Human Capital, Returning Migration and Rural Entrepreneurship in China

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Abstract

This paper provides a study of internal rural urban migration and returning migration in China. Since the economy reform in the early 1980s, about 130 million of rural residents move to metropolitan area either temporarily or permanently – known as the "floating population". Migrant workers have powered China's economic success by providing cheap labor for the country's rapidly growing infrastructure and dominant low-priced exports. The income they bring home have helped spread prosperity from the booming cities into the relatively poor countryside. In this paper, I formulate a model that is both descriptive and analytical with respect to the mechanism through which rural agents' occupational choices are made, which further determines the form and length of migration. Through working in urban sector, some rural-origin agents are able to get over the borrowing constraint and start business. The emergence of rural entrepreneurs helps raise employment in rural area and thus ease the pressure of rural migrants wave on cities. The theoretical model is followed by empirical tests of China's Rural Households Survey Data (RCRE Survey). The close examination of 5643 rural households from 1995 to 1999 provides strong support to the conclusions drawn from the theoretical model.

Keywords: China, migrants, credit constraint, human capital, RCRE
JEL - codes: J2, J6, O11, O15, L26

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1 Introduction

This paper takes the angle of entrepreneurship among returning migrants, who face borrowing constraints, to examine the mechanism through which the rural-urban migration is formed and the economic application to rural development brought by the moving population and the entrepreneurial activities of returnees.

After the household registration system reform in China in 1984, the urbanization has leaped from 24.52% in 1986 to 42.99% in 2005, and the estimated rural migrants were 130 millions in 2003 (BSC, 2004, 2006). According to the China Rural Development Research Center, one third of migrants started to go back to native homes in late 1990s (Murphy, 1999). Why do people leave hometown to become guest workers? Furthermore, given the initial migration, why do they return? There are extensive theoretical as well as empirical studies for both questions. There has been general agreement on the former question. Rural originated individuals move to cities because their human capital receives higher rental rate there. As for to explain the phenomenon of returning migration, researchers have offered a wider array of potential reasons. To name a few, congestion cost in cities, high living expenditure, housing cost, emotional preference of hometown over guest area, uncertainty of living in guest place, marriage match, etc. More recently, a series of studies started to pay attention to the occupational choices of returnees (Mesnard, 2004, McCormick, 2003, Murphy, 1999, Rapoport, 2002, Ilahi, 1999). A common finding is that, among all the returnees, those who become entrepreneurs tend to have higher level of saving through their working in guest place and higher human capital. However, none of them have studied the interaction of the entrepreneurial activities of returning migrants and the occupational/migration decision of the new generation.

A market mature for sound entrepreneurship cannot exist without the strong support of a healthy credit market. The lack of perfect credit market in rural area of developing countries prevents people who do not have certain collateral level from borrowing sufficient money to start out own business (Ellis, 1998, Rapoport, 2002, Gine, 2007). A poor rural born agent has slim chance of starting business had he faced borrowing constraint. That said, migration to economic more developed cities offers a splendid opportunity to accumulate capital and allows the rise of entrepreneur class even with the financial constraint. Migrants who have saved a substantial amount of money through hard working in cities show advantage in the source of usable capital from their own saving. The returning entrepreneurs generally

open small non-farm business while hiring local labor (Murphy, 1999). The reasons why those migrants do not open business in cities are manifold: high fixed cost, unaffordable launching investment, exclusive labor cost hindering profit, and most importantly, the pressure from highly competitive corporations (Quadrini (1999)).

I want to achieve three goals in this paper: First, to explore the interaction between internal migration and rural entrepreneurship; second, to analyze how and to what extent the new rural business launched by returning migrants contribute to enlarging local employment and economic growth; third, to examine the real data in order to check the validity of conclusions drawn from the theoretical model. The paper is organized in the following manner: section two introduces the model; section three sets up the equilibrium; section studies the stationary equilibrium as well as the dynamics connecting different equilibria; section presents some simulation results; section conducts econometrics tests using the RCRE survey data. A brief background of rural China after the economic reform in the early 1980s is given before any technical details.

1.1 Background of Rural China after 1980s

After China's government loosened the household registration system in 1984, the excess labor in agricultural sector turned to urban area for opportunities. In 2003, there are 140 million rural migrants in China. Starting from the mid-1990s, the wave of returning migration has formed and became a noticeable phenomenon. Most of returnees are the early migrants who have spent their golden working years in urban area. Murphy (1999, 2002) conducted a study in rural China, in which she found that manufacturing business in rural area by returnees were very crucial to the local economic diversification and growth. One fifth of individual enterprises in the surveyed counties were owned by returnees. The industrial product value of returnees' enterprises accounts for nearly 13% of the total industrial product value of industries in Xinfeng. In another county, Yudu, over 4000 migrants have returned to set up around 1450 private and individual business engaged in production or manufacturing. In 1996, out of 109 new projects with annual product values of around one million yuan, 63% were created by returnees (Murphy, 1999). The size of the new business set up by returning migrants is in general small to medium. From Table (1.1) we can see that even those relatively "large" manufacturing business hire around only 40 employees. Even though the size of each individual business is not too impressive, the

quantity of returnees is large. Therefore on the overall scale, returnees have contributed in creating new jobs for the rural area than other wise would be.

Table 1.1: Job Creation by the Returning Migrants

Type and scale	No. in Survey	No. of Employees	Financial resources
Manufacturing			
Large scale	27	16 to 860, median: 40	Some have formal loans, some partly owned by the gov.
Small scale	25	1 to 15, median: 4	Personal saving, informal loans
Services			
Small scale	22	1 to 13, median: 4	Personal Saving, informal loans

Data source: Murphy (1999, Pg. 146)

Table 1.2: Return Migrants, Non-migrants, and Migrants in China, 1999

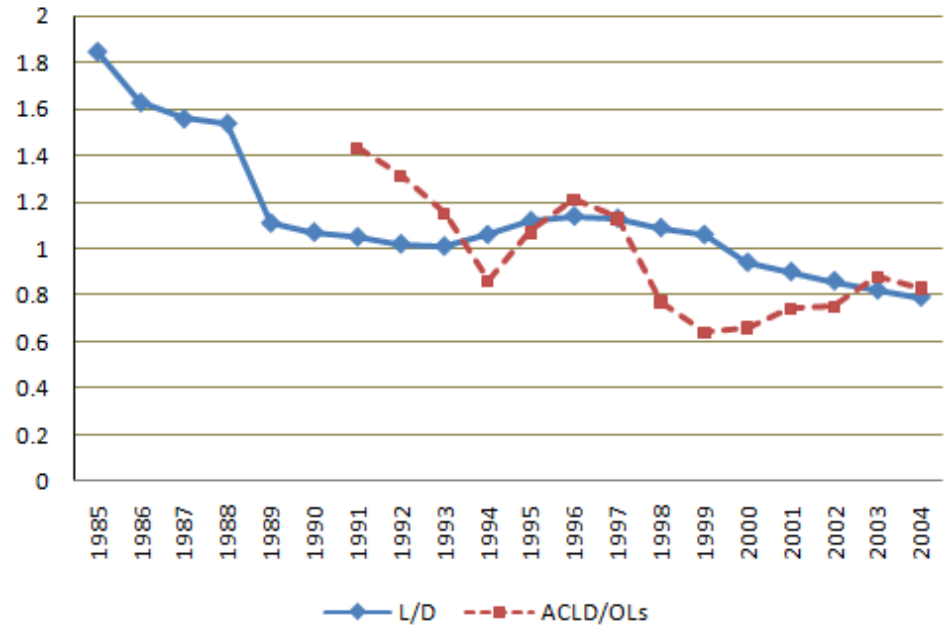
	All	Non-migrants	Continuing migrants	Return migrants
No. of workers	2137	1673	289	175
%	100	78.3	13.4	8.3
Male(%)	52.0	47.8	63.3	73.6
Married(%)	83.3	89.5	48.6	80.9
Age (years)	39.6	42.0	27.9	35.6
Schooling (years)	6.0	5.5	7.7	7.1
Illiterate(%)	12.4	14.9	3.8	2.2
Primary school (%)	38.9	42.9	18.5	33.7
Junior high(%)	41.3	35.1	68.5	54.9
Senior high(%)	6.9	6.6	7.6	8.6
Technical school or higher(%)	0.6	0.4	1.0	1.1

Data Source: Survey, Ministry Of Agriculture(1999)

Table (1.2) describes the human capital portfolio of non-migrants, migrants and returnees. The human capital of migrants and returnees tends to be higher than non-migrants, whereas there is no significant difference in the human capi-

tal level between continuing migrants and returnees. Murphy (2002) documents a survey among 60,000 rural migrants conducted by the Statistical Bureau of Yudu County in 1992. The data records the information on rural Chinese's education level as following: illiterate, 2.1%, primary, 47%, lower middle school, 50.9%. The 1995 government figures for the total rural labor force of Ganzhou are: illiterate, 12.92%; primary, 40.41%; lower middle school, 37.49%. From all sources of data, we can preliminarily summarize that the returnees generally have either longer education or better special skills. The percentage of returnees with special skills prior to migration are 53% in Yudu and 47% in Xinfeng. Two thirds of the entrepreneurs in Yudu and three quarters in Xinfeng possessed vocational skills. It is not only that rural migrants have better human capital prior to migration, but they also obtain different extent of gain from migration. In a survey conducted by Chinese Agricultural Survey Team (Nongcun Gongzuo Diaochaozu), 95.1% of the 737 returned migrants reported a gain in skills during their migration stage.

Figure 1.1: Loan to Deposit Ratio in Rural China



After 1980s, there have been several government attempts to liberalize the rural financial system in rural China, and the results were, however, not as encouraging as expected. Over the past three decades, there have been the so called dual financial system in China: the one in the urban area has experienced fast modernization and joined in the world competition now;

Table 1.3: Ratios of Rural Loans to Deposits

	L/D			ACLD/OLs		
Year	Total	ABC	RCCs	ABC	RCC	ADBC
1985	1.85	0.45				
1986	1.63	0.46				
1987	1.56	0.46				
1988	1.54	0.47				
1989	1.11	0.43	0.66			
1990	1.07	0.39	0.66			
1991	1.05	0.37	0.67	1.43	1.43	
1992	1.02	0.35	0.71	1.31	1.40	
1993	1.01	0.34	0.76	1.15	1.33	
1994	1.06	0.26	0.73	0.86	1.51	
1995	1.12	n/a	0.73	1.07	1.16	0.90
1996	1.14	n/a	0.72	1.21	1.25	0.96
1997	1.13	0.15	0.69	1.13	1.20	0.88
1998	1.09	0.16	0.68	0.77	0.95	0.73
1999	1.06	0.59	0.69	0.64	0.94	0.54
2000	0.94	0.45	0.69	0.66	0.91	0.80
2001	0.90	0.40	0.69	0.74	0.96	0.45
2002	0.86	0.18	0.70	0.75	1.02	0.24
2003	0.82	0.16	0.72	0.88	1.12	0.25
2004	0.79	0.14	0.70	0.83	1.19	0.34

Resource: Almanac of China's Finance and Banking (1986-2005); ADBC internal report; Jia (2007)

L/D: Outstanding of loans divided by outstanding of deposits.

ACLD: Annual cumulative loan disbursement.

OLs: Outstanding of loans.

ABD: Agricultural Bank of China.

ADBC: Agriculture and development bank of China.

however, the one in rural area has been largely stagnant. Literature has well summarized the characteristics: formal credit programs are highly centralized; the "cheap" credits are earmarked to certain agricultural investment; private lending is strictly regulated and usually illegal; the rural credit market is fragmented (Cheng, 2004; Jia, 2007). Deposits in rural China has been increasing over the two decades whereas the loan in rural area has not shown the similar trend of growth. Figure (1.1) and Table (1.1) illustrates

the plummet in the ratio of total rural loans to deposits from 1985 to 2004, which indicates that the rural loanable funds are either channeled outside of rural China or are left unused (Jia, 2007). Unlike the case in other developing countries, the constraint facing rural Chinese is unbalanced in the sense that, rural agents have the access to save but have trouble in obtaining credit. I set up the model according to this unbalanced financial system phenomenon, in which rural people are constrained in taking out loans. This creates the comparative advantage for those who have migrated and brought back capital with them. Along this line, returning migrants serve a function of channeling credit back from cities to rural area.

2 The Model

I use a two period over-lapping-generation model to study the rural area in a less developed country(LDC). The urban area is exogenous in the model for now. The rural economy is originally populated by a continuum of individuals, who live for two periods. In their first period of life, they can either work on farm, or rural non-farm sector, or migrate to urban and work there. At the beginning of the second period of life, an individual has accumulated some saving, with the amount of saving, he can either deposit it in the bank and earn interest, or invest it in an rural non-farm entrepreneurial project and earn profit. There are several reasons why a migrant wants to start his non-farm business in rural but not urban area: first, to launch an entrepreneurial project, there is an amount of minimum capital requirement. It is reasonable that this minimum requirement level is smaller in the less-industrialized area. Second, if there was a complete credit market, then individuals could just borrow against their future profit in order to get over the initial capital requirement. However, this possibility is assumed away in this paper by the common observation that it is very hard for rural-origin individual migrants to obtain credit in urban area. This is related with decades of the Śidentity controlŠ of household registration (Hu Kou), and labour-personnel dossiers (Ren Shi Dang An) (Li, 1996). Hence, if a rural-origin individual has a plan for an entrepreneurial project, the capital input that he can manoeuver is mostly from his own saving. An individual's own wealth (from inheritance or from one's own saving) has significant impact on the possibility of becoming an entrepreneur. Quadrini (1999) shows that a potential entrepreneurial project may fail to be launched if the household's net asset value is lower than the required amount of capital input. Third, urban area is more industrialized, where competitive corporations have already settled at, hence

the strong competition crowds out the rural-origin, small business starters, who go back to the rural area to look for business opportunities. This phenomenon has been noticed by China's government as well as economics and sociology scholars (see details in the section: Background of Rural China after 1980). All the three reasons put together, it is essential to model the entrepreneurial activities of rural migrants in rural area.

Following Galor and Zeria (1993), I assume people only consume in their second period of life and derive utility from it, thus an individual who is born in period t has lifetime utility:

$$U = lnc_f + lnc_e + lnc_m \tag{2.1}$$

Everyone takes utility from three types of goods: agricultural goods c_f produced by farms, and non-agricultural goods c_e produced in rural non-farm entrepreneurs' firms and c_u manufacturing goods produced by urban industry sector. We can think of c_f as rice, c_e as shoes, and c_m as TV. σ is a constant that is strictly less than one. As pointed out in Glomm (1992) that this utility function has desirable feature that the consumption of agricultural goods and rural non-farm goods do not have income effect.

There are two types of production in rural area, farm and non-farm. Farm production uses labor and land as inputs:

$$F^f(L_f) = A_f L_f \tag{2.2}$$

where A_f is the agricultural productivity, and L_f is labor input in farming sector, land is normalized to 1. It is reasonable to assume that one unit of man labor spent on farm has constant returns unless there is technological improvement. This assumption is also taken by Glomm(1992), Gine and Townsend (2005), Galor and Zeria (1993).

The rural non-farm enterprises hire physical capital and efficient labor to produce non-agricultural goods through the following production function:

$$F^e(K_e, H_e, h) = A_e h K_e^{\alpha} H_e^{\beta}, \qquad (\alpha + \beta) \in (0, 1) \tag{2.3}$$

A_e is the total factor productivity level in rural non-farm sector. K_e is the physical capital input, and H_e is the efficient labor input. h is the entrepreneur's human capital. The role of entrepreneurial skill in operating business has been widely explored in the literature. Lucas (1978) and Jovanovic (1982) found that the abler entrepreneurs have a higher level of production and a higher level of marginal product of capital at all levels of capital. This paper does not differentiate the general human capital and

"entrepreneurial ability". The restriction $0 < \alpha + \beta < 1$ is necessary because otherwise, it would have been observed in real world that all the businesses are conducted by one entrepreneur.

The urban industrial sector uses capital and effective labor as inputs:

$$F^u(K_u, H_u) = A_u K_u^{\gamma} H_u^{1-\gamma}, \qquad \gamma \in (0,1) \tag{2.4}$$

A_u is the urban industrial sector's total factor productivity, K_u is input of capital and H_u is the units of efficient labor input.

2.1 Solving Households Problem

Individual agents only consume in the second period. Given his lifetime wealth $W(h)$, the exogenous prices for consumption goods, agricultural goods, c_f, non- agricultural goods c_m, the agent chooses the optimal consumption to maximizes his lifetime utility subject to lifetime budget constraint:

$$\begin{aligned} \max_{\{c_f, c_m\}} \quad & U = lnc_f + lnc_e + lnc_u \\ s.t. \quad & c_f + p_e c_e + p_u c_u \leq W(h) \\ & \text{given } \{p_e, p_u, r\} \end{aligned} \tag{2.5}$$

where p_e and p_u is the relative price of non-farm goods and urban manufacturing goods to agricultural goods. These two relative prices are assumed to be exogenously given in the current setting. The argument for the exogenous goods prices rises from observation. If an economy's commodity market is open and trade freely with the world commodity market, then its goods' prices will not be affected by its production level in that it can always import/export at the world price. r is the real net interest rate measured in units of agricultural goods, which equals to the world interest rate given that the economy's urban sector has free access to the international capital markets. In the later section it will be shown that even though rural-origin individuals cannot borrow, the asymmetric capital market does allow deposit at a rate of r, which give rise to the opportunity cost of any capital usage. $W(h)$ is lifetime income of the agent with human capital h. No matter which occupation is chosen by a rural agent, he will solve the utility maximization problem as described in (2.5), which can be simplified as following:

$$\begin{aligned} V(h) &= 3lnW(h) - B \\ & where, \\ & B \equiv ln(3p_f) + ln(3p_e) + ln(3p_u) \end{aligned} \tag{2.6}$$

therefore, the households utility maximization problem is transformed into a lifetime income maximization problem. The lifetime income level $W(h)$ does depend upon the occupational choices, which is elaborated more in later section.

2.2 Solving Farm Production

Farm sector employs labor together with land as inputs to maximize the profit:

$$\begin{aligned} \max_{\{L_f\}} \quad & A_f L_f - w_f L_f \\ & \text{given}\{w_f\} \end{aligned} \tag{2.7}$$

Therefore labor demand from the agricultural sector is given by:

$$w_f = A_f \tag{2.8}$$

2.2.1 Solving Rural Non-farm Production's Problem

As is already argued in previous sections, there is incomplete capital market in the rural area in LDC's. For simplicity, this paper assumes that there is *no* capital market in the rural area. Hence, a potential entrepreneur needs to rely on his own saving from the first period of work as a source for capital to start a business in the second period. This means that the capital input in a non-farm enterprise cannot exceed the individual's first period's saving, as there is no external financing.

An entrepreneur chooses the optimal capital and labor inputs in his rural non-farm business project, given his own human capital h, wage to hire a unit of efficient labor in rural area w_e, opportunity cost of using his own capital $(1 + r)$, and the capital input constraint. The constrained profit maximization problem is:

$$\begin{aligned} \max_{\{K_{e,t+1}, H_{e,t+1}\}} \quad & p_e F(K_{e,t+1}, H_{e,t+1}) - (1+r)K_{e,t+1} - w_{e,t+1}H_{e,t+1} \\ s.t. \quad & K_{e,t+1} \leq w_{u,t}h \end{aligned} \tag{2.9}$$

If the constraint is not binding, i.e. $K_{e,t+1} < w_{u,t}h$, then the profit maximization problem has the interior solution, and otherwise, corner solution. First order conditions are given by:

$$\begin{aligned} FOC(K_{e,t+1}): \quad & \alpha p_e A_e h K_{e,t+1}^{\alpha-1} H_{e,t+1}^{\beta} = 1 + r \\ FOC(H_{e,t+1}): \quad & \beta p_e A_e h K_{e,t+1}^{\alpha} H_{e,t+1}^{\beta-1} = w_{e,t+1} \end{aligned} \tag{2.10}$$

From the Eq.(2.10) we can find the capital-labor ratio given interest rate and rural non-farm wage:

$$\frac{K_e^U}{H_e^U} = \frac{w_e}{1+r}\frac{\alpha}{\beta} \tag{2.11}$$

The unconstrained capital input K_e^U and labor input H_e^U, are solved as:

$$\begin{aligned} K_e^U &= \underbrace{\frac{A_e \alpha^{1-\beta}\beta^{\beta}}{(1+r)^{1-\beta} w_{e,t+1}^{\beta}}}_{C_1} h^{\frac{1}{1-(\alpha+\beta)}} \\ H_e^U &= [\frac{A_e h \beta (K_e^U)^{\alpha}}{w_{e,t+1}}]^{\frac{1}{1-\beta}} \end{aligned} \tag{2.12}$$

Following the solution for unconstrained capital and labor inputs as in Eq.(2.12), the maximized profit for an unconstrained entrepreneur is given by:

$$\begin{aligned} \pi_e^U &= p_e F(K_e^U, H_e^U, h) - (1+r)K_e^U - w_e H_e^U \\ &= \underbrace{\frac{1-\alpha-\beta}{\alpha}[\frac{p_e A_e \beta^{\beta}\alpha^{1-\beta}}{w_{e,t+1}^{\beta}(1+r)^{\alpha}}]^{\frac{1}{1-\alpha-\beta}}}_{C_2} h^{\frac{1}{1-\alpha-\beta}} \end{aligned} \tag{2.13}$$

Thus, the unconstrained entrepreneur's lifetime income is given by:

$$\begin{aligned} W(h) &= w_{u,t} h(1+r) + \pi_{e,t+1}^U - D \\ &= w_{u,t} h(1+r) + C_2 h^{\frac{1}{1-(\alpha+\beta)}} - D \end{aligned} \tag{2.14}$$

Necessary conditions to become an *unconstrained* entrepreneur

1. Capital constraint is not binding:

$$K_{e,t+1}^U > w_{u,t} h \tag{2.15}$$

2. Maximized profit is larger than the foregone urban wage:

$$\pi_{e,t+1}^U \geq w_{u,t+1} h \tag{2.16}$$

or, in a more compact form:

$$\frac{w_{u,t}}{C_1} \geq h^{\sigma_1} \geq \frac{w_{u,t+1}}{C_2}$$
$$where \quad 1+\sigma_1 \equiv \frac{1}{1-(\alpha+\beta)} \tag{2.17}$$

On the other hand, if the saving from first period is less than the unconstrained optimal capital input, then this entrepreneur is constrained by the capital borrowing constraint. Had he been able to borrow, he would have hire more capital and has larger firm size. A constrained entrepreneur puts in all he has saved from previous period, $w_{u,t}h$, as capital into his non-farm business project and choose labor input accordingly. The constrained capital and labor inputs are given by:

$$K_e^C = w_u h$$
$$H_e^C = [\frac{p_e A_e h \beta (K_e^C)^\alpha}{w_{e,t+1}}]^{\frac{1}{1-\beta}} \tag{2.18}$$

Following the solution for constrained capital and labor inputs, the constrained entrepreneur's profit is given by:

$$\pi_e^C = p_e F(K_e^C, H_e^C, h) - (1+r)K_e^C - w_e H_e^C$$
$$= [\frac{p_e A_e (1-\beta)^{1-\beta} \beta^\beta w_{u,t}^\alpha}{w_{e,t+1}^\beta}]^{\frac{1}{1-\beta}} h^{\frac{1+\alpha}{1-\beta}} - (1+r) w_{u,t} h \tag{2.19}$$

Hence the constrained entrepreneur's lifetime income is given by:

$$W(h) = w_{u,t} h(1+r) + \pi_{e,t+1}^C - D$$
$$= \underbrace{[\frac{p_e A_e (1-\beta)^{1-\beta} \beta^\beta w_{u,t}^\alpha}{w_{e,t+1}^\beta}]^{\frac{1}{1-\beta}}}_{C_3} h^{\frac{1+\alpha}{1-\beta}} - D \tag{2.20}$$

Necessary conditions to become a *constrained* entrepreneur

1. Capital constraint is binding:

$$K_{e,t+1}^U < w_{u,t} h \tag{2.21}$$

2. Maximized profit is larger than the foregone urban wage:

$$\pi_{e,t+1}^C \geq w_{u,t+1} h \tag{2.22}$$

Or, in a more compact form:

$$\begin{aligned} h^{\sigma_1} &> \frac{w_{u,t}}{C_1} \\ h^{\sigma_2} &> \frac{w_{u,t}(1+r) + w_{u,t+1}}{C_3} \\ where \quad 1+\sigma_2 &\equiv \frac{1+\alpha}{1-\beta} \end{aligned} \tag{2.23}$$

2.2.2 Occupational Choices of Households

If we denote the lifetime income by $W(h)$, then we can categorize this income level by different occupations which the rural-origin individual has engaged himself in:

$$W(h) = \begin{cases} w_{f,t}(1+r) + w_{f,t+1} & \text{Farmer} \\ w_{e,t}h(1+r) + w_{e,t+1} & \text{Non-farm worker} \\ w_{u,t}h(1+r) + w_{u,t+1} - D & \text{Migrant; non-entrepreneur} \\ w_{u,t}h(1+r) + \pi_e^U - D & \text{Migrants; unconstrained entrepreneur} \\ w_{u,t}h(1+r) + \pi_e^C - D & \text{Migrants; constrained entrepreneur} \end{cases} \tag{2.24}$$

If we compare the occupational choices pair-wise, there are two possibilities of the set of the thresholds of human capital:

1. <u>Possibility One</u>: There are constrained and unconstrained entrepreneurs

exist at the same time:

$$\begin{cases} \text{Farmer} & 0 \leq h < \frac{w_{f,t}(1+r)+w_{f,t+1}}{w_{e,t}(1+r)+w_{e,t+1}} \\ \text{Non-farm worker} & \frac{w_{f,t}(1+r)+w_{f,t+1}}{w_{e,t}(1+r)+w_{e,t+1}} \leq h < \frac{D}{(w_{u,t}(1+r)+w_{u,t+1})-(w_{e,t}(1+r)+w_{e,t+1})} \\ \text{Mig; Mig} & \frac{D}{(w_{u,t}(1+r)+w_{u,t+1})-(w_{e,t}(1+r)+w_{e,t+1})} \leq h < (\frac{w_{u,t+1}}{C_2})^{\frac{1}{\sigma_1}} \\ \text{Mig; Uncons entrep} & (\frac{w_{u,t+1}}{C_2})^{\frac{1}{\sigma_1}} \leq h < (\frac{w_{u,t}}{C_1})^{\frac{1}{\sigma_1}} \\ \text{Mig; Cons entrep} & (\frac{w_{u,t}(1+r)+w_{u,t+1}}{C_1})^{\frac{1}{\sigma_2}} \leq h < \infty \end{cases} \tag{2.25}$$

2. <u>Possibility Two</u>: There is only constrained entrepreneurs:

$$\begin{cases} \text{Farmer} & 0 \leq h < \frac{w_{f,t}(1+r)+w_{f,t+1}}{w_{e,t}(1+r)+w_{e,t+1}} \\ \text{Non-farm worker} & \frac{w_{f,t}(1+r)+w_{f,t+1}}{w_{e,t}(1+r)+w_{e,t+1}} \leq h < \frac{D}{(w_{u,t}(1+r)+w_{u,t+1})-(w_{e,t}(1+r)+w_{e,t+1})} \\ \text{Mig; Mig} & \frac{D}{(w_{u,t}(1+r)+w_{u,t+1})-(w_{e,t}(1+r)+w_{e,t+1})} \leq h < (\frac{w_{u,t+1}}{C_3})^{\frac{1}{\sigma_1}} \\ \text{Mig; Cons entrep} & (\frac{w_{u,t}(1+r)+w_{u,t+1}}{C_3})^{\frac{1}{\sigma_2}} \leq h < \infty \end{cases} \tag{2.26}$$

Even though there are two possibilities in theory, but in simulation I find that the second possibility never happens, that is to say, there are always both constrained and unconstrained entrepreneurs at the same time.

3 Definition of Equilibrium

What type of equilibrium needs to be defined depends on how we approach the model. If we want to take a snapshot of the economy and assume the model is static, we could then define a static equilibrium. If we are interested in the dynamic model, which for example, is driven by exogenous technological shocks, then we need to define a different equilibrium. Both are very interesting and can serve different research purposes. Evans Jovanovic

(1989), Lucas (1978) are representative of such static models, Glomm (1992), Lucas (2004) concentrate on the dynamics of such migration models. In the following, I will study both static and dynamic equilibria.

3.1 Competitive Equilibrium in a Dynamic Model

In stead of thinking about a static model, let us take a look at a dynamic model in which there are technological changes in three sectors, and the commodities markets are closed. A competitive equilibrium for this economy consists of

1. A sequence of agricultural sector wages $\{w_{f,t}\}_{t=1}^{\infty}$;
2. A sequence of rural non-farm sector wages $\{w_{e,t}\}_{t=1}^{\infty}$;
3. A sequence of rural population $\{N_t\}_{t=1}^{\infty}$;
4. A sequence of emigration rate ζ_t;

such that,

1. (Households' problem) Given the price $\{w_{f,t}, w_{e,t}, w_{u,t}, 1+r\}_{t=1}^{\infty}$, the occupational choices solve the rural household's utility maximization problem;
2. (Rural farm production's problem) Given the price $\{w_{f,t}, w_{e,t}, w_{u,t}, 1+r\}_{t=1}^{\infty}$, the rural farm's profit maximization problem is solved;
3. (Rural non-farm production's problem) Given the price $\{w_{f,t}, w_{e,t}, w_{u,t}, 1+r\}_{t=1}^{\infty}$, the rural non-farm's profit maximization problem is solved;
4. The labor market for rural farm sector clears:

$$L_{f,t}^{d} = L_{f,t}^{s} \tag{3.1}$$

5. The labor market for rural non-farm sector clears:

$$H_{e,t}^{d} = H_{e,t}^{s} \tag{3.2}$$

$$\begin{aligned} &N_{t-1}\int_{\hbar_{3t-1}}^{\hbar_{4t-1}} H_e^U(h)d\Phi(h) + N_{t-1}\int_{\hbar_{4t-1}}^{\infty} H_e^C(h)d\Phi(h) \\ &= N_{t-1}\int_{\hbar_{1t-1}}^{\hbar_{2t-1}} hd\Phi(h) + N_t\int_{\hbar_{1t}}^{\hbar_{2t}} hd\Phi(h) \end{aligned} \tag{3.3}$$

6. The rural population evolves according to

$$N_t = N_{t-1}(1 - \int_{\hbar 2t-1}^{\hbar_{3t-1}} d\Phi(h)) \tag{3.4}$$

in another word, the emigration rate ζ_t can be expressed as:

$$\zeta_t = \int_{\hbar 2t}^{\hbar_{3t}} d\Phi(h) \tag{3.5}$$

3.2 A Stationary Equilibrium with Exogenous Prices

In stead of repeating the whole model again to describe static model, I will just drop all the t's (except for rural population N_t) in the above sections, while keeping everything else the same.

A stationary competitive equilibrium for this economy consists of:

1. Agricultural sector wages w_f
2. Non-farm sector wages w_e;
3. Rural born population $\{N_t\}_{t=1}^{\infty}$;
4. A sequence of emigration rate ζ;

such that,

1. (Households' problem) Given the price $\{w_f, w_e, w_m\}$, the occupational choices solve the rural household's utility maximization problem;
2. (Rural farm production's problem) Given the price $\{w_f, w_e, w_m\}$, the rural farm's profit maximization problem is solved;
3. (Rural non-farm production's problem) Given the price $\{w_f, w_e, w_m\}$, the rural non-farm's profit maximization problem is solved;
4. The labor market for rural farm sector clears:

$$L_f^d = L_f^s \tag{3.6}$$

5. The labor market for rural non-farm sector clears:

$$H_{e,t}^d = H_{e,t}^s \tag{3.7}$$

$$\begin{aligned} &N_{t-1}\int_{\hbar_3^*}^{\hbar_4^*} H_e^U(h)d\Phi(h) + N_{t-1}\int_{\hbar_4^*}^{\infty} H_e^C(h)d\Phi(h) \\ &= N_{t-1}\int_{\hbar_1^*}^{\hbar_2^*} hd\Phi(h) + N_t\int_{\hbar_1^*}^{\hbar_2^*} hd\Phi(h) \end{aligned} \tag{3.8}$$

6. The rural population evolves according to

$$N_t = N_{t-1}(1 - \int_{\hbar 2^*}^{\hbar_3^*} d\Phi(h)) \tag{3.9}$$

in another word, the emigration rate ζ can be expressed as:

$$\zeta = \int_{\hbar 2^*}^{\hbar_3^*} d\Phi(h) \tag{3.10}$$

4 Stationary Equilibrium and Dynamics

4.1 Stationary Equilibrium

Given the exogenous urban wage w_u, rural households make individual occupational choices, rural labor markets clear and the rural wage w_e is obtained from the equilibrium condition. The stationary equilibrium here specifically means that the prices (including exogenous wage w_u, exogenous commodity prices, and endogenous wage w_e) are all constants, which is crucial in maintaining constant human capital thresholds ($\hbar's$, being functions of prices), which furthermore results in the constant fraction of rural households who select each occupation. In this stationary equilibrium, prices are constant, distribution of occupational choices is invariant , and the emigration rate ζ – fraction of rural origin agents choosing to permanently stay in cities – is constant. The only thing that is changing is the rural population, which is decreasing at an invariant rate $(1-\zeta)$. This seems to be puzzling sometimes, because it is natural to expect the urban wage drops when rural people rush into cities. However, this thought is only true if the urban manufacturing sector is subjected to a closed capital market. In that case, when urban labor supply increases, the higher demand for capital will push up the interest rate, hence the urban sector can not maintain the original wage rate while absorbing all the extra labor. On the other hand, if the urban manufacturing sector can borrow freely from international capital market at a constant world interest rate, then when the urban labor supply rises, the urban production sector enlarges the capital input proportionally, while being able to keep the urban wage as before even if there are more labor. This assumption has been adopted by many papers, such as Galor and Zeria (1993), and it is a reasonable assumption for China's urban manufacturing sector after the reform in 1980s.

4.2 Dynamics between Stationary Equilibria

Suppose there is an exogenous shock in urban manufacturing sector, which raises the urban wage w_u from w_{u0} to w_{u1}. We can calculate the rural wage in stationary equilibrium corresponding to the two urban wages. Let us denote the old stationary equilibrium rural wage as w_{e0} and the new one as w_e^*. Hence we need to find out the path that connecting the two stationary equilibria. This transition process is described by Eq.(3.3). Because $\hbar_{1t}$ and $\hbar_{2t}$ are functions of w_{et} and w_{et+1}, and $\hbar_{3t}$ $\hbar_{4t}$ $\hbar_{5t}$ are functions of w_{et}, if we express all the human capital thresholds in Eq.(3.3) in terms of rural wage w_e, we will have a non-linear second order difference equation containing $(w_{et}, w_{et+1}, w_{et+2})$, which can be denoted as $F(w_{et}, w_{et+1}, w_{et+2}) = 0$.

If I linearize $F(w_{et}, w_{et+1}, w_{et+2}) = 0$ around the new steady state w_e^*, I can get the following difference equation:

$$\begin{aligned} \left\{ \begin{array}{c} w_{e,t+2} - w_e^* \\ w_{e,t+1} - w_e^* \end{array} \right\} &= \left\{ \begin{array}{cc} \Phi_1 & \Phi_2 \\ 1 & 0 \end{array} \right\} \left\{ \begin{array}{c} w_{e,t+1} - w_e^* \\ w_{e,t} - w_e^* \end{array} \right\} \\ &= \quad \Lambda \quad \left\{ \begin{array}{c} w_{e,t+1} - w_e^* \\ w_{e,t} - w_e^* \end{array} \right\} \end{aligned} \tag{4.1}$$

The eigenvalue of Λ are calculated as:

$$-1 < \lambda_1 < 0, \quad \lambda_2 < -1 \tag{4.2}$$

The general solution to the difference equation is:

$$\left\{ \begin{array}{c} w_{e,t+1} - w_e^* \\ w_{e,t} - w_e^* \end{array} \right\} = b_1 \lambda_1^t \left\{ \begin{array}{c} v_{11} \\ v_{12} \end{array} \right\} + b_2 \lambda_2^t \left\{ \begin{array}{c} v_{21} \\ v_{22} \end{array} \right\} \tag{4.3}$$

where b_1 and b_2 are constants, and v_1 and v_2 are eigenvectors corresponding to the eigenvalue λ_1 and λ_2. The eigenvector corresponding to λ_1 can be computed as:

$$\left\{ \begin{array}{c} v_{11} \\ v_{12} \end{array} \right\} = \left\{ \begin{array}{c} 1 \\ 1/\lambda_1 \end{array} \right\} \tag{4.4}$$

A saddle path can be obtained by setting $b_2 = 0$. b_1 needs to be pinned down from the initial condition $w_{e,0}$:

$$b_1 = \lambda_1 (w_{e0} - w_e^*) \tag{4.5}$$

Hence the saddle path is given as:

$$\begin{aligned} w_{e,t} &= w_e^* + b_1 \lambda_1^{t-1} \\ &= w_e^* + \lambda_1 (w_{e0} - w_e^*) \lambda_1^{t-1} \end{aligned} \tag{4.6}$$

5 Simulation Results

In order to see whether the theoretical model makes sense, some simulations of the model are conducted. In this section, I will explain how the simulation is done and relevant meaning.

First, the parameters of rural non-farm production are chosen such that $\alpha = 0.28$ and $\beta = 0.42$, hence the income share ratio of physical capital to labor is $2:3$. The human capital is assumed to follow log-normal distribution, $h \sim LN(\mu, \sigma^2)$. By picking the two parameters $\mu = 1$ and $\sigma = 0.8$, the human capital has mean of 3.74, standard deviation of 3.54 and median of 2.72. The real interest rate is chosen such that the annual real interest rate is 4%. The moving cost, D, is picked at 5, which is about 1/9 of the median income of migrants who are not an entrepreneur, 5% of the median income of migrants who become unconstrained entrepreneurs, and 1.67% of the median income of migrants who become constrained entrepreneurs. Finally, we need to fix the city wage rate w_u at two time points. I followed the real data in China that the real urban wage rate has increased 7.4% from 1985 to 1999 and let the city wage rate in the model increase by 7.4%.

The simulation of the model gives us prediction in several dimensions. First, given the urban wage increases by 7.4%, the rural wage rises by 5.59%. Why has not rural wage grown at the same rate as urban wage? There are at least two reasons. On the demand side, the rising urban wage has discouraged a subset of potential entrepreneurs, who would have been become an entrepreneur, but under the attraction of high urban wage, choose to continue being an urban worker rather than going back to rural home; however, the hiking urban wage also has provided entrepreneurs more self-fund, which allows them to hire more labor. To summarize the demand side story: high urban wage suppresses the quantity of returning entrepreneurs while leaving the entrepreneurs more self-fund. On the supply side, the rising urban wage has encouraged a subset of rural workers to migrate. The overall outcome is a surge in rural wage, even though the rising proportion is smaller than the urban wage.

Second, let us take a look at the left panel in Figure (5.3). It is shown that the changes in human capital thresholds given the rise in urban wage. From bottom up, the portion between the blue and green curves are rural non-farm worker, between the green and red and green curves are the permanent migrants, between the red and light blue is unconstrained entrepreneurs, and lastly, above the light blue line is the constrained entrepreneurs. Keep in mind the distribution of human capital is log normal rather than uniform. Let us analyze the modification in the four lines one by one. The uplift

in the red line represents that given the higher urban wage, there are a subset of rural agents who would have been entrepreneurs had the urban wage not grown now enter the permanent migrants category. This reflects the fact that without other benefits, when the urban sector pays better, the opportunity cost of returning to rural area to run non-farm business keeps rising, hence it is less attractive for migrants to return rather than stay in cities. Therefore, it is very difficult to purely rely on migrants to continue returning because if urban wage rises, there will be less and less migrants find it optimal to return. If the rural industrialization is the target of Chinese government, as pointed out by its National Conference of the Party in 2008, it should seriously consider subsidizing returning entrepreneurs. Next, the uplift in the light blue line reveals a shift in the financial constraint. This can been seen more clearly from Figure (5.2). In the left panel (the lower urban wage), the financial constraint kicks in at human capital level 11.52, while in the right panel (the higher urban wage), the financial constraint shows up at human capital level 12.26. What does the financial constraint mean in the model? For example, in the left panel, if someone's human capital is above 11.52, he will become a constrained entrepreneur. Why constrained? because his human capital is at such a level that his desired optimal level of capital input for his own business is correspondingly large. However, under the borrowing constraint, all the available capital comes from his own saving in the first period, which is linear in human capital ($w_u h$). Therefore, that person becomes a constrained entrepreneur in the sense that the realized size of his business is below his desired level. What does the uplift of light blue curve in the left panel of Figure (5.3) mean? Basically, it means that when urban wage is higher, it gives people more self-fund, thus less people will be constrained now.

Combining the uplift of the light blue line and the uplift of the red line in the left panel of Figure (5.3), it leads to an interesting conclusion: higher urban wage has two effects: on the qualitative dimension, it allows more people be unconstrained because they have more self-fund now, however on the quantitative side, it has discouraged a group of entrepreneurs at the lower end (by "lower end", I mean those whose human capital is very close to the red line from above), who would have been mediocre business people. When the cities provide them higher wage, they quit being entrepreneurs.

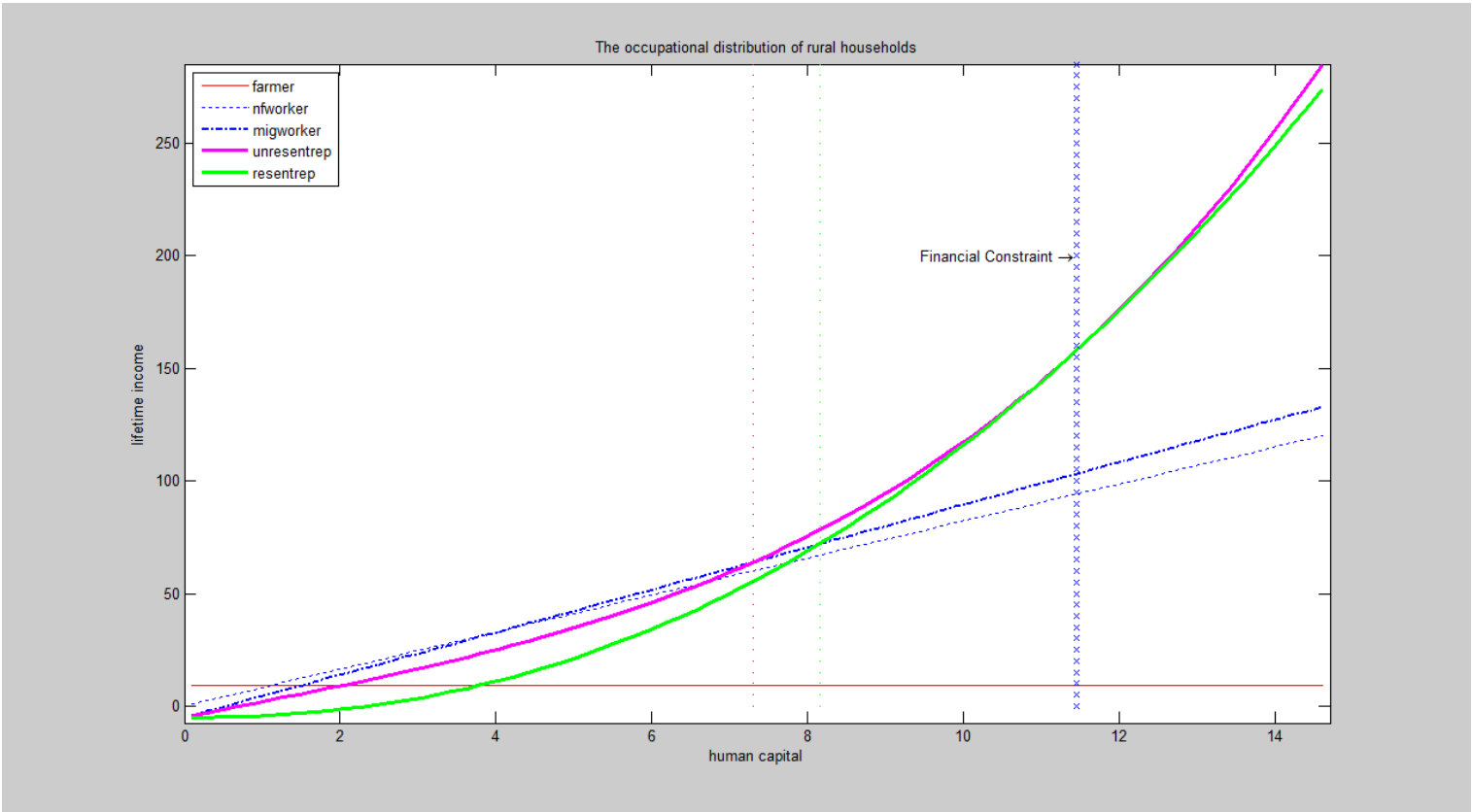


Figure 5.1: Human capital and Occupational choices

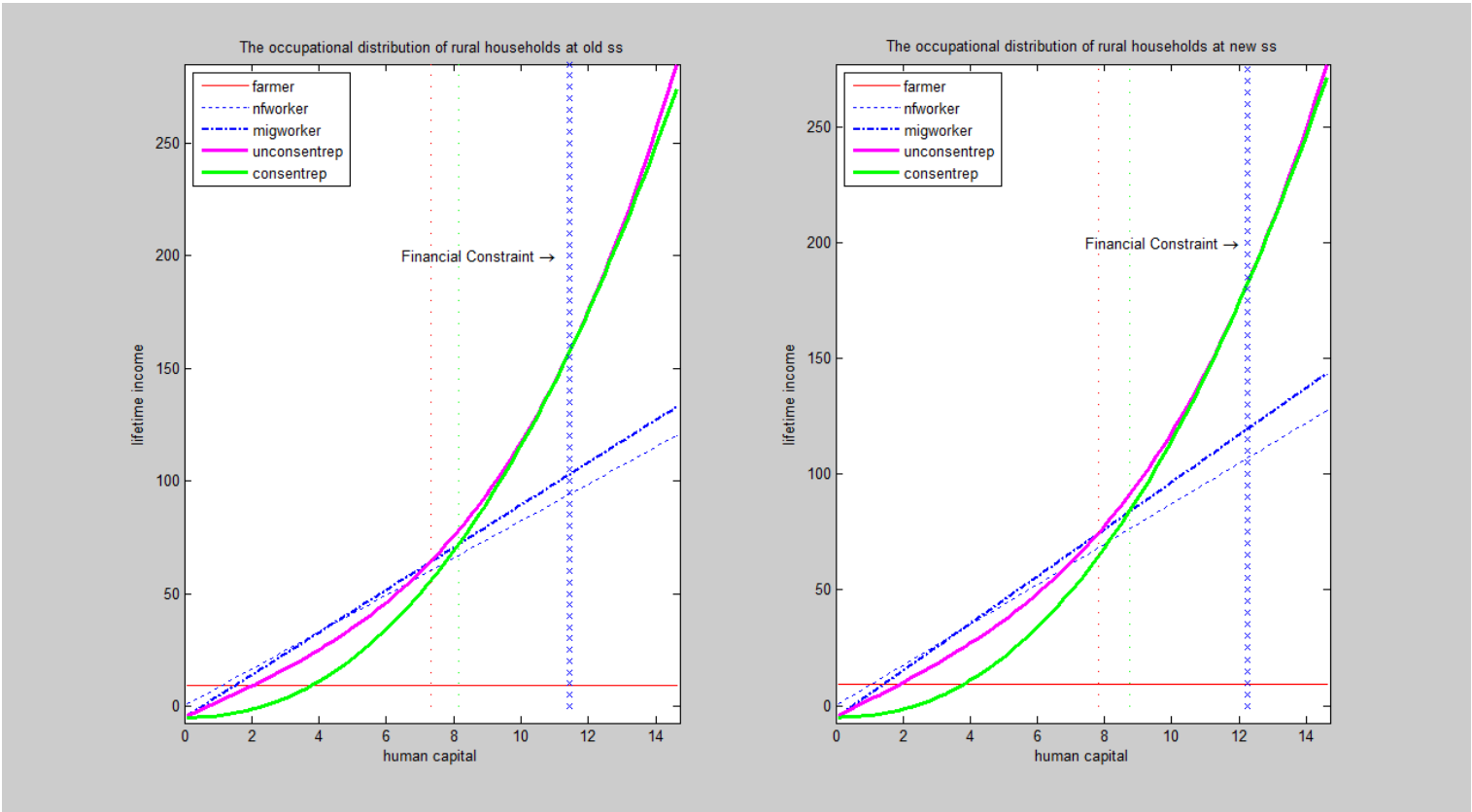


Figure 5.2: Human capital and Occupational choices in two Stationary Equilibria

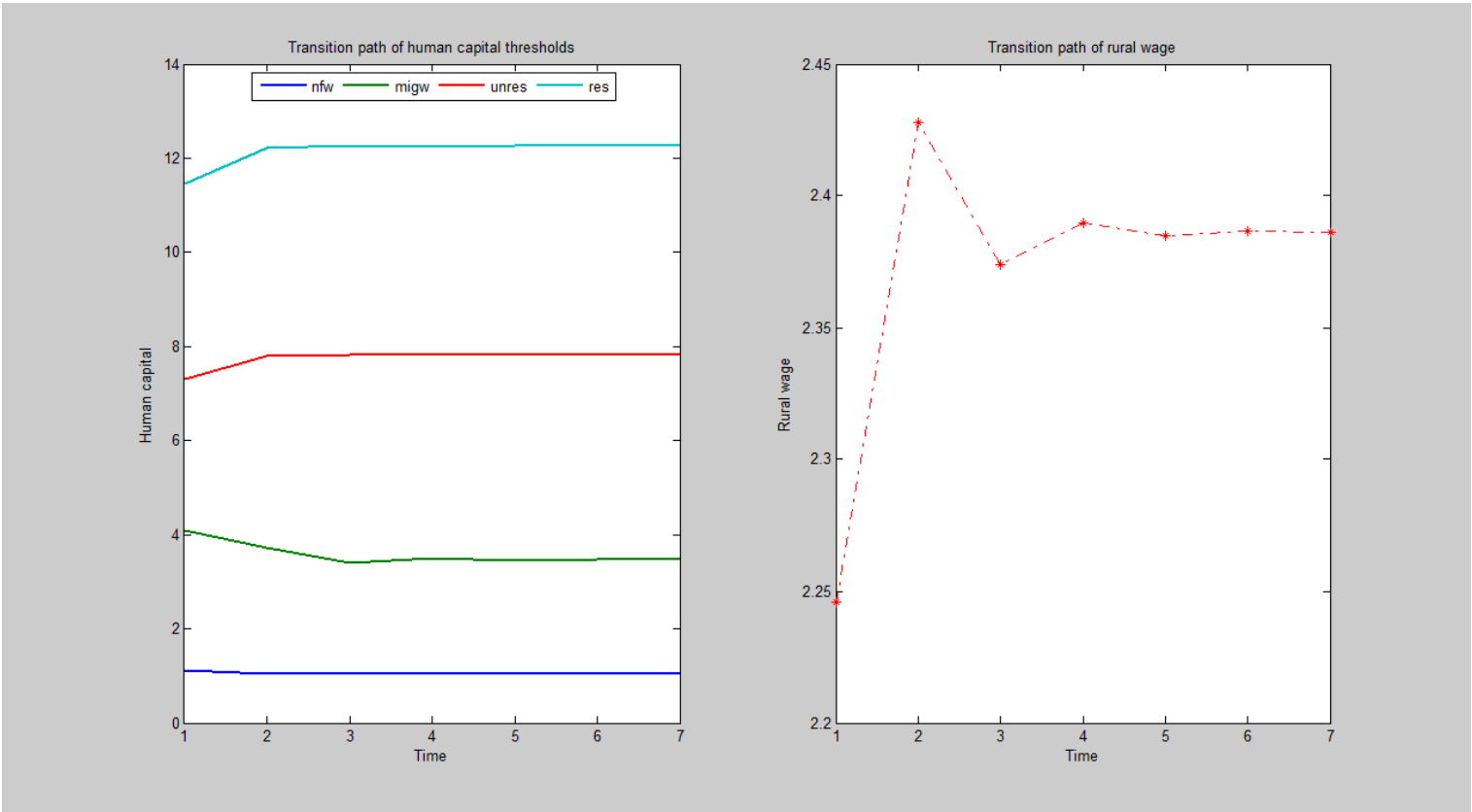


Figure 5.3: Transition Path of human capital thresholds and rural wage

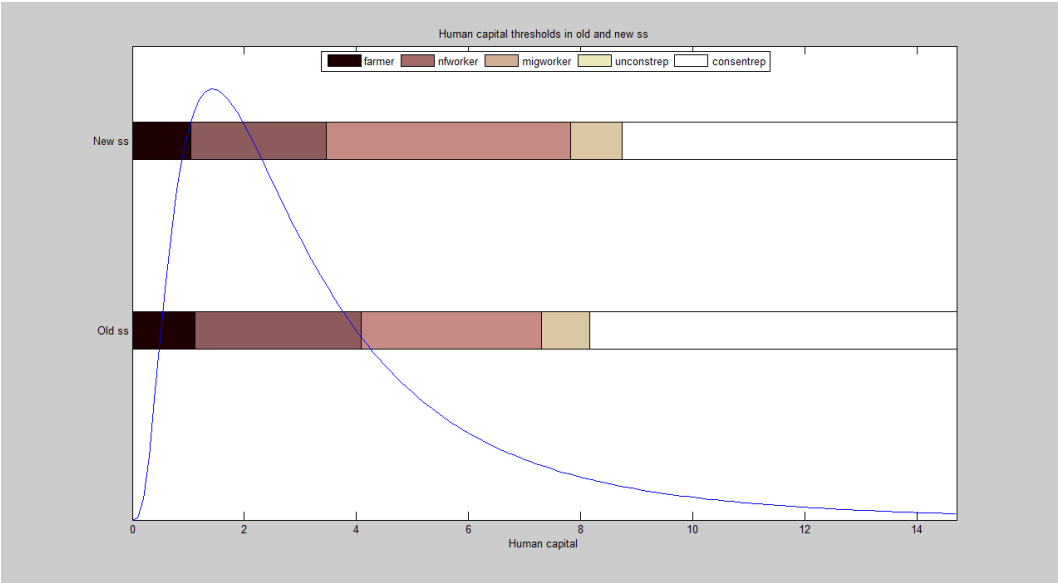


Figure 5.4: Occupational choices before and after urban technology shock

6 The Data and Empirical Tests

The goal of the empirical task in this paper is to verify the predictions drawn in the theoretical model:

1. Rural agents who have higher human capital migrate to urban area because the payoff for one unit of human capital is higher there.
2. The rural households who have migrated and obtained income from migration activities are able to overtake the borrowing constraint and set up non-farm business.

Therefore, I need to test three points as following:

1. Both the income from migration and education level affect rural households' probability of *entering* the non-farm business.
2. Both the income from migration and education level affect rural households' probability of *being* in the non-farm business.
3. Both the income from migration and education level affect rural households' income from non-farm business, conditional on whether the households have entered the non-farm business.

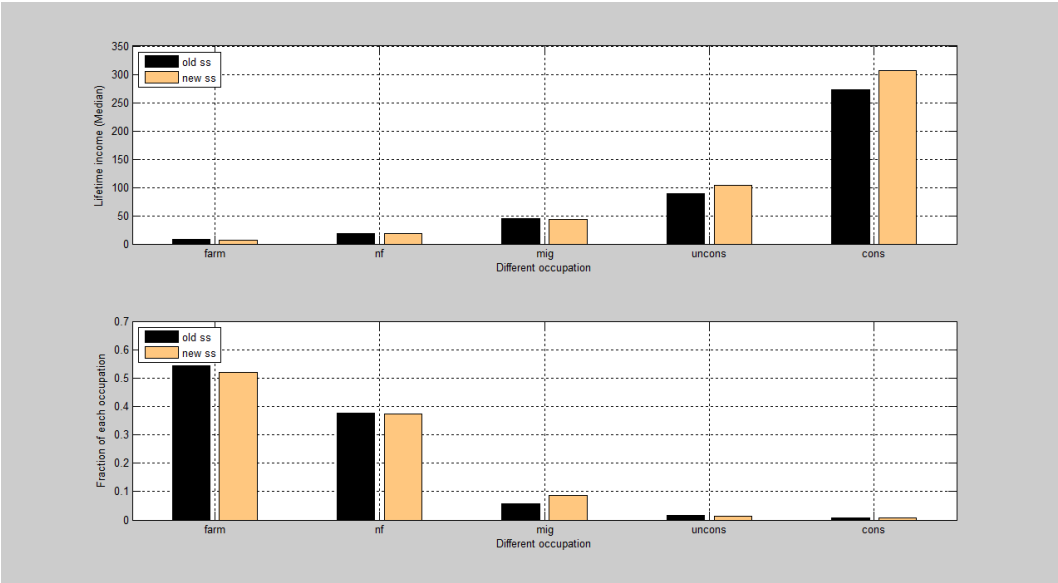


Figure 5.5: Median income of each occupation and occupation distribution

6.1 The Data Description

The dataset I use in this paper is China Rural Households Survey collected by the Research Center for Rural Economy (RCRE), a research institute within the Agricultural Ministry of China. This RCRE survey dataset is by far the only empirical source that satisfies three characteristics at the same time: it is collected and managed by academic and administrative authority of China; on the time dimension, it covers as long as 11 years from 1984 to 1999; on the geography dimension, it surveyed 10 provinces, which results in a very rich dataset containing 37422 households. Such panel data set allows the study of China's contemporary rural development from a wide array of approaches.

I use 1995-1999 period data from RCRE survey, which consists of a sample of 5643 rural households over the five years span. There are two reasons for engaging only a segment of the original survey data: first, it fits the goal of my empirical tests. With the contribution from migration to rural business being the focus of this paper, it is legitimate to ignore the periods before 1995 when the internal migration only started to form its momentum. Second, the RCRE survey was not conducted in 1994 because of a lack of fund, which incurs not only the discontinuity in several facets of the data but also an attrition problem of participating households from before 1994

and after then.

Rural households derived their income from four sources: farm, non-farm, rural wage work, and migration. The definitions for the difference between farm and non-farm work are listed in Table 6.1.

Table 6.1: Definition of farm and non-farm work

Farm	Planting, forestry, husbandry, fishery
Nonfarm	Manufactory industry (including agricultural product processing), construction, transportation,retailing,restaurants, other services

In this survey, I do not have the direct information on whether a rural household is majoring in farm or non-farm work, hence the need to define a measure for it. There are at least two alternatives: first, rural households can be categorized into farm/non-farm according to their income level, that is, if a rural household derive most of the income from farm work, then it is a "farm" household, similarly for non-farm households; second, instead of using income, it is also reasonable to label rural households' work types by their time allocation. The latter way seems to be more natural, but unfortunately, there is no information on the time input recording in the dataset. Therefore, I adopt the first measure. Table 6.2 illustrates that from 1995 to 1999, the percentages of rural households who mainly work in non-farm sector had been increasing steadily from 19.32% to 26.04%, and farm households's number had seen a downward trend, from 80.68% to 73.95%. Let me make clear about the terminology here: "rural households" refer to all the households in this rural households survey; "farm households" refers to the rural households who mainly engage in working in farm sector; "non-farm households" refers to the rural households who mainly engage in working in non-farm sector.

Table 6.2: Occupation division of rural households

Year	Farm	Non-farm
1995	80.68	19.32
1996	80.66	19.33
1997	77.41	22.59
1998	75.58	24.41
1999	73.95	26.04

Table 6.3: Summary statistics (1), 1995-1999

Name	mean	se
Households size	4.30	1.58
Number of labor	2.61	1.10
Male (%)	54.17	21.39
Education (%)		
Illiterate	15.29	25.98
Elementary	40.06	33.73
Secondary	37.08	33.58
High school	7.55	19.41

Data: RCRE survey data

Table 6.3 presents the summary statistics of demographic characteristics in the rural households survey. The figures in under "Education" record the percentages of households members that had no education at all (0 year), or had elementary school education (6 years), or had secondary education (9 years) or had high school and above (> 9 years). The education level in general was still quite low in rural China during the survey period. The majority of rural residents only had finished elementary school, only a single digit of rural population made it though high school. Meanwhile, as high as 15% had not any type of education at all. Table 6.4 displays the summary statistics for production assets, revenue and income categorized by households' working types. Under the "Income" sub-panel, we can see that the large discrepancies between the income of farm and of non-farm households. Farm households obtained most of their income from farming sector, with the mean value 1827.64 yuan annually. Non-farm households draw more of their income from non-farm sector, with the mean value at 4454.42 yuan. The total income of non-farm households is on average 6715.12 yuan per year, doubles that of farm households, a mere 3416.36 yuan. Finally, non-farm households also witness a larger income from migration activities, 1268.92 yuan, which is 46.64% more than the migration income made by farm households.

Whether the incomes drawn from the four different resources are correlated? The answer is yes. Table (6.5) shows that while farm income has negative correlations with both non-farm and migration income, non-farm income and migration income however, is positively correlated. Whether the higher migration income has caused non-farm income, or the other way around, or is it merely a coincidence of happening? The causality needs to

Table 6.4: Summary statistics (2), 1995-1999

	Major in Farming			Major in Non-farm		
	mean	se	median	mean	se	median
Production Asset						
Farm	700.79	3560.38	192.00	356.09	1738.01	51.61
Nonfarm	718.88	2784.50	144.57	4532.76	14155.15	737.50
Revenue						
Farm	3190.44	4059.60	2447.15	1483.58	2184.21	1066.33
Nonfarm	739.96	4047.85	60.00	8593.22	18433.82	3570.83
Income						
Farm	1827.64	1439.40	1523.30	829.24	1086.56	654.15
Nonfarm	451.57	2439.13	40.00	4454.42	7107.82	2421.67
Other wage	271.79	854.08	0.00	162.54	554.66	0.00
Migration	865.36	1555.70	369.07	1268.92	3657.44	309.00

Data: RCRE survey data
Note: All in 1995 Chinese Yuan

be studied by the methods of econometrics tests, which are covered in the next section.

Table 6.5: Correlation between Different Sources of Income

Income Source	Farm	Nonfarm	Migration
Farm	1.0000		
Nonfarm	-0.1456	1.0000	
Migration	-0.1442	0.3394	1.0000

Table 6.6: Rural households having Income from Migration in the previous year

Year	1996	1997	1998	1999
%	42.03	43.13	44.57	47.67

It needs to be taken with caution that not every rural household migrates, hence only a subgroup of rural household has income from migration activity. First of all, I need to know what percentage of rural households

Table 6.7: Occupation transition of rural households

		$t=1$		
		Farm	Non-farm	Total
$t=0$	Farm	16,191	1,547	17,738
	(%)	(91.28)	(8.72)	(100.00)
	Non-farm	1,167	3,667	4,834
	(%)	(24.14)	(75.86)	(100.00)
	Total	17,358	5,214	22,572
	(%)	(76.90)	(23.10)	(100.00)

have migration income last period Table 6.6 shows that from 1996 to 1999, about 42% to 47% of rural households obtained at least part of their income from migration, and that proportion was rising over the four year span.

Even though Table 6.2 has given us an overall results of farm/non-farm division, it will be clearer if I know the proportion of households transferring in and out of both sectors. The results of panel transition matrix are displayed in Table 6.7, which presents the transition of rural households between farm and non-farm sectors. Although the proportion of households transited from farm sector into non-farm sector is 8.72%, which was smaller than the proportion of households transited from non-farm sector into farm sector, 24.14%, however, given the large base of farm households, there were still net increase in the number of non-farm households.

6.2 Empirical Tests

6.2.1 Logit Model on Entering Non-farm Business

It is of interests to see whether the amount of income a rural households derived from migration activity in the previous period helps the probability of this household entering rural non-farm business. Since whether a household has income from migration activities in the pervious period changes their time and resource allocation, it is reasonable to study the relationship under two cases. Denote d_{it} to be the binary variable that a household was not in non-farm sector at $(t-1)$ but entering the non-farm sector at time t. I can use a logit model to study how the probability of entering non-farm business is affected by an array of other factors, such as migration income from last period, education level, location of the households, etc.

$$d_{it} = \gamma_0 + \gamma_1 y^m_{it-1} + \gamma_2 y^f_{it-1} + z'_{it}\gamma_3 + \eta_{it} \tag{6.1}$$

where,

$$d_{it} = \begin{cases} 0, & \text{No entering} \\ 1, & \text{Entering non-farm business} \end{cases} \tag{6.2}$$

where y^m, y^f are income drawn from migration and farming respectively. z is a vector containing demographic characteristics, such as education level, households composition, geographic location, etc. Table 6.8 reports the impact from migration income on the probability of entering non-farm business. The table contains three column blocks: the first and the second blocks are respectively for the sub-group who had or did not have migration income from the previous period; the third block is for everyone in the survey. As already reported in Table 6.6 that there were only around 45% of rural households deriving some or all of their income from migration activities, thus the number of observations in the first block (10003) is less than that of the second block (12538). The reported estimation is the mean value, which is not the marginal effect in the logit model. Instead, the coefficients stand for the marginal effects of each variable on the odds ratio. The interpretation can be drawn in the following way: given a household did have at least some income from migration activities in the previous period, when that migration income rises by 1%, the odds ratio of this household entering non-farm business increases by 33.02%, when the farming income in the previous period rises by 1%, the odds ratio rises by 7.33%; Similarly, being in the coastal area raises the odds ratio by about 9.29%. On the other hand, if we look at the third column block in Table 6.8, the results are quite different. The coefficient for migration income is 3.51%, almost one tens of that in the first block. The explanation is that part of the rural households who are in non-farm business this period did not have income from migration last period. It could be that the households have participated in migration activities several periods ago (which were not recorded in the data), and had already entered non-farm sector in 1995; it could be also the case that the households had enough self-saved fund (not from migration but from other sources), and hence they were in non-farm sector without accumulating fund through migration.

6.3 Panel Logit Model on Being in Non-Farm Sector

It is clear from Table (6.7) that the transition in and out of non-farm business does not happen that often in our five years data observation. Among households who were majoring in farming work in the previous year, 8.72% entered non-farm business in that current year, while the rest 91.28% stayed

in farming sector. Once households entered the non-farm sector, more than three quarters of them stayed in non-farm sector instead of move in and out frequently. Therefore, in stead of studying the probability of new entering into the non-farm sector, I am also interested in learning about what affect the probability of *being* in non-farm sector this period given the income derived from migration last period. For this purpose, I construct a panel logit model with random effect as following:

$$h_{it} = \alpha_0 + \alpha_1 y^m_{it-1} + \alpha_2 y^f_{it-1} + \alpha_3 y^{\text{nf}}_{it-1} + z'_{it}\alpha_4 + \zeta_{it} \tag{6.3}$$

where,

$$h_{it} = \begin{cases} 0, & \text{Not in non-farm business} \\ 1, & \text{In non-farm business} \end{cases} \tag{6.4}$$

and y^{nf} is the income derived from non-farm business.

As we can see from Table (6.12), conditional on a household did migrate in the previous period, if the migration income increases by 1%, the odds ratio of that household being in the non-farm business (note: here I am interested in "being in non-farm business", while the previous subsection studies "entering non-farm business") rises by 37.90% . The conditional regression gives us the expected results: income from migration raises the odds ratio of being in non-farm sector. However, the unconditional regression shows there is no effect from migration income (an insignificant -0.23%). Farming income has negative effect on the probability of being in non-farm business, as shown in the estimated coefficient -0.4275 in the conditional case and -0.4838 in the unconditional case. Non-farm income from previous period has positive effect on the probability of being in non-farm business, 0.3540 for the group of those who migrated before and 0.4115 for the group who did not migrate. Having higher education or being in the coastal area definitely has raised the probability of being in non-farm business.

6.4 Panel Regression Model of Non-farm Income

Whether the income from migration activities help improve non-farm business? As seen in the theoretical model that the migration income serves partly as self-fund when a rural agent wants to start his own business, and it also provides an extra momentum to push those financially constrained agents getting over the borrowing hurdle. In order to check the relationship between the income a household derive from non-farm sector this period

and the income that they get from last period's migration work, a panel regression with random effect is conducted as following:

$$y_{it}^{\text{nf}} = \beta_0 + \beta_1 y_{it-1}^{m} + \beta_2 y_{it-1}^{f} + \beta_3 y_{it-1}^{\text{nf}} + z_{it}'\beta_4 + \epsilon_{it} \tag{6.5}$$

Table (6.11) presents the estimated results of the impacts from migration income, farm income and non-farm income in the previous period on current period's non-farm income. Similar with the previous two estimations, the conditional regression gives expected results that are consistent with the theory. Because all the income related independent and dependent variables are in log-form, we can interpret the coefficient in the meaning of elasticity. When migration income from the previous period rises by 1%, the current non-farm income grows by 0.2871%. The elasticity of current non-farm income to last period's non-farm income is 0.0952, while that of last period's farm income is -0.0865. On the other hand, the result from unconditional estimation gives different sign on migration income, -0.0134, even though the unconditional estimations of coefficients other than the one for migration income all have the same signs with the conditional estimation results. Table (6.10) reports the estimation results when the random effects are only in intercept. Both quantitatively and qualitatively, Table (6.11) and Table (6.10) provide very similar outcomes.

Table 6.8: Entering Non-farm Business: Logistic Model

	Migrated at $(t-1)$		Not migrated at $(t-1)$		Overall	
	mean	(se)	mean	(se)	mean	(se)
Mig inc $(t-1)$	**0.3302**	(0.0464)	–		**0.0351**	(0.0080)
Farm inc $(t-1)$	**0.0733**	(0.0222)	**0.1068**	(0.0236)	**0.0708**	(0.0157)
Nonfarm inc $(t-1)$	**0.0464**	(0.0121)	**0.0420**	(0.0102)	**0.0382**	(0.0077)
Deposit $(t-1)$	-0.0155	(0.0107)	**-0.020**	(0.0099)	-0.0092	(0.0072)
Education	0.0808	(0.0701)	0.0657	(0.0560)	**0.1009**	(0.0434)
Male (%)	-0.1115	(0.2031)	0.1861	(0.1656)	0.0705	(0.1275)
Num. of Labor	-0.0369	(0.0349)	0.0591	(0.0361)	**-0.0142**	(0.0251)
Coastal dummy	0.0929	(0.937)	-0.0036	(0.0875)	**0.1675**	(0.0608)
Constant	**-5.5799**	(0.4571)	**-3.9653**	(0.2775)	**-3.6343**	(0.1983)
No. of observations	10003		12538		22541	
Log Likelihood	-2529.9339		-3028.1116		-5592.8167	

Logistic regression

Table 6.9: Being in Non-farm Business: Panel Logisitic Model

	Migrated at $(t-1)$		Not migrated at $(t-1)$		Overall	
	mean	(se)	mean	(se)	mean	(se)
Mig inc $(t-1)$	**0.3790**	(0.0493)	–		-0.0023	(0.0085)
Farm inc $(t-1)$	**-0.4275**	(0.0220)	**-0.5433**	(0.0249)	**-0.4838**	(0.0161)
Nonfarm inc $(t-1)$	**0.3540**	(0.0132)	**0.4115**	(0.0117)	**0.3524**	(0.0085)
Deposit $(t-1)$	0.0084	(0.0116)	-0.0085	(0.0099)	0.0056	(0.0076)
Education	0.1193	(0.0803)	**0.1901**	(0.0617)	**0.1941**	(0.0497)
Male (%)	-0.0908	(0.2265)	0.0070	(0.1795)	-0.0296	(0.1413)
Num. of Labor	-0.0671	(0.0386)	0.0498	(0.0387)	**-0.0361**	(0.0279)
Coastal dummy	**0.8023**	(0.1091)	**0.8869**	(0.0962)	**1.0353**	(0.0733)
Constant	**-3.2357**	(0.4876)	-0.3640	(0.2874)	**-0.4161**	(0.2115)
/lnsig2u	**0.6434**	(0.1272)	**0.7210**	(0.0964)	**0.6599**	(0.0732)
σ_u	**1.3795**	(0.0878)	**1.4340**	(0.0691)	**1.3909**	(0.0509)
ρ	**0.3664**	(0.0295)	**0.3846**	(0.0228)	**0.3703**	(0.0170)
No. of observations	10003		12538		22541	
No. of households	3704		4290		5640	
Log Likelihood	-3149.3808		-4402.3219		-7577.3685	

Random effects logistic regression

Table 6.10: Non-farm Income: Panel Random Intercept Model

	Migrated at $(t-1)$		Not migrated at $(t-1)$		Overall	
	mean	(se)	mean	(se)	mean	(se)
Mig inc $(t-1)$	**0.2905**	(0.0243)	–		**-0.0124**	(0.0040)
Farm inc $(t-1)$	**-0.0879**	(0.0154)	**-0.0991**	(0.0090)	**-0.0832**	(0.0081)
Nonfarm inc $(t-1)$	**0.0965**	(0.0071)	**0.1219**	(0.0056)	**0.0832**	(0.0042)
Deposit $(t-1)$	**0.0475**	(0.0068)	**0.0287**	(0.0043)	**0.0308**	(0.0037)
Education	**0.3007**	(0.0530)	**0.2396**	(0.0324)	**0.2583**	(0.0299)
Male (%)	-0.0487	(0.1417)	0.1421	(0.0854)	0.0942	(0.0756)
Num. of Labor	**-0.1442**	(0.0233)	**-0.0856**	(0.0184)	**-0.1419**	(0.0152)
Coastal dummy	**0.8064**	(0.0732)	**0.9682**	(0.0551)	**1.0592**	(0.0507)
Constant	**4.1943**	(0.2651)	**6.3973**	(0.1339)	**6.4559**	(0.1179)
sd(cons)	**1.1924**	(0.0283)	**1.1269**	(0.0219)	**1.2510**	(0.0193)
sd(residual)	**0.9036**	(0.0158)	**0.7748**	(0.0095)	**0.8196**	(0.0074)
No. of observations	3715		6403		10118	
No. of households	1987		2601		3552	
Log Likelihood	-6272.7227		-9726.8322		-15830.184	

Mixed-effects REML regression

Table 6.11: Non-farm Income: Panel Regression Model (Random Effects)

	Migrated at $(t-1)$		Not migrated at $(t-1)$		Overall	
	mean	(se)	mean	(se)	mean	(se)
Mig inc $(t-1)$	**0.2871**	(0.0268)	–		**-0.0134**	(0.0043)
Farm inc $(t-1)$	**-0.0865**	(0.0151)	**-0.1006**	(0.0090)	**-0.0901**	(0.0079)
Nonfarm inc $(t-1)$	**0.0952**	(0.0074)	**0.1241**	(0.0073)	**0.0894**	(0.0049)
Deposit $(t-1)$	**0.0470**	(0.0071)	**0.0291**	(0.0044)	**0.0327**	(0.0038)
Education	**0.3018**	(0.0541)	**0.2418**	(0.0328)	**0.2656**	(0.0298)
Male (%)	-0.0491	(0.1470)	0.1422	(0.0918)	0.0925	(0.0809)
Num. of Labor	**-0.1453**	(0.0230)	**-0.0847**	(0.0191)	**-0.1395**	(0.0147)
Coastal dummy	**0.8132**	(0.0789)	**0.9619**	(0.0553)	**1.0408**	(0.0507)
Constant	**4.2142**	(0.2706)	**6.3881**	(0.1429)	**6.4545**	(0.1183)
σ_u	1.1737		1.0529		1.1234	
σ_e	0.8677		0.7396		0.7988	
ρ	0.6466		0.6696		0.6642	
No. of observations	3715		6403		10118	
No. of households	1987		2601		3552	

Random-effects GLS Regression

Note: the se of individual specific characteristics is $\sigma_u = 1.1737$, which is much larger than the se of residuals$\sigma_e = 0.8677$, that means the unobserved individual-specific component of the error (the random effect) is much more important than the idiosyncratic error.

Table 6.12: Non-farm Income: Panel Regression Model (Fixed Effect)

	Migrated at $(t-1)$		Not migrated at $(t-1)$		Overall	
	mean	(se)	mean	(se)	mean	(se)
Mig inc $(t-1)$	**0.0841**	(0.0440)	–		-0.0033	(0.0049)
Farm inc $(t-1)$	**0.0508**	(0.0216)	0.00003	(0.0087)	0.0077	(0.0101)
Nonfarm inc $(t-1)$	**0.0315**	(0.0113)	**0.0252**	(0.0087)	**0.0255**	(0.0054)
Deposit $(t-1)$	0.0136	(0.0122)	0.0072	(0.0055)	**0.0099**	(0.0046)
Education	**0.3564**	(0.1397)	0.0103	(0.0605)	**0.1035**	(0.0490)
Male (%)	-0.1587	(0.3071)	0.1690	(0.1204)	0.1349	(0.1060)
Num. of Labor	**-0.2427**	(0.0496)	**-0.1418**	(0.0385)	**-0.1703**	(0.0294)
Coastal dummy	–		–		–	
Constant	**5.4333**	(0.5188)	**7.4793**	(0.2254)	**7.0338**	(0.1689)
σ_u	1.6723		1.5939		1.6269	
σ_e	0.8676		0.7397		0.7987	
ρ	0.7879		0.8228		0.9057	
No. of observations	3715		6403		10118	
No. of households	1987		2601		3552	

Fixed effects (within) regression

7 Conclusion

After China's economic reform in early 1980s, about 10% of rural Chinese have migrated temporarily or permanently to urban area. This translates into about 130 million Chinese have been working in places other than their original hometown. The scale of internal migration is large historically in China and even around the world. Furthermore, around one third of the migrants go back to hometown after working temporarily in cities. This group of people provide a unique channel for capital flowing from urban to rural area, where has been credit deprived historically. As recorded in the literature, there were various extents of borrowing constraints in rural China from 1980 to 2000, which has prevented rural agents from entering rural non-farm business because the grass-root rural people do not have enough self-fund to start non-farm business. Meanwhile, they are likely to be declined by financial institutions for lack of collateral. Along with this line, migration to cities provides a way for rural poor people to accumulate self-fund, and if they ever go back to their hometown, their saving from migration activities will be able to assist them to start non-farm business.

Under this motivation, I constructed a theoretical growth model in which rural origin households are heterogeneous in human capital level. They make their occupational choices as well migration decisions taking into account their human capital level, urban and rural wage difference, and the potential profitability if they ever return to rural area. The main message conveys by the theoretical model has several folds. Rural agents migrate to cities with different motivations. Some are purely driven by the rural urban wage differences, some are encouraged by the rosy prospect of starting own business. The credit constraint in rural China prevented those smart and able people from being entrepreneurs, however, the loosening in labor mobility policy in China after 1980s has lighted new opportunities for them. The more lively mobility in labor market in inland China has jump started movement in capital flow.

Following the theoretical model, I examine the Rural Households Survey from 1995 to 1999. The data was collected by Research Center for Rural Economy under The Ministry of Agriculture of People's Republic of China, with 5643 households during the five-year span. In order to test whether and how much the income from migration activities affect rural agents' ability to start rural non-farm business, I conducted three sets of research: First, a logit model estimates the impact of migration income on the probability of entering rural non-farm business. Second, a panel logit model checks the influence of migration income on the probability of *being* in rural non-farm

business sector. Third, a panel regression model with random effect investigatess to what extent the migration income affects the income a household derive from non-farm business. Because not all rural households have ever migrated, hence each set of the study needs to be studied under the conditional and unconditional cases (conditional on whether the household has migrated in the previous period). Conditional on a household did migrate in the previous period, his migration income increases his chance of entering rural non-farm business had he not in that sector. Secondly, migration income significantly raises the probability of a rural household being in non-farm business sector. Lastly, migration income also improves the profitability of a household's non-farm business.

Given all the results, there are two policy implications that can be drawn: First, China's government should loosen the restrictions of rural households migrating to urban area. Historically, the internal movement has been restricted brutally, which enlarged the rural-urban income inequality. It is clearly shown in this paper that migration and returning migration magnificently spread the prosperity of urban area back to the less developed rural area, hence removing migration restrictions should be able to greatly ameliorate the communication between cities and country side. Secondly, the benefit of migration income on rural households' starting-operating rural non-farm business is significant, which implies that the demand of external finance from rural households is large. Migration certainly provides a channel as external funds, however, it might still be inadequate. Therefore, China's government might also consider reforming its financial sector in rural area, so that rural households can have access to credit more easily, which should be able to promote the rural non-farm economy furthermore.

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