot) - \frac{1-\rho}{\rho} c. \quad (6b)$$

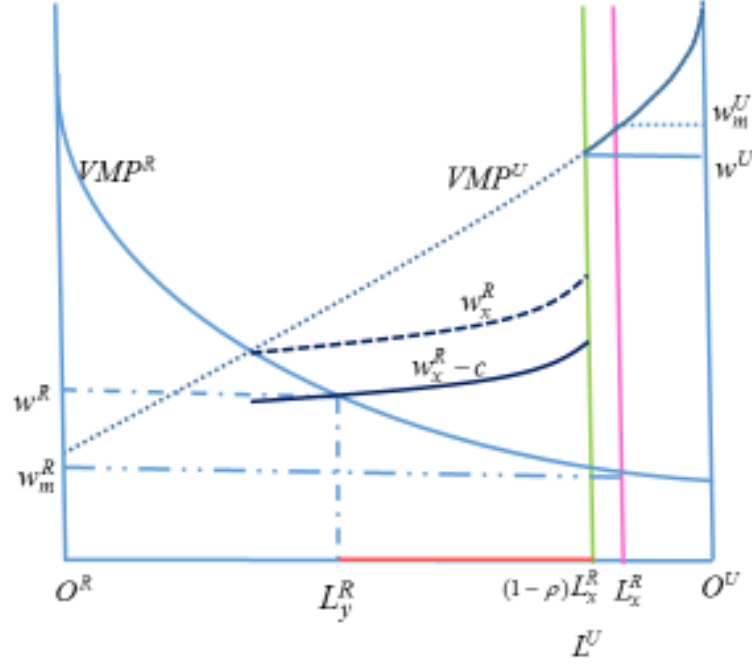
With the added population from rural immigration  $\rho L_x^R$  obtaining urban status, the urban income is given by,

$$w^U = x_L(L^U + \rho L_x^R, K)p. \quad (7)$$

Thus, given the relative price  $p$ , the migration equilibrium in the reform era is determined by Eqs. (3), (4), (7) and  $L_x^R + L_y^R = L^R$ , which jointly yield the solutions to  $L_x^R$ ,  $L_y^R$ ,  $w^U$  and  $w^R$ .

Figure 2 depicts the quasi-migration equilibrium, drawn with  $\delta = 1$  for picture clarity (i.e. the migrant's reservation wage being  $w^R$ ). With  $L^U$  and  $\rho$  given by the government, the urban income  $w^U$  can be found on the  $VMP^U$  curve to the right of the vertical green line. In contrast, rural migrants face the expectation of  $\rho$ , and migration leads to the formation of the positively sloped dotted curve  $w_x^R$ , which is a linear combination of  $VMP^U$  and  $VMP^R$ , to the *right* of their intersection. In addition, the migrant must pay the migration cost  $c$ , shifting  $w_x^R$  down to  $w_x^R - c$ , that in essence represents the supply of the migrant workers. In the absence of any restrictions, the migrants would receive their marginal products, so their wage would lie on the  $VMP^U$  curve since rural migrants would become urban residents after migration, but *Hukou* control prohibits them from changing status and thus lowers their wage, first to the  $w_x^R$  curve, and with the migration cost  $c$ , finally down to be located on curve  $w_x^R - c$  instead.

Figure 2. Migration Equilibrium under *Hukou*



A rural resident then faces two choices: either staying in the countryside and receiving  $VMP^R$ , or migrating to the city and receiving  $w_x^R - c$ . It follows that the quasi-migration equilibrium is determined by the intersection of curves  $w_x^R - c$  and  $VMP^R$ , which equates the migrant net income to the rural income, yielding labor allocation between the two sectors. In this equilibrium, only  $\rho L_x^R$  migrant rural workers are able to change their status to urban and receive the urban income  $w^U$ , while  $(1 - \rho)L_x^R$  of them work in the city by keeping their rural status, who receive the migrant income and return to the countryside after their work is finished. Note that those who successfully change their status are denoted by the horizontal distance between the green and pink vertical lines, and the migrant workers are represented by the red segment on

the horizontal axis. At this quasi-migration equilibrium, migrant workers receive the wage  $w_x^R - c$ , which is less than the value of their marginal product given by  $VMP^U$ . As such, firms in the urban sector would like to hire more migrants, but no more migrants are willing to come from the countryside due to *Hukou* rationing, which in reality may prevent them from buying urban homes, receiving medical care and retirement pension, and sending children to urban schools, etc.

We can also straightforwardly incorporate *seasonal migration*, to model the fact that some migrants work in the urban area for only a fraction of the year and return home for the rest, perhaps due to family reasons such as taking care of elderly parents, school children and farm work during busy seasons. Suppose the seasonal migrant spends a fraction  $\theta$  of his time working in the countryside, and the remaining fraction working in the cities, then his income becomes  $\theta w^R + (1 - \theta)(w^U - \frac{nc}{\rho})$ , where  $n$  represents the number of round-trips he makes.

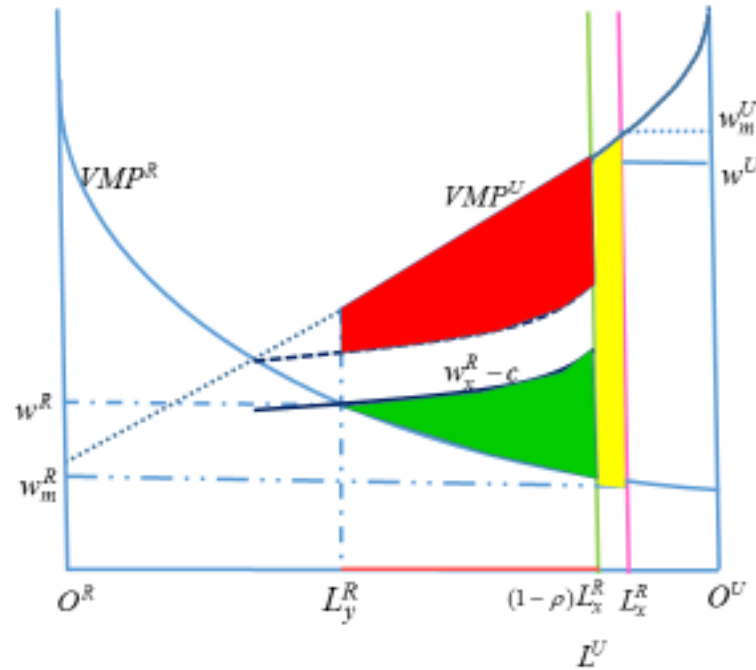
Obviously, this income is lower than that of a full-time migrant.

## 5. Gains from Reform and the Distribution of Gains

In this section, we examine the net gains from allowing partial rural-urban migration and the distribution of the gains. In order to do that, we need to first define ownership to some extent. As described in Section 2, under *collective ownership*, all land and all capital belong to the whole country (i.e., the central government), all profits from industry and commerce were collected by the government, and peasants must pay taxes every year. We thus assume the return to capital in the urban regions and the return to land in the countryside are all collected by the government. As in Lewis (1954), the government could accumulate the collected rents to develop the

industrial base in a dynamic setting, and hire more migrant workers in the long run, which is beyond the scope of the present paper though.

Figure 3. Gains of Reform and Redistribution



Using Figure 3 above, it is straightforward to see that both rural and urban residents gain from reform, and the country as a whole gains by the combined colored areas. More important is the distribution of the gains. To be specific, the yellow area is created and obtained by the residents who have successfully changed their status from rural to urban, and the rest of the colored areas is created by the rural migrants, of which only the green area is obtained by them, and the *red area* is taken away by the capital owner—the government. In other words, this area is created by migrant workers who cannot claim ownership of it due to the remaining *Hukou*

control. In a sense, it is the “exploitation” of the *Hukou* system under migration. In reality, the exploited income may be redistributed to residents with urban status through various channels, such as retirement pension, housing and health benefits, etc.

In sum, while the loosening of the *Hukou* system allows the whole country to gain, in per-capita terms, a typical urban resident gains more due to the distortion caused by the remaining *Hukou* rationing, which is confirmed by recent empirical findings in Fu, Li and Yang (2015), as mentioned in the Introduction.

## 6. Trade Pattern Reversal and the Export Boom

To deliver the point we want to make, let us assume that in the Mao era, China is a small country which takes world price as given, and it has reached a special external equilibrium with the rest of the world (ROW) in the sense that both imports and exports are zero, which was in fact very close to reality in that era, even though trade was allowed then.

Next, China enters the reform era and allows quasi labor migration as described in the previous sections, thereby releasing the tremendous surplus labor from the countryside. As official numbers show, in 2013, there are 260 million migrant workers, leaving behind them 100 million children. Figure 2 indicates that rural employment decreases but urban employment increases, by  $L_x^R$ . It follows that rural output must fall and urban output must increase, i.e.,

$$y - y_m \leq 0, \quad x - x_m \geq 0. \quad (8)$$

Then, for given consumer preference, China must export manufacturing and import agricultural products.

To formalize the above, we assume that a typical consumer maximizes the following homothetic utility function,  $\mu = C_x^\alpha C_y^{1-\alpha}$ , where  $C_x$  and  $C_y$  are respectively the domestic consumption of goods  $x$  and  $y$ , and  $\alpha \in (0,1)$  is a positive constant. Utility maximization subject to the standard budget constraint yields the following inverse demand function, where  $p(\cdot)$  is also the relative price of good  $x$ :

$$p(C_x, C_y) = \alpha C_y / (1 - \alpha) C_x. \quad (9)$$

As explained earlier, suppose China is a small economy in the Mao era, then  $p(\cdot) = p^*$ , where  $p^*$  is the world relative price of good  $x$ . And to maintain balanced trade, we must have

$$C_x = x - q, \quad (10a)$$

$$C_y = y + p^* q \quad (10b)$$

where  $q$  is the amount of manufacturing exports. Eqs. (9), (10a) and (10b) then implicitly give the solutions to  $C_x$ ,  $C_y$  and  $q$  under trade. Note that  $x$  and  $y$  must be calculated using (1a) and (1b), with the correct labor inputs according to the *Hukou* rationing in the reform era.

Since there was no trade before reform (though trade was free), consumption was at the optimal point then. In order to maintain this optimal position, all increased manufacturing output in the reform era,  $x - x_m$ , must be exported. In other words, *it is the released surplus labor from the countryside, that becomes migrant workers without urban status, that has generated the sudden boom in manufacturing exports*. In return, and as a matter of fact, China in 2013 is the world's biggest importer of soybean, #2 importer of rice, a top-10 importer of corn and wheat.

China also imports large quantities of other agricultural products, including beef, milk, wine, deep-sea fishery, tropical fruits, etc., not to mention natural resources such as petroleum, gold, natural gas and iron ore. In 2011, primary exports was only 4.5 percent, compared to about 50 percent in 1980; that is, the production and contribution of the migrant workers *reversed the Chinese trade pattern* and led to the recent trade boom, which is what Chan (2005) calls the “secret recipe” for China’s success.

## **7. Some Ongoing Reforms**

In this section, we use the above basic model to examine some of the recent and ongoing reforms in China, such as “special economic zones”, export tax refund, foreign direct investment (FDI), urbanization, privatization of state-owned firms, the creation of a service sector using migrant labor, etc. Our analysis will also be related to the one-child policy, the so-called “demographic dividend” and population aging. We investigate how these reforms and policies affect the rural and urban earnings, peasant migration and exports.

### **7.1 Export tax refund and foreign direct investment**

Since 1985, China has been using tax refund to encourage exports. Specifically, the *value added tax* that is imposed on domestically sold goods, is exempt for exported goods. Apparently, such a policy stimulates exports and increases their domestic prices, raising the *VMP* of labor in manufacturing in the present model. In figure 2, the number of migrant workers, manufacturing output and the rural wage all will increase.

In the reform era, China also received tremendous amount of inward FDI. In 2012, it surpassed the U.S. and became the biggest FDI destination country, totaling US \$253 billion. In

Figure 2, the effects of inward FDI can be shown similarly as the export-tax refund, because an increase in FDI raises capital  $K$ , raising the  $VMP$  of labor in manufacturing, and all other effects follow. Note that an increase in *manufacturing technology* would cause similar effects, but an increase in *agricultural technology* would bring opposite qualitative effects.

## 7.2 Special economic zones

Special economic zones (SEZs) played pioneering roles in the early decades of China's open-door period. They were set up along the coast, such as in Shenzhen, Dongguan, Zhuhai, etc. One distinct feature of SEZs is that they are located not in the cities but in the countryside; in other words, foreign capital comes into the countryside and uses *rural labor to make manufacturing goods*, and most often, for exports!

In Figure 4 below, since SEZs use foreign capital and rural labor, the yellow segment on the horizontal axis represents rural labor that is used in the SEZs. As a result, employment in agriculture is reduced, which raises  $VMP^R$  and the rural wage to  $w^{SEZ}$ , lowering labor migrating to the cities. Since SEZs make manufacturing goods for exports, total exports in the country will increase. Hence, SEZs are in a sense used as export platforms by foreign multinational firms, as processing zones.



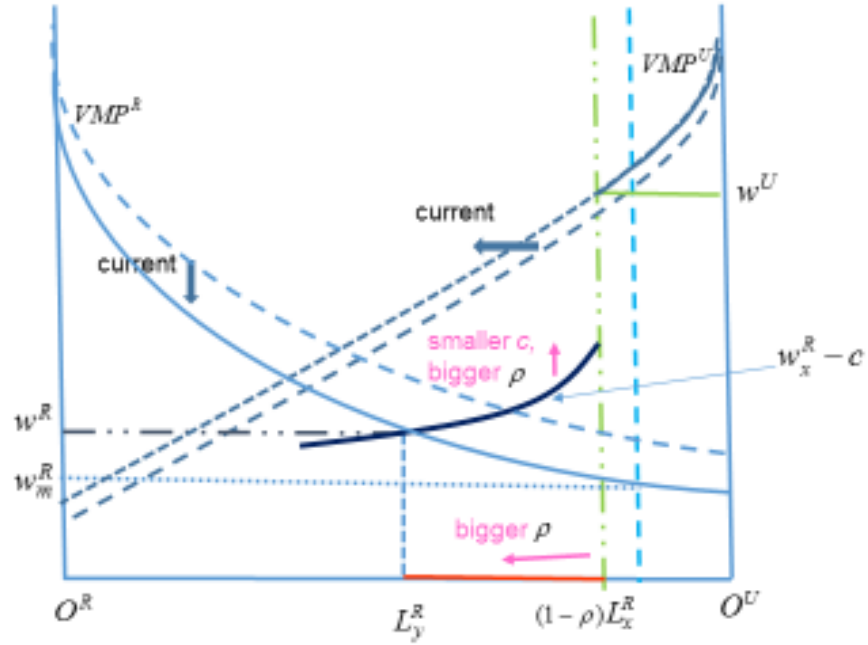
China today is under rapid urbanization. In fact, the central government has a midterm urbanization plan for the whole country from 2014 to 2020, as a means to transform the economy from export promotion to internal expansion. In March 2014, the Chinese government and the World Bank held a joint conference, in which the latter has the following recommendations: i) under current Chinese urbanization, cities are using too much land and the available farmland has dropped to below “the red line”; ii) China should aim at more mobile and versatile labor force with equal access to quality services, giving equal treatment to workers of different status (see Indrawati, 2014). Bai et al. (2004) and Au and Henderson (2006) find that

*Hukou* restricts Chinese urbanization in terms of scale and deepening (migrants obtaining *permanent* urban status), causing many small cities to build duplicate facilities that prevent the country to take advantage of scale economies.

As reflected in the Word Bank recommendations, so far urbanization in China has been mostly taking farm land away for city construction, either for consumption (building apartments) or production (building factories). A special feature of the current Chinese urbanization process is that the growth of urban area has outpaced the growth of urban residents, which might be the result of the local governments' ability to seize rural land at will. Over the years 2000-2011, the urban built-up areas grow by 76.4%, while the urban population increases by only 50.5% (*Southern Weekend News*, Dec. 4, 2014).

It follows that, each rural worker must have less land to work with. Then in Figure 5, the  $VMP^R$  curve shifts down, and the  $VMP^U$  curve may shift up if the reduced farmland is used for factory construction. As a consequence, the rural income falls and the urban income rises, inducing more migrant workers to the urban region.

Figure 5. Current & Ideal Urbanization



The “ideal” urbanization though, is to follow the recommendations by the World Bank, and is adequately termed by the Chinese government as “from land-based fiscal policy to focusing on citizens.” This can be illustrated in our model, which is to raise the probability for rural migrants to change status,  $\rho$ , and to lower the migration cost,  $c$ . In Figure 5, lowering  $c$  shifts the thick-dark curve  $w_x^R - c$  upwards in a parallel fashion. And raising  $\rho$  has two effects: it shifts the green dotted vertical line leftwards, increasing the share of migrant workers with urban status; and it also rotates the  $w_x^R - c$  curve upwards around its intersection point with curve  $VMP^R$ , making it closer to  $VMP^U$ .

## 7.4 One-child policy and the demographic dividend

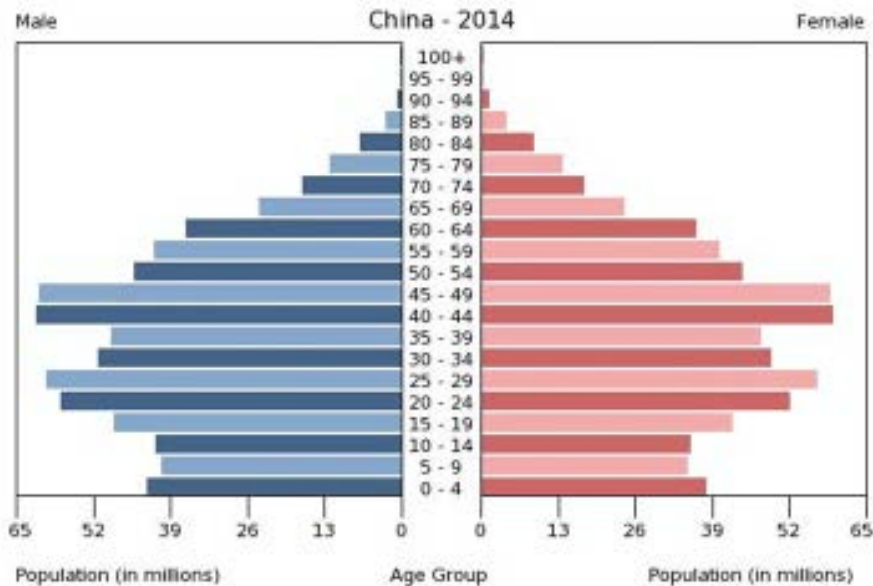
Figure 6 depicts the Chinese population pyramid in 2014, from which one sees that over two thirds of the population belong to the groups from age 20 to 60, the legitimate working age.<sup>9</sup> It implies that in a span of one hundred years, China has been enjoying the largest labor force for a couple decades (in fact it is the largest labor force in Chinese history)---hence the so-called “demographic dividend”. But this should end in 5 to 10 years as the pyramid base is becoming smaller going downwards on the one hand, and on the other hand, near the top a large number of people are retiring (at age 60). According to UN projections, by 2025, more people will be over 60 than those under 20 years of age, and by 2050, more than 34 percent of the population will be older than 60. There is great concern that China will be “ageing before affluence” (Cai, 2012).<sup>10</sup> The diminishing pyramid base is obviously caused by the one-child policy imposed since 1979; and after 35 years of adoption, the government announced its abolition in late 2015, hoping to increase the future labor force.

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<sup>9</sup> Wang, Zhao and Zhao (2016) use the ages 15~60 to indicate the working age, and the population in this age group peaked in 2010, at 74.3% of the total population.

<sup>10</sup> Chan (2010b) also documents the paradox that there appears to be a shortage of labor in eastern China’s export-oriented manufacturing belt and an abundant supply of labor in the inner, rural areas.

Figure 6: Population Pyramid



Source: [http://www.indexmundi.com/china/age\\_structure.html](http://www.indexmundi.com/china/age_structure.html)

In the present model, the “demographic dividend” that China has been enjoying can be expressed as an increase in labor endowment, which would prolong the horizontal axis in Figure 5, with the left side extending out more than the right side, since there are more rural than urban workers to begin with. As a consequence, both rural and urban wages decrease, but the former decreases relatively more. In addition, an excess of labor supply appears in the rural region, forcing more peasants to become migrant workers at lower wages, enabling Chinese manufacturing firms to produce and export more. In sum, the “demographic dividend” strengthens China’s comparative advantage in manufacturing, in addition to the migrant labor released by the loosening of *Hukou* control. Together, they made China “the manufacturing center of the world”.

## 7.5 Privatization of publicly owned firms and the creation of a service sector

According to official data, by the end of 2012, China has 10.86 million privately owned firms, with US\$3110 billion registered capital and US\$2010 billion annual revenue, while state-owned firms (SOE) under SASAC (State-owned Assets Supervision and Administration Commission of the State Council) was only 120 in number, but with registered capital and revenue of roughly the same size as the private firms (3120 billion and 2250 billion respectively).<sup>11</sup> So it is teased that one SOE is worth 100,000 private firms. However, this is a result of the government's privatization policy—"grabbing the big while releasing the small (zhua da fang xiao)", implying that less efficient firms are privatized.

We can illustrate this using Figure 2. "Grabbing the big while releasing the small" implies the government keeps the most productive firms and let go off the less productive ones. As a result, workers in the former firms still receive the urban income, which will rise since less efficient firms are privatized, while those in the privatized firms will have to compete with the migrant workers and receive a wage lower than the urban income. Qualitatively, in Figure 2, privatization of less efficient firms is similar to lowering  $\rho$ , moving the green vertical line rightwards. Under *Hukou* rations, laid off urban workers still receive an actual income higher than the migrant wage, due to their urban status that carries special benefits and the fact that they do not need to migrate for work. In sum, "grabbing the big while releasing the small" will likely increase the urban-rural income gap, enlarging social inequality.

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<sup>11</sup> Source: SASAC and National Association of Industry and Commerce.

Note that a phenomenon closely related is the development of a service sector, such as opening a small shop, doing repairs, delivery, vending, cleaning, and homecare, etc., which can be created by either the laid off urban workers or the migrant workers. These workers can also work in the construction sector, which mainly requires manual labor. The modeling technique would be similar to the creation of special economic zones, where some rural labor is taken away from agriculture, raising the  $VMP^R$  and rural and migrant income as a consequence. Obviously, the expansion of the service sector may not increase as much manufacturing output and exports as the FDI in SEZs does.

## 8. Concluding Remarks

We have modelled the Chinese *Hukou* system, from the Mao era to the Deng Xiaoping era. The loosening of Hukou control generated large numbers of rural migrants, who reversed the Chinese trade pattern and made China “the manufacturing center of the world”. We analyzed the gains from reform and its distribution during this special transition period. We also used the model to examine some ongoing reforms, such as special economic zones, export tax refund, urbanization, privatization, one-child policy, etc. Our analysis is qualitative. The extent of each policy effect, of course, depends on further quantitative studies.

The *Hukou* system not only creates an urban-rural divide, but also an urban-urban divide between small and big cities. Our model has focused on the former divide. Clearly, more research is needed for the latter one, which is closely related to the expanding regional inequalities in China, especially between the so-called first-tier cities (Beijing, Shanghai, Shenzhen and Guangzhou) and small cities.

Our model is static, ignoring capital accumulation. It would be interesting to study how the government uses the rents extracted from migrant workers in expanding urban production in the long run, along the lines in Lewis (1954).

*Hukou* reform is one of the most complex issues in the Chinese transition. It is closely related to the urbanization of millions of peasants, the privatization of state and publicly owned firms, the migration of urban residents across cities, the ownership of land, and the fairness of the education system, etc. As discussed earlier, so far the government has allowed less efficient firms to be privatized. It certainly remains to be answered whether this is a good policy in terms of welfare and resource allocation. Problems also arise with regard to workers' retirement pension and health care, and sometimes efficient firms and suburban land may be cheaply sold to princelings and those with government connections. In addition, why can workers in privatized firms have urban status while most rural migrant workers cannot? All these tricky and eminent issues are important topics that deserve detailed research in the future.

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