The impact of China's hukou restrictions on the aggregate national saving

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Abstract

This paper presents a model accounting for the impact of the Chinese rural-urban migration on the stock of aggregate saving and the skill composition of the urban labor force. The novel mechanism through which immigration affects labor-market outcomes is the availability of new loanable funds for investment, which also results in endogenous skill upgrading. Given their rural *hukou,* which determines their higher training costs in the city, migrants skip the financial costs of human capital or residential investment. As a result, they self select as net lenders, which reduces the equilibrium local interest rates and facilitates the investment mostly of new generations of urbanites. Consequently, the aggregate labor income of people with urban hukou increases with immigration.

1 Introduction

In the year 1978 only 18% of China's population lived in cities, which was clearly less than the average low income country by then. By 2003, China's number of cities (and the average city size) had grown up rapidly and its urbanization rate had reached 41%, a figure similar to the expected level for a developing country of its income per capita (Naughton, 2007). However, the main turning point in the urbanization rate took place by the year 2000 (Huang, 2010). Two fundamental causes determined this important phenomenon: a widespread rural-urban migration and the spatial expansion of the urban boundaries that encroached upon previously rural areas.

Simultaneously, the Chinese ratio of consumption over GDP also experienced a substantial and prolonged decay, starting from the year 2000. The domestic saving rate in 2006 also reached an

astonishing 52% (Vendryes, 2011). Therefore, both the urbanization and the consumption decline went hand in hand with each other, which is an "intriguing empirical confluence" (Huang, 2010). In this paper we will introduce a stylized model able to account for these coincidental facts, whose final verification could be relevant for the global financial imbalances experienced recently by the world economy (Rajan, 2010).

The *hukou* registration system in China is highly discriminatory against the floating population of rural-hukou holders residing in the main urban centers. They face a much more difficult access to health, pension, housing or education public services there. However, once these disfavored urban residents get acquainted with the reality of urban private markets, they usually change their aspirations and become eager to accumulate, trying to ascend socially and upgrade their intergenerational status. In this sense, our theoretical chain of causality is related to their incentives to save, in the context of *hukou* restrictions that set very high costs of human capital acquisition or entrepreneurship for them.

"One of the main drivers of China's phenomenal economic growth during the past three decades has been the large-scale and persistent rural-to-urban migration" (Chen and Feng, 2012). The 2010 census registers the existence of about 260 million of "non-*hukou*" people who work and live in a locality other than his/her official *hukou* is registered at. Given that funding for elementary education is allocated by the number of children with local *hukou* and is not portable across administrative units, a significant portion of the migrant students have to enter the (so called) "migrant schools", started as informal schools by migrants themselves. Needless to say, the consequences of this discriminatory educational policy affect their lifetime welfare, their exposure to poverty and crime and their sense of exclusion from both the rural and urban identities (Solinger, 1999).

Like immigrant labor in other settings, they are "eager to earn money at any price [...], grateful for the chance to live at the city, vulnerable to threats of deportation, and powerless because of the state's unwillingness to offer them rights, welfare or security" (Roberts, 2007). This is a move between two worlds, even if it is within a single region or country. Nevertheless, their saving rates are much higher than those of urban-hukou residents, which may have been boosting accumulation and investment in the Chinese economy (Huang, 2010; Brugiavini, Weber and Wu, 2010).[1]

When asked about the reasons why they save, Huang (2010) reports that education (40%) tops

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[1]According to Huang (2010)'s survey, "in 2007, the urban-hukou household saving rate for Guangzhou is 15.6%; for Shenzen it is 27.5%. By contrast, the rural migrant workers in Guangzhou in 2007 had a household saving rate of 41% and those in Shenzen had a saving rate of 42%."

the list, followed by saving to build houses in home villages (32%), and savings for illnesses and disaster planning (28.5%). Therefore, precautionary saving motivations are clearly crucial, but Brugiavini, Weber and Wu (2010) describe another motive that will be emphasized by our model: "Young consumers would save despite the prospects of high income growth because they anticipate moving to a different social environment where consumption needs are higher [...]. Moreover, "if they also have a transfer motive in their preferences, they may keep saving in old age to allow their children to fully enjoy the opportunities offered by their urban environment".

Given the financial system imperfections in China, there are few alternatives to funneling these savings into deposits in the state-owned banking system, with the implicit deposit insurance provided by the government. Therefore, the abundant bank liquidity largely finances investment by state enterprises. Their important inefficiencies have costs that "are probably ultimately borne by depositors, in terms of low real returns on their savings" (Prasad and Rajan, 2006). Such low interest rates are also important for the borrowers' investment purposes. These borrowers are usually urban-hukou holders, which gives rise to higher inequality within the cities.

In what follows, we will describe some of the institutional and behavioral characteristics in the life of rural-hukou migrants. In section 3, our model will be introduced with assumptions arguably based on such characteristics. Section 4 compares our model to other strands of the related theoretical literature. Section 5 concludes.

2   Institutional bases of migration and urban labor markets in China

The institution of *hukou* has been inherited from a pre-reform period of very strong government controls. It keeps some similarities with the old Soviet "propiska", which was used to tie the access to services and resources to the registration system. In fact, it reflected the state's commitment to sustain the privilege of urbanites, by anchoring peasants to the land and ensuring a geographical transfer of value from rural to urban areas (Fan, 2002).

Today the economic reforms and the subsequent consumerism have forced some readaptation of the state institutions; still, temporary jobs keep a marginalized and underclass existence in society. In order to escape this trap, migrants are often upward movers responding to the large gaps in income and employment opportunities. In fact, they can even modify sometimes their *hukou* status,

always after experiencing some forms of success. For instance, "the criteria for obtaining a *blue stamp* include a large investment or home purchase and age, education and skills".

However the migrants' probability of success is considerably lower, due mainly to the long run consequences of their educational disadvantage in the city (Meng and Zhang, 2010; Liang and Chen, 2005). Moreover, this lower upward economic mobility of migrants (in comparison with the urbanites) is both cause and consequence of segregated labor markets, in which migrants with low human capital are hardly able to collocate in firms and localities with high skilled urbanites (Fu and Gabriel, 2012).

According to Meng and Zhang (2010), such segregation probably limits both the labor-market substitutability between migrants and unskilled urbanites, and their labor-market complementarity with skilled urbanites. Accordingly, their empirical results indicate that the impact of an enhanced migratory inflow on the labor-market income and employment of urban-hukou holders (regardless of their skill) is negligible, if not slightly positive.

This standard empirical result, obtained in the context of many different countries (Ottaviano and Peri, 2007), is at odds with many theoretical predictions. "The inconsistency between the theory and the empirical evidence has shaken the basis of the traditional belief that an immigrant influx should lower the wage of competing factors (Borjas, 2003), and calls for new evidence and new explanations" (Meng and Zhang, 2010). In this respect, our model offers a potential explanation based on a pure capital market complementarity between migrants and urbanites: since rural-hukou holders become relevant net lenders in the city, it becomes easier mainly for new generations of urbanites to invest, upgrade their skills and increase their future labor-market earnings.

3   Model

This urban economy consists of a population of urbanites (henceforth natives) equal to one. In the first period of time ($t = 0$) there is a migratory shock and M migrants arrive unexpectedly to the city. They start their urban life during the youth, before accumulating any human capital. Their training and investment costs in the city are higher than those of natives; without loss of generality, we will assume that newly arrived migrants and their offspring exhibit the same training and investment costs. The upgrading opportunities offered to them by the urban credit markets are supposed to be absent in their original rural environment.

3.1 Technology

The receiving urban economy shows a production technology that combines both skilled and unskilled labor in a perfectly competitive environment. Most traditional models of the immigration surplus focus on labor-market complementarities derived from a limited degree of substitutability between unskilled and skilled labor (and/or physical capital); once unskilled wages fall, immigration results in a net gain for the native population, after the new surplus is appropriated by the capital owners (or by the skilled workers). The latter factors of production will gain, whereas unskilled workers will lose.

In contrast to these explanations, here we will focus on a pure capital market complementarity. Both types of labor are perfect substitutes and, consequently, their respective wages are not altered by immigration. Even in this situation we will show that the availability of new loanable funds for investment, the subsequent reduction of the equilibrium interest rate and the easier skill upgrading for the future generations will induce a rise in the aggregate labor income of natives.

This assumption of perfect substitutability is made to sharpen our point, since in this way we can switch off any sort of labor-market complementarity and emphasize our particular chain of causality. The value of the urban unskilled wage will be equal to 1 and the skilled wage will be given by $\delta \gg 1$.

3.2 Preferences

In our model (whose time setting is based on Galor and Zeira (1993)) individuals live for two periods. In the first one they must decide whether to invest (either in human capital or in the creation of a startup; the precise form of the investment will be indifferent for us) or to work as unskilled labor. Whenever they decide to invest, they could benefit from a parental bequest. In the second period they work according to their skills, consume, have a child and potentially leave a bequest.

Parents do not bequeath physical or financial capital in their second period of life. Alternatively, they can hire some qualified professors to teach their child at home and reduce her future training costs. More specifically, if the parents find the child to be capable enough they will finance some hours (x) of home teaching. Such a transfer will reduce the child's needed number of hours in college by the amount ax; where a is a measure of the idiosyncratic ability of the child.

We adopt the assumption of risk neutrality in preferences and warm glow altruism. Parents derive utility from the future income enjoyed by the child, gross of financial costs of investment. Let

us consider the following utility function, expressed in expected terms:

$$U_t = c_t + \beta E_t W_{t+1}; \ \beta > 0 \tag{1}$$

where c_t stands for consumption (during adulthood) of an individual born at $(t-1)$, and $E_t W_{t+1}$ stands for the expected (gross) income accruing to the next generation, born at period t. β is an indicator of the level of parental altruism towards the next generation.

3.3 Investment decision

If a young native (migrant) individual born at t decides to acquire education, he will have to hire a quantity $\gamma \ (\gamma')$ of skilled professors, where by assumption $1 > \gamma' > \gamma$. The way to do so will be borrowing from the student loan market in period t and repaying the loan (plus the interests) in period $(t+1)$. His own ability (measured by a), combined with the paternal human capital bequest (x), will allow him to reduce the investment costs.

In particular, education is today a major instrument for occupational mobility in China (Chow and Shen, 2005). In response to the increasing demand for tertiary education, its financing and provision has shifted gradually from government institutions to non-government institutions sensitive to market forces.[2] "Since economic reform started, non government schools have sprung up rapidly at all levels".

3.3.1 Decision by the child

When deciding whether to invest (and/or upgrade skills) in period t, a young native individual (a child) will make the following comparison: $(2 + r_{t+1})$ will be her earnings from an unskilled profession, whereas $(\delta - (\gamma - ax)\, \delta \, (1 + r_{t+1}))$ will be the earnings from a skilled job. The earnings must be measured in units of period $(t+1)$, since it is then when her consumption will take place.

$\gamma \delta$ is a measure of the training or investment costs, which depend on the skilled wage (δ) because only skilled professors are able to train the students. The term ax represents the amount of training that the individual can skip due to the familial transmission of human capital (x) and his idiosyncratic ability (a).

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[2] The private share within the total funding for education was 15.5% in 1991 and 36.3% in 2002. Moreover, many educational institutions were often "government owned" but "people run" public schools.

Unskilled individuals will work in both periods and save the initial earnings for their second one (adulthood), when they are supposed to consume and bequeath. Those young individuals determined to become skilled will borrow from the unskilled to pay for their training/investment costs in the first period, and then will repay their debt once they receive the skilled wage in the second period. Consequently, by comparing the two algebraic expressions in the preceding paragraph an solving for the cutoff ability value, a young native individual (born at t) will decide to invest if and only if

$$a_t \geq \frac{1}{x}\left(\gamma + \left(\frac{(2 + r_{t+1}) - \delta}{\delta\left(1 + r_{t+1}\right)}\right)\right) \equiv \frac{\Phi}{x}, \text{ where } \Phi \equiv \left(\gamma + \left(\frac{(2 + r_{t+1}) - \delta}{\delta\left(1 + r_{t+1}\right)}\right)\right) \tag{2}$$

A similar cutoff expression will hold for a migrant child, provided that we replace γ by γ' ($> \gamma$). This higher value of the investment cost for migrants is our way to introduce the incidence of *hukou's* restrictions on the decision making of the urban economy.

More specifically, Heckman (2005) emphasizes that "the 10% increase in the cost of schooling as a fraction of household income for the children of migrants currently reduces social mobility and perpetuates intergenerational poverty".

3.3.2 Decision by the parent

Our assumption is that parents observe the realization of the child's random ability variable and decide upon leaving a human capital bequest or not on the basis of such realization. From (2), they know that their child will invest if and only if their bequest is such that $x \geq \frac{\Phi}{a}$. Taking into account their preferences in (1), parents will compare their current costs and future benefits of providing a bequest. The costs are given by the number $\frac{\Phi}{a}$ of professors they would need to hire at a wage of δ, while their benefits come from the child's future gross benefits (before their debts have been repaid).

Given that their warm glow altruistic motive depends on gross eranings, parents will bequeath exactly what their child needs to become skilled, and never more. It will (will not) be worth for them to leave a bequest if and only if

$$\beta\left(\delta - (2 + r_{t+1})\right) > (<) \ \delta\frac{\Phi}{a_t} \tag{3}$$

This will happen only if the ability realization is high enough. From (3), they will leave a bequest provided that

$$a_t \geq \alpha\left(r_{t+1}\right) \equiv \frac{2 + r_{t+1} - \delta\left(1 - \gamma\left(1 + r_{t+1}\right)\right)}{\beta\left(\delta - (2 + r_{t+1})\right)\left(1 + r_{t+1}\right)} \tag{4}$$

This parental boundary value for the ability realization (α) is the only relevant cutoff for the decision making, since parents can control the investment behavior of children. It is also important to check

that $\frac{d\alpha}{dr} > 0$: a higher interest rate makes investment less attractive and increases the cutoff ability value to receive a bequest.

Let us denote by α' the relevant cutoff value for immigrants, who only differ from natives because $\gamma' > \gamma$. We also assume that a is a random variable following a generic distribution function $F(a)$, with support on $a \in [0, \infty)$, such that $F'(a) \geq 0 \; \forall a$.

3.4   Existence and uniqueness of a steady-state competitive equilibrium

Let us consider now an endogenous, equilibrium interest rate r_t that clears the credit market at any date in time. We will focus our attention on a steady state value of this endogenous variable (r), and will obtain some conditions required for its existence and uniqueness in this economy. Our competitive equilibrium can be defined as a positive interest rate and a subsequent allocation of natives and migrants across the skilled and unskilled occupations, such that the supply of credit by the unskilled is identical to the demand for credit by the future generation of skilled workers.

Who is supplying credit in the city at any point in time t? There are two distinct sources of saving: first, the young population born at t that does not invest and will save their whole unskilled wage (equal to 1) for their adulthood at $(t+1)$; secondly, those parents born at $(t-1)$ with sufficiently capable children will save and bequeath according to the expressions in section 3.3.2.

On the other hand, the demand for credit for investment comes from the sufficiently capable young population of natives and migrants. Their individual investment will be equal to the remuneration of skilled professors they need to hire at t, namely $\gamma\delta$ and $\gamma'\delta$ for urbanites and migrants, respectively. Taking all this into consideration, it is possible to derive that the relevant equilibrium condition in steady state is:

$$F(\alpha) + MF(\alpha') = \delta\left[(\gamma - \Phi)(1 - F(\alpha)) + M(\gamma' - \Phi')(1 - F(\alpha'))\right] \tag{5}$$

On the left hand side of this equation we have the supply of loanable funds by the unskilled workers. On the right hand side we can observe the aggregate expenditure on training, which amounts to the remuneration of skilled professors minus the quantity skipped due to parental bequests. Taking expressions (2) and (5) into account, our previous expression boils down to

$$\left(\frac{\delta - (2 + r)}{(1 + r)}\right)\left[1 - F(\alpha) + M\left(1 - F(\alpha')\right)\right] = F(\alpha) + MF(\alpha') \tag{6}$$

By manipulating carefully the previous equality we can derive our Lemma 1, on the conditions for the existence and uniqueness of a steady state competitive equilibrium.

Lemma 1: If $\delta\left(1-\gamma'\right) \geq 2$, there exists a unique steady state competitive equilibrium characterized by an interest rate $r^* \in (0, \delta - 2)$, with positive measures of the native and immigrant population on both sides of the credit market (the lending side and the borrowing side).

Proof. If we multiply both sides of expression (6) by $(1 + r)$ and rearrange terms, it is possible to characterize in a different way the equilibrium in the credit market. Let us define $Z(r)$ as follows:

$$Z(r) \equiv \left[(\delta - (2+r))(1+M) - (\delta - 1)\left(F(\alpha) + MF\left(\alpha'\right) \right) \right] \tag{7}$$

We can observe that there will be an equilibrium whenever $Z(r) = 0$. From (4) we can conclude that the value of r that makes $\alpha' = 0$ is

$$\tilde{r} \equiv \frac{\delta\left(1 - \gamma'\right) - 2}{1 + \delta\gamma'} \tag{8}$$

That is, $\tilde{r}$ is the value of the interest rate that shuts down the supply of credit. For lower values, there will be nobody willing to save. On the other hand, the value of the interest rate that shuts down the demand for credit is precisely

$$\bar{r} \equiv \delta - 2$$

This is true because, for $r \geq \bar{r}$, the bequests would allow all students to invest for free and nobody would need to apply for a loan.

Now we have to prove that our equilibrium interest rate r^* is such that $\tilde{r} < r^* < \bar{r}$ and is also unique. It is straightforward to show that $Z(\tilde{r}) = \frac{\delta(\delta-1)\gamma'}{1+\delta\gamma'} > 0$ and also $Z(\bar{r}) = -(\delta - 1)(1 + M) < 0$.

Moreover, a thorough inspection of (7) reveals that $Z(r)$ is a continuous, differentiable, strictly decreasing function for all values of r. Following Bolzano's theorem, this implies there exists a unique value for $r^* \in (0, \delta - 2)$ such that $Z(r^*) = 0$, provided that $\tilde{r} \geq 0$, i.e. that $\delta\left(1 - \gamma'\right) \geq 2$.

Furthermore, $\alpha'(r^*) > \alpha(r^*) > 0$, which involves that there are positive measures of the native and immigrant populations on both sides of the credit market. ∎

Lemma 1 makes clear the requirement of relatively advantageous investment opportunities, both in terms of the future returns (δ) and the short run costs $\left(\gamma \text{ and } \gamma' \right)$, for the existence of an active demand side of the credit market. Such conditions guarantee that the supply side will be active as well, since market clearing ensures that one side will not shut down while the other is active.

Additionally, the equilibrium interest rate (r^*) is shown to be unique, which facilitates our task of predicting the effects of immigration.

3.5 The availability of new loanable funds

We are now ready to spell out our desired effect of immigration on the availability of loanable funds for investment. As we anticipated above, in this setting loans are supplied by young unskilled workers. They are received by the remaining (more capable) youngsters to finance the share of their investment costs uncovered by the parental bequests. Migration provides the city with a higher proportion of unskilled people supplying funds, which will be useful to reduce the equilibrium interest rate in the student loan market (r^*).

A lower r^* will also decrease the minimum ability requirements (the cutoff values of α and α') needed to access highly remunerated jobs. Therefore, for the new migration wave to provide the city with a net supply of loanable funds, migrants need to face higher investment costs $(\gamma' > \gamma)$ in order to enlarge the pool of young lenders more than the pool of young borrowers. Consequently, it will be possible to speak of an immigration surplus (in terms of the labor income of natives[3]) that does not depend on wage variations.

Proposition 1 *If $\gamma' > \gamma$, then a higher initial migratory shock (higher M) will reduce r^*, α and α' $(\frac{d\alpha}{dM} < 0, \frac{d\alpha'}{dM} < 0, \frac{dr^*}{dM} < 0)$. The steady-state aggregate labor income of urbanites will increase with immigration.*

Proof. From (6) we can totally differentiate with respect to M and solve for $\frac{dr^*}{dM}$, obtaining that

$$\frac{dr^*}{dM} = \frac{(\delta - (2 + r^*)) - (\delta - 1) F(\alpha')}{\left[MF'(\alpha') \frac{d\alpha'}{dr} + F'(\alpha) \frac{d\alpha}{dr} + (1 + M) \right]} \tag{9}$$

Furthermore, we can rearrange (6) to finally get that

$$\delta - (2 + r^*) = \frac{(\delta - 1)(F(\alpha') M + F(\alpha))}{1 + M} \tag{10}$$

If we now plug (10) into (9), we can finally derive that

$$\frac{dr^*}{dM} = \frac{(\delta - 1)\left(F(\alpha) - F(\alpha') \right)}{(1 + M)\left[MF'(\alpha') \frac{d\alpha'}{dr} + F'(\alpha) \frac{d\alpha}{dr} + (1 + M) \right]} \tag{11}$$

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[3]By aggregate labor income of natives we understand the sum of the remunerations to both skilled and unskilled labor.

We already know from (4) that $\frac{d\alpha}{dr} > 0, \frac{d\alpha'}{dr} > 0$ and hence the denominator of the last expression is positive for sure. For (11) to be negative we thus need the numerator to be lower than zero, which requires $\alpha' > \alpha$. This last inequality holds if and only if

$$\gamma' > \gamma$$

Then, since the ability cutoffs are increasing functions of the interest rate, $\frac{d\alpha}{dM} < 0, \frac{d\alpha'}{dM} < 0, \frac{dr^*}{dM} < 0$. Finally, since wages are invariant and $\delta > 1$, a higher share of skilled urbanites means that their aggregate labor income increases. ■

4 Comparison with other related theoretical literature

Some recent models, inspired by the case of China, have argued about the convenience of migration restrictions from the viewpoint of allocative efficiency and/or accumulation and development (Fan and Stark, 2008; Vendryes, 2011). Fan and Stark present a static model where human capital externalities at the urban level determine the inefficiency of free migration, since many disfavored Western areas may lose most of its existing human capital stock.

On the other hand, Vendryes also emphasizes (in a dynamic model of capital accumulation) the role of *hukou* as a determinant of the huge Chinese saving rates. However, in his paper the conceptual definition of *hukou* points directly to a limitation in the inflow of Western migrants to the Eastern cities. That is, his message could be summarized as follows: less East-West migration implies higher aggregate saving and growth under certain conditions.

In our model, unlike Vendryes (2011), we represent *hukou* by means of higher relative investment costs for a given stock of migrants. Therefore, we prove that a larger migratory inflow *in the presence of higher training and investment costs for migrants,* gives rise to higher saving. We believe that the Chinese internal migration (with its effect on urbanization) is a large scale phenomenon that has been always gaining momentum, instead of losing it. Therefore, we find it appropriate to underline the differences with respect to the rest of the literature.

5 Conclusions

It is already well known that in China "households are net lenders to other sectors [...], largely through deposits in banks and post offices." (Bardhan, 2010). However, our paper formalizes the

special role of urbanization and rural-urban migration in this process. Once migrants get acquainted with the reality of developed urban markets of goods, labor skills and credit, they are known to change their aspirations and become net lenders, even with higher intensity than urbanites.

Therefore we argue that the resilience of the *hukou* institution, in parallel with the massive recent urbanization, may well be crucial to account for the fast pace of national accumulation. And perhaps for some of our global financial imbalances as well. The removal of *hukou* may be a possible way to limit the magnitude of these imbalances. In that sense, we offer a rationalization for such hypothesis.

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