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**ENTREPRENEURSHIP, MARKET SELECTION AND INCOME  
MOBILITY - EVIDENCE FROM RURAL CHINA \***

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This paper aims at bridging the approaches on entrepreneurship and income mobility with a market selection process. An inter-temporal model is introduced to show that market incentives drive the households with higher entrepreneurial abilities to rationally make greater efforts. As such, market selection works: households with higher abilities earn higher incomes. This selection gives rise to income mobility over time in the favor of the households with higher abilities. Given household choices are also in function of market risk, the performance of market selection varies among countries, depending on the capability of the state to supply an ample market infrastructure and the endowment of social capital in order to reduce market risk. The tests based on a sample of 1530 Chinese rural households during 1989-2009 confirm the theory.

*Keywords:* Income Mobility, Entrepreneurship, Risk Taking, Market Selection, Market Infrastructure, Social Capital, Chinese Rural Economy

*JEL Classification:* D13, D31, L26, R20

## 1. INTRODUCTION

Unlike traditional income inequality measurements that capture snapshots of income distribution, income mobility presents a picture of the dynamics of this distribution. Consider two economics of equal income inequality, but different in mobility. The more mobile one can be judged as being better than the other is, at least by Sen's (2000) criterion of "equality of opportunity." The work on income mobility has, however, two serious deficiencies: 1) there are few signs of the mechanism by which mobility materializes

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and/or an economy becomes more or less mobile; 2) the literature on mobility lacks empirical models.

A natural candidate for explaining the difference in mobility could be the endowment and distribution of entrepreneurial abilities among households.<sup>1</sup> Several theoretical contributions have concentrated on the link between entrepreneurship in the face of risk on one side, and income inequality on the other. It is evident that entrepreneurship affects mobility, but we need a theory that bridges entrepreneurship and income mobility.

In this study, this bridge is market selection defined as distributing larger incomes to households with higher abilities. If this selection occurs, over time, households with higher abilities have upward income mobility and those with lower ones have downward mobility. So the key questions are how does the market select, and what are the conditions under which this mechanism could be performant or fail to work?

Our story runs as follows: consider a period of middle term (say 20 years) in which entrepreneurial abilities can be treated as exogenous and unchanged. At the starting time, people with various talents are dispersed in all social classes. Households with higher talents are given larger returns. This expresses market incentives. Just as in a product market, with a unique equilibrium price, producers of higher productivity earn larger profits. With the incentive mechanism, whenever households choose to supply their optimal entrepreneurial efforts, comparative static analysis tells us that those with higher talents are driven to make bigger efforts. As the result of this interplay, market selection works: households with higher abilities earn larger incomes. As the consequence of a performant market selection, income growth rate is higher the higher the household's ability, causing income mobility over time: people of higher abilities climb the social ladder. By the same token, people in higher social hierarchy but less entrepreneurial may descend to low levels.

Nevertheless, the working of market selection is not an automatic process: in the presence of market risk, market incentives are no longer sufficient for the selection. Households choose to provide optimal efforts also in function of market risk. The higher the market risk level, the larger the number of households choosing to not make an effort. The performance of market selection vary between countries, depending on their capabilities to reduce market risk through supplying an ample market infrastructure, especially the reinforced institutional rule to constrain all market players to respect the rule of the game. This performance also depends on their endowments of social capital to play a strong role of informal credit and insurance.

This theoretical framework is then followed by empirical tests. Since more than thirty years, profound market transition has taken place in rural China. From the CHNS data, we constitute a balanced longitudinal sample of 1530 representative Chinese rural households of 22 years. As these abilities are not directly observable, but only partially reflected by some available factors (such as education level, social and professional positions), the big challenge is how to quantify them. To deal with this issue, deeming that permanent income

<sup>1</sup> In the theoretical part of this paper, individual and household can be interchangeably used. For the sake of the coherence with the empirical part, the latter is systematically employed.

could to large extent reflect ability, we classify the households into 10 deciles according to their permanent incomes. Then the parameter reflecting entrepreneurial ability of each decile by wave is computed. Two other variables: education level and the off-farm income share are also constituted to reflect entrepreneurial ability in a complementary way. The amounts of loss and gains by household and wave are used as the basis to compute market risk. Lastly, entrepreneurial effort, in the context of rural economy, is measured by the variation of inputs devoted into their production activities.

With these variables, plus some control variables that are directly available from the data, econometric estimations are operated. They confirm the theoretical predictions: 1) entrepreneurial effort is larger the higher the household's entrepreneurial ability. This result confirms the household rationality; 2) market selects: household incomes are positively determined by their abilities; 3) income mobility works: for all households, income growth rate is higher the higher the ability.

To summarize, this study seeks to make three contributions. It provides a model to bridge entrepreneurship and income mobility with a market selection process. It shows the crucial role of institutions, formal and informal, in the determination of the performance of market selection in the presence of market risk. Lastly, it offers empirical proofs to these theoretical predictions.

This paper is organized as follows. Section 2 introduces the conceptual issues on entrepreneurship and income mobility, and addresses the need to bridge them with a market selection process. Section 3 outlines the intertemporal model for describing household choices, and then exposes how market selects and how this selection determines income mobility. Section 4, after a discussion on the socioeconomic background of Chinese rural economy, presents empirical methods and test results. The final section concludes.

## 2. THEORETICAL CONTEXT

Income mobility, or the dynamic aspect of income distribution and its profound implications for economic development have generated a rich literature (cf. Davies and Shorrocks, 2000; Kanbur, 2000). Few works, however, have focused on the mechanism by which an economy becomes more or less mobile. One factor that affects mobility is entrepreneurial behavior in the face of risk. Several theoretical contributions have significantly improved our understanding of the relationship between risk and income distribution. Kihlstrom and Laffont (1979) model the idea of Knight (1921) and establish the link between risk-taking and entrepreneurship. Friedman (1953) provides a clear statement of positive correlation between risk loving and inequality. Kanbur (1979) casts doubt on many of Friedman's strong propositions and finds that the relationship between inequality and risk loving is not necessarily monotonic. Nor greater diversity in tastes for risk necessarily contributes to greater inequality.

The other works on the links between risk and inequality have followed two lines of

inquiry: taxation and intergenerational income distribution. Domar and Musgrave (1944), and later Stiglitz (1969) and Cowell (1975) show that the impact of taxation on risk-taking, and therefore on inequality, is far from a simple negative correlation. On intergenerational income distribution under Markov process, Champernowne (1953) shows that if each one of a population of identical agents bore an independent idiosyncratic risk proportional to its wealth, then in the long run income would approximate a Pareto distribution. Banerjee and Newman (1991) prove that in the incomplete credit market, regardless of how wealth is distributed, its distribution over time will be ergodic, meaning that a lineage will experience all levels of wealth in the interim: the descendants of the rich could eventually become poor, and vice versa.

Aghion and Bolton (1997) analyze the trickle-down effect of capital accumulation on income inequality and show that moral hazard with limited wealth constraints on the part of the borrowers is the source of both capital market imperfections and the emergence of persistent income inequality. Only when the rate of capital accumulation is sufficiently high does the economy converge to a unique invariant wealth distribution.

All these works, even those with indirect implications for income mobility, have concentrated on the link between entrepreneurship in the face of risk on one side, and income inequality on the other. More work is needed to bridge entrepreneurship and mobility because entrepreneurship affects mobility.

The second shortcoming of the literature on mobility is the lack of empirical models. The empirical work on mobility relies exclusively on country data to measure a country's mobility. Despite a large body of work on Chinese rural income inequality, there are few studies of Chinese rural income mobility. One notable paper by Zhang and Wan (2008) has used the same dates as our study, and a decomposition framework to measure the downward mobility of the poor. A micro-econometric study of the entrepreneurial behavior in the face of risk and opportunity, and an estimation of the effect of households' entrepreneurial efforts on their mobility will improve our understanding on development mechanisms.

### 3. THEORY

#### 3.1. The Household's Inter-Temporal Choice

Each household's preference under uncertainty is described by a vNM utility model that has been used by other authors (e.g. Banerjee and Newman, 1991, p.215). The decision problem of a representative household is  $Max E\{u(x_1) + v(x_2) - e\}$  subject to the constraint that the expenditure  $x_1 + x_2$  cannot exceed the total income, where  $x_1$  is the consumption in period 1,  $x_2$  is the sum of consumption in period 2 and  $e$  the entrepreneurial effort (in terms of an investment) made in period 1, which may and may not pay off in period 2. That is, regardless of the outcome of entrepreneurial effort, the

household incurs a cost, or more accurately, disutility, in making such an effort.<sup>2</sup> To simplify analysis, the cost (disutility) is normalized as an identity function of the effort. The functions  $u(\cdot)$  and  $v(\cdot)$  both are increasing, concave and twice differentiable, with the latter allowed being different from the former.

Taking into account the budget constraint and the uncertainty associated with risk-taking activity, the decision problem of the representative household is formulated as follows:

$$\max_{x_1 \in [0, y_0], e \geq 0} \{u(x_1) + pv(y_0 + ew - x_1) + (1 - p)v(y_0 - x_1) - e\}. \quad (1)$$

$y_0$  signifies the income at the starting time before the decision making about entrepreneurial effort, which indicates each household's initial socio-economic status in terms of wealth. The household-specific parameter  $w$  measures the kind of intrinsic ability of the household in entrepreneurial undertaking. It is also the payoff to per unit of such effort. The households of higher ability getting higher payoff characterizes market incentives.  $p$  is the inverse function of market risk.

The entrepreneurial effort the household makes in period 1 ( $e$ ) may pay off in period 2 in an amount of  $ew$  with a probability  $p$ , and may turn out to be a pure waste with a probability of  $(1 - p)$ .

Market risk is present everywhere. For rural households, all their production choices bear risks of different natures: technological uncertainty associated with technological innovations, price uncertainty, policy uncertainty, and uncertainty caused by weather, time and other uncontrollable factors, the variation of the quality of input (seeds, fertilizer, etc.), and unexpected changes in labor supply (health conditions, for instance). This is why references to lotteries and expected utility models are widely applied in studies of agricultural production (cf. Moschini and Hennessy, 2001). In off-farm activities, market risk is still more pervasive. More generally, it can be assumed that the newer and (or) larger a household's economic operation is, the higher the risk will be.

Parameter  $p$  is assumed to be universal to all households, capturing the notion that all of them face the same "veil of ignorance (uncertainty)" when undertaking entrepreneurial activities in the market. The value of  $p$  may change from one period to the next.

Observing Eq. (1), it can be established that:

$$y = p(y_0 + ew - x_1) + (1 - p)((y_0 - x_1) - e) = (pw - 1)e + (y_0 - x_1). \quad (2)$$

Eq. (2) tells us that the necessary condition for households to provide a positive

<sup>2</sup> It is noteworthy that the term "entrepreneurial effort" is used throughout this article in its broadest possible sense in that anyone may be entrepreneurial in rationally taking risk in their income generation activities, in accord with Banerjee and Newman (1991, p.213): "we use this term loosely: anybody who bears risk is an entrepreneur".

entrepreneurial effort is  $(pw - 1) > 0$ . Otherwise, they will choose zero effort. Or:

$$e = \begin{cases} e^*(w, p) & \text{if } (pw - 1) > 0 \\ 0 & \text{otherwise.} \end{cases} \quad (3)$$

Eq. (3) implies that even with very high probability of success, there are always some people (with  $w < 1$ ) that will not take an effort. In another extreme, even with very low  $p$ , some people with exceptionally high abilities may devote an effort.

Assuming that the interior solution exists (for corner solution the problem becomes rather trivial), then FOC turns out to be as follows:

$$p w v'(y_0 + e w - x_1) = 1, \quad (4)$$

$$u'(x_1) = p v'(y_0 + e w - x_1) + (1 - p) v'(y_0 - x_1). \quad (5)$$

Apparently, Eq. (4) is the marginal condition (benefit equaling cost at margin) of the effort, and Eq. (5) the conventional inter-temporal allocation condition reflecting the tradeoff between benefit reaped in the current period and that in the future. Substituting Eq. (4) in (5) leads to the optimal solution of  $x_1$ , denoted as  $x_1^*$ , implicitly determined by parameters  $w, p$ .

$$u'(x_1^*) = \frac{1}{w} + (1 - p) v'(y_0 - x_1^*(w, p)). \quad (6)$$

In view of formula (6), Eq. (4) turns out to be an implicit equation of the optimal effort  $e^*$ , also determined by  $w, p$ :

$$p w v'(y_0 + e^*(w, p) w - x_1^*(w, p)) = 1. \quad (4A)$$

Omitting the algebraic details (available upon request from the authors), we obtain from Eq. (6) and (4A):

$$\frac{\partial e^*}{\partial w} > 0, \quad (7)$$

$$\frac{\partial e^*}{\partial p} > 0. \quad (8)$$

Eq. (7) and (8) are the most important results describing the optimal household behavior on providing entrepreneurial efforts. When households have incentive to provide efforts ( $pw > 1$ ), first, these efforts are proportional to their entrepreneurial abilities; second, the effort rises as risk falls.

An open question is whether  $x_1$  and  $e$  must be treated as affected by  $y_0$ . Modelling the impacts of initial wealth, nonetheless, needs some strong assumptions. Under the assumption that Arrow-Pratt coefficient of relative risk aversion (CRRA) is decreasing,

the richer people have a larger share of risky assets, or  $\frac{\partial x_1}{\partial y_0} < 0$  and  $\frac{\partial e}{\partial y_0} > 0$ . But it also makes sense to assume that  $\frac{\partial x_1}{\partial y_0} > 0$  and  $\frac{\partial e}{\partial y_0} < 0$ , because the richer, having being assured by a larger amount of wealth, could possibly spend a larger share of incomes in consumption. On the other hand, the poor could make a hard effort due to their stronger willingness to change. Another argument in the favor of not considering the impact of  $y_0$  is that initial wealth can also be endogenous to ability. Furthermore, with the existence of a competitive credit market, the importance of initial wealth is weakened. Therefore, we choose to leave aside this issue and just assume  $\frac{\partial x_1}{\partial y_0} = 0$  and  $\frac{\partial e}{\partial y_0} = 0$ . In our empirical tests, however, initial income will be retained as explanatory variable, and its effects on entrepreneurial effort, income and income growth will be estimated.

### 3.2. Market Selection

Market incentives are created through Eq. (1), in which the payoff of entrepreneurial effort  $e$  is  $ew$ . Income is a positive function of both  $e$  and  $w$ . In a product market, with a unique equilibrium price, the producers of lower costs derive larger profit. These producers correspond to those with higher ability, hence greater productivity, or higher returns ( $w$ ). On the other hand, households putting in little effort get lower income regardless of their  $w$ .

From above analysis, households with higher abilities optimally choose to make greater efforts (Eq. (7)). Market incentives make market selection effective through inciting household efforts to be proportional to their abilities. More precisely, deriving Eq. (2) with respect to  $w$ ,

$$\frac{\partial y}{\partial w} = pe + (pw - 1) \frac{\partial e}{\partial w} - \frac{\partial x_1}{\partial w} > 0. \quad (9)$$

Eq. (9) expresses the market selection process. The first term on the right is the prime to the efforts regardless of household ability; the second and third terms are indirect incentive effects via household choices: those with higher abilities get higher incomes through their induced bigger efforts. Given  $\frac{\partial e}{\partial w} > 0$  (see Eq. (7)), and  $\frac{\partial x_1}{\partial w} = \frac{\partial x_1}{\partial y_0} \frac{\partial y_0}{\partial w} = 0$  (as  $\frac{\partial x_1}{\partial y_0} = 0$  has been assumed), we get  $\frac{\partial y}{\partial w} > 0$ .

Above presentation may let people to feel that market selection is an automatically working process. It, nonetheless, varies in performance under different market environments. To see this, assume an economy composed of  $n$  households ranked from the highest to the lowest abilities, or from  $w_1$  to  $w_n$ . For any household  $i$  with  $pw_i > 1$ , market selection provides a positive effort, or  $\frac{\partial y_i}{\partial w_i} > 0$ . With household  $m$  as that with  $pw_m - 1 = 0$ , then the economy's total income is:



$$Y = \sum_{i=1}^n y_i = \sum_{i=1}^m [(pw_i - 1)e_i + (y_{0i} - x_{1i})] + \sum_{i=m+1}^n (y_{0i} - x_{1i}). \quad (10)$$

For a social planner, or an organizer of the market to maximize  $Y$ , the only variable under his control is  $p$ , He must increase  $p$ , or reduce market risk as low as possible. This is the only way to allow market selection to cover as more households as possible. The larger the number of covered households, the stronger the selection effect is. If risk is so high that no anyone takes an effort, market selection stops working.

Market risk depends crucially on institutional setting. Risk rises along with the division of labor and specialization. The unrepeated one-shot game of exchanges between households creates a huge number of opportunities and a great incentive for cheating, stealing and opportunism. In the meantime, there also arise a great many occasions for conflicts of commercial interests between households as each became more and more specialized and increasingly dependent on the supply of most of the goods and services of which he stood in need.

The ability of market selection varies across countries, depending on their differences in social-political environments, and changes overtime for the same country. To schematize the arguments, let

$$p = p(F, S) \text{ with } \frac{\partial p}{\partial F} > 0, \frac{\partial p}{\partial S} > 0. \quad (11)$$

The probability of entrepreneurial success is firstly a positive function of the supply of the market infrastructure ( $F$ ) by the government. This infrastructure consists in a system of reasonably specified and enforced property rights, functioning legal framework and forcible government of justice. The state has a central role of putting up a market infrastructure to reduce market risk. Sun (2012) provides an extensive review on such classic authors as Smith and Montesquieu on this role of the government in the early stages of the transition from an agrarian to commercial society.

$S$  refers to social capital, an aggregate of interpersonal networks in which transactions are marked by reciprocity, trust, and cooperation. It exerts an important role of reducing entrepreneurial risk and provides some kind of insurance (Thornton and Flynn, 2003). It also reduces transaction costs between actors, search and information costs, bargaining costs, and decision costs (Landry et al., 2002).

Eq. (11) implies that market risk varies between countries due to their difference in market infrastructure and in social capital. The ability of undertaking institutional changes differs among countries. North (1981) has analyzed historical path dependence. He takes the contrasting histories of the Netherlands and England on the one hand and Spain on the other hand about their capabilities to change their institutional setting.

One can reason that over time, as market deepens, risk will reduce and the probability of success in entrepreneurial undertaking increases. To see this, note:

$$F_t = F(R_t, C_t) \text{ with } \frac{\partial F_t}{\partial R_t} > 0, \frac{\partial F_t}{\partial C_t} < 0, \quad (12)$$

where  $R_t$  and  $C_t$  are respectively the returns and costs of the market infrastructure.

The optimal supply of market infrastructure is determined by the marginal condition, or  $F_t^*$  is determined by  $\frac{\partial R_t}{\partial F_t} = \frac{\partial C_t}{\partial F_t}$ . Following Wallis and North (1986), marginal returns from specialization and the division of labor are increasing as the consequence of market expansion, while marginal costs of organizing exchanges decrease. Consequently,  $F_t^*$  must increase over time. By Eq. (11), larger  $F_t$  leads to higher probability of success, or lower market risk. Therefore, as the result of market deepening, the performance of market selection by country tends to be enhanced over time.

Furthermore, deriving Eq. (9) with respect to  $p$ , we have:

$$\frac{\partial}{\partial p} \left( \frac{\partial y}{\partial w} \right) > 0. \quad (13)$$

As market deepens, further reduction in market risk benefits to larger extent the households with higher abilities. This is a Mathieu effect: returns to abilities are increasing over time due to decreasing market risk.

To summarize, market selection process is a powerful mechanism to reward households according to their entrepreneurial abilities. This reward increases over time with market deepening. The efficiency and operating range of this process, however, depend on market risk, which, in its turn, depends on the capability of the state to supply market infrastructure, and the endowment of social capital of a country.

### 3.3. Income Mobility

As entrepreneurial abilities are initially dispersed in all income classes, with a performant market selection process, income mobility will be high, because households achieve different income growth rates proportional to their abilities. Based on Eq. (2), define income growth rate as:

$$\begin{aligned} \gamma_t(w, p_t) &= \frac{\Delta y_t(w, p_t)}{y_{t-1}} \\ &= (y_t(w, p_t) - y_{t-1})/y_{t-1} = (p_t w - 1)e_t(w, p_t) - x_t(w, p_t))/y_{t-1}. \end{aligned} \quad (14)$$

Deriving Eq. (14) with respect to  $w$  gives:

$$\frac{\partial \gamma(w, p_t)}{\partial w} > 0. \quad (15)$$

And deriving Eq. (15) with respect to  $p_t$  leads to:

$$\frac{\partial}{\partial p_t} \left( \frac{\partial \gamma(w, p_t)}{\partial w} \right) > 0. \quad (16)$$

These results mean that with market selection, households with higher abilities are rewarded with higher income growth. As market deepens, this selective effect is further intensified.

This gives rise to a strong effect on income mobility: households of higher abilities but located in lower income classes take upward mobility, while those of lower abilities but in higher classes take downward mobility. The extent of the mobility depends on the initial distribution of abilities among income classes. If for historical or institutional reasons, a large share of people with high abilities was locked in lower classes while a large share of people with low abilities locked in higher classes, then very significant income mobility occurs along with a market reform.

## 4. EMPIRICS

In what follows, the data on Chinese rural households are explored to test the theoretical framework. Firstly, the context of Chinese rural economy is introduced to justify the choice of the Chinese case. Then the sample, test strategies, and results will be presented.

### 4.1. Socioeconomic Background

Since the late 1980s, three aspects of rural China's market transition have become favorable to entrepreneurial activities: the rise and the decline of township and village enterprises (TVEs), the relaxation of control on rural-urban migration, and the expansion of self-employment. Table 1 on the evolution of income structure reflects these changes. Income from TVEs involves wages paid from off-farm activities. Migration income mostly comes from "others" covering other activities. That of self-employment is dispersed in all categories, including farming activities. Since income from farming was in decrease, the main sources of income from self-employment were "off-farm", "others" and "sideline" activities. In total, household incomes from the three sources: TVEs, migration and self-employment were impressively increasing. They explain the increasing income growth rates.

TVEs are responsible for much of rural economic miracle. Weitzman and Xu (1994, p.121) write that "the Chinese model, with a central role being played by TVEs as the dominant form of non-state enterprise, is ... enormously successful." This growth began in the late 1970s. Between 1982 and 1988, industrial output of TVEs grew at an average annual rate of 38.2% (Putterman, 1997). By 1995, industrial TVEs had overtaken state-owned enterprises, becoming the biggest contributor to China's industrial production. Between 1995 and 2000, they produced over 30% of all industrial value-added, profits, and output, and all TVEs across non-agricultural sectors created more than 15% of China's GDP (Sun, 2002). TVEs' expansion appeared to have reached a turning point in 1997 when the total number of firms and employment declined for the first time. This decline

was in great measure attributable to the East Asia crisis and, more generally, to the labor-intensive and low technology features of them (Kung and Lin, 2007). In response to this decline, many small TVEs were transformed from collective to private ownership.

**Table 1.** The Shares of Rural Income Based on the Household Sample

	Farming	Sideline	Wage and business	Others	Per-income annual growth
1989	0.27	0.24	0.35	0.13	
1991	0.28	0.23	0.37	0.12	1.01%
1993	0.20	0.24	0.44	0.12	6.77%
1997	0.20	0.18	0.51	0.11	7.79%
2000	0.14	0.16	0.56	0.14	7.07%
2004	0.19	0.13	0.50	0.18	7.78%
2006	0.17	0.10	0.52	0.21	7.95%
2009	0.10	0.23	0.51	0.16	13.85%

Source: the CHNS data.

Note: 1) Calculated based on the sample of 1530 rural households presented in the next section.

2) "Sideline" income comes from fishing, gardening and livestock raising. "Others" include retirement, subvention, and all other incomes.

The expansion and transformation of TVEs had major consequences on entrepreneurial development in rural China. First, income from TVEs was often an important source for most households and contributed to savings and to business start-ups. In addition, most TVEs engaged in off-farm activities and played a role of "leading the way" for all people having entrepreneurial ambitions. Lastly, the decline of TVEs has driven a lot of rural labor with some entrepreneurial talents to search for new opportunities, and the privatization of TVEs has brought the emergence of middle- and large-scale entrepreneurs, and thus opened the way for further rural modernization.

Another force of change in rural economy is the rapid increase in migration. Migration became the fastest-growing share of off-farm labor market during the 1990s. Remittances from migrants also rose with the outflow of labor from villages, accounting for 9% of rural income in 2001 (De Brauw and Rozelle, 2008). More recently, a reverse flow of labor has accompanied rapid growth in migration. Zhao (2002) even claims that rural communities could depend upon remittances and the reverse flow of migrants to stimulate development.

Migration, like TVEs, not only had strong wealth effects that directly impacted rural mobility, but also had strong micro-economic effects by increasing people's knowledge of technology and the market, and hence expanding the number of choices available to them. Rural people with urban connection, through the diffusion of know-how and market information, became a new source of entrepreneurship for all villagers. Furthermore, migrants learned to perfect their rational choices under risk, and their entrepreneurial capabilities were thereby strengthened by learning-by-seeing and by learning-by-doing.

The third pillar of Chinese rural development is self-employment. During 1988- 1995, rural China had an estimated 30 million self-employed workers (Rozelle et al., 1999). The

increase in earnings from self-employment contributed substantially to increasing China's rural income in the late 1980s and 1990s (Parish et al., 1995). Mohapatra et al. (2007) find econometric evidence that self-employment in rural China shares many features of small business.

Chinese rural self-employment was intimately linked with entrepreneurial development and hence had a strong pro-mobility effect. Self-employed projects required limited investments, and, thus, was a rational choice for low-income entrepreneurs.

With the three pillars, rural China has transformed from a centrally command to quasi-market economy. The development of TVEs and their privatization reflect the formation of product and capital markets, rural-urban migration implies the freedom in labor market while in Mao's epoch peasants were constraint by a *system* of household registration (*hukou*) and had not right to work outside their villages. The expansion of self-employment has been the consequence of the maturity of these markets.

In the theoretical model, the working of market selection depends on the capability of the state to provide market infrastructure and social capital. Firstly, Chinese government had powerful ability to improve its market infrastructure and to impose disciplines in market activities. Secondly, China's traditional social networks showed themselves to be a most efficient institutional instrument of easing the financial constraints on small businesses. Yueh (2009) argues that although rural China lacks a strong credit market, it can nonetheless draw upon the traditional culture of interpersonal relationships (*guanxi*) in running business. Moreover, entrepreneurs in China are most likely to have friends and relatives who are entrepreneurs, suggesting that social environment has an important role in entrepreneurship (Djankov et al., 2006).

In summary, market selection works well in rural China. It provides a good case for testing our theoretical model and checking the linkage between entrepreneurship, market selection and income mobility.

#### 4.2. Sample and Testing Strategies

From the CHNS data collected in nine Chinese provinces during 1989, 1991, 1993, 1997, 2000, 2004, 2006 and 2009, we keep those that are present in all waves, and arrive at a balanced longitudinal sample of 1530 rural households. The indicator reflecting income level is per capita household income measured in constant 2009 prices.

One issue for the tests is the measurement of entrepreneurial ability due to its unobservable and qualitative nature. We first compute "permanent income" prevalingly used in income mobility theory and assume a meaningful correlation between it and entrepreneurial ability. The distances of eight waves are ranged from three to five years. By simply assuming that incomes of non-surveyed years are the average of the precedent and next years, we get, for example,  $income_{94} = (income_{93} + income_{95})/2 = (income_{93} * 1.5 + income_{97} * 0.5)/2$ , etc. By such averaging interpolation, a measure of permanent income over the period of 1989-2009 is obtained:

$$\begin{aligned}
\text{permanent89\_09} = & (\text{income89} * 1.5 + \text{income91} * 2 + \text{income93} * 3 \\
& + \text{income97} * 3.5 + \text{income00} * 3.5 + \text{income04} * 3 \\
& + \text{income06} * 2.5 + \text{income09} * 2) / 21.
\end{aligned} \tag{17}$$

Table 2 presents actual and permanent income deciles and their evolution. Gini coefficients appear to be close to that of entire rural China, indicating the representability of the sample.

**Table 2.** Actual and Permanent Income and Inequality

		1	2	3	4	5	6	7	8	9	10	Gini
Actual income	1989	184	697	1023	1323	1687	2056	2473	3044	3993	6679	0.40
	1991	357	799	1116	1383	1695	2023	2480	3073	3869	6836	0.40
	1993	385	880	1190	1506	1854	2249	2728	3457	4701	7878	0.41
	1997	494	1143	1604	2027	2482	2971	3652	4567	6042	10206	0.41
	2000	435	1126	1615	2248	2892	3676	4427	5553	7324	13356	0.44
	2004	473	1277	1861	2592	3308	4081	5053	6358	9032	16908	0.46
	2006	389	1391	1978	2624	3545	4563	5788	7353	10208	21974	0.49
	2009	555	2146	3314	4485	5685	7067	8853	11242	15283	33110	0.48
Permanent income		1561	2130	2528	2979	3436	3884	4551	5461	6827	10883	0.32

Source: the CHNS data.

Note: 1) Calculated based on the sample of 1530 rural households.

2) The method of computing permanent income is introduced in 4.2.

In the theoretical model,  $w$  was treated as unchanged over time. In the empirical tests, however, entrepreneurial returns ( $w$ ) are computed as the returns of each permanent income class by wave. For a certain permanent income decile group  $j$ :

$$w_{jt} = \frac{e_{jt}w_{jt}}{e_{jt}} = \frac{y_{jt}^+}{\text{abs}(y_{jt}^-)}, \tag{18}$$

where  $e_{jt}$  is group  $j$ 's entrepreneurial effort at wave  $t$ .  $e_{jt}w_{jt}$ , as defined in Eq. (1), is the total gain of entrepreneurial undertaking.  $e_{jt}$  is the effort that is in probability  $(1 - p)$  may turn out to be a pure waste. For each permanent income decile group, we calculate  $y_{jt}^+$  and  $\text{abs}(y_{jt}^-)$  by wave relating to last wave, which correspond to  $e_{jt}w_{jt}$  and  $e_{jt}$ , respectively. For each group, they are obtained by summing up the increased incomes of the households that had their incomes increased ( $y_{jt}^+$ ) and the decreased incomes in absolute value of the households that had their incomes decreased in each wave ( $\text{abs}(y_{jt}^-)$ ), respectively. They are then converted in annual basis using the length of the period as weight (e.g., the increase of 1991 income relating to 1989's is divided by 2, and the increase of 1997 income relating to 1993's is divided by 4, and so on).

As  $w_{jt}$  is invariant within the same permanent income group, two variables varying at the within-group household level are also chosen to reflect in a complementary way entrepreneurial ability: 1) mean education years by household ( $Edu\_hh$ ); 2) share of off-farm income by household ( $Offfarm\_share$ ); Education level can be regarded as reflecting the intelligence aspect, rather than risking-taking aspect, of entrepreneurial ability.

Another important variable is that measuring market risk. This probability in the model is defined as unvarying by household but varying by wave. We first compute changes in per head income between two successive waves by household. With  $y_t^+$  as the sum of these changes of the households that gained, and  $abs(y_t^-)$  the sum of these changes of the households that lost in absolute value, then:

$$p_t = \frac{y_t^+}{(y_t^+ + abs(y_t^-))}. \quad (19)$$

With this method, their values by wave between 1989 and 2009 are respectively 52.64, 59.68, 61.71, 64.88, 63.84, and 75.97%, with an increasing trend over time.

Lastly, to test household choices in entrepreneurial effort, the measurement of this effort by household and wave is needed. *Effort* is approximated with the variations of total inputs of productive activities between two successive waves by household divided by household size.

Corresponding to the theoretical framework, the tests consist in providing evidence on three assertions: 1) households choose to provide their optimal efforts proportional to their entrepreneurial abilities; 2) market selects through rewarding the households of higher abilities with higher income; 3) market selection produces income mobility by allowing households with higher abilities to achieve higher income growth. The following estimation model is made for these purposes:

$$Z_{it} = a + bw_{it} + \sum_{j=1}^2 c_j x_{ij} + \sum_{k=1}^3 d_k y_{ik} + \sum_{t=2}^8 e_t wave_t + \sum_{l=2}^9 f_l province_l + \mu_i + \delta_{it}. \quad (20)$$

$Z$  denotes alternatively three dependent variables: entrepreneurial effort (*Effort*), per household income at constant prices (*Income*), and income growth rate (*Growth\_rate*), which will be used to test the existence of entrepreneurial choices, market selection and income mobility, respectively.

$w$  is the ability by household and wave measured according to their permanent income classes introduced previously.  $x$  stands for two variables reflecting entrepreneurial ability in complementary way:  $Edu\_hh$  and  $Offfarm\_share$  by household and wave.  $y$  refers to 3 control variables: 1)  $y$ , household income of the last wave by household and wave; 2)  $Out\_share$ , the share of the members leaving for working in cities in total household members by household and wave; and 3) household size ( $Hhsize$ ) by household and wave.

Waves 2 to 8 are seven dummy variables for isolating time period effects. Province 2

to province 9 are dummy variables reflecting regional difference effect. Wave 1 and province 1 are set as baselines. The unobservable household characteristics such as family background and other intangibles are captured in  $\mu_i$ . The last term is the error term, assumed to be IID as usual.

Table 3 contains the descriptive statistics of all variables for the tests.

**Table 3.** Descriptive Variable Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
<i>Effort</i>	10710	97.19	1497.81	-7679.75	11384.29
<i>Income</i>	10710	4725.23	6664.87	-9263.23	280126.34
<i>Growth_rate</i>	10710	1.11	3.41	-6.11	34.26
<i>w</i>	10710	1.84	0.90	0.72	4.60
<i>Edu_hh</i>	10710	1.27	0.69	0	5
<i>Offfarm_share</i>	10710	0.212	0.25	0	1
<i>Out_share</i>	10710	0.26	0.26	0	1
<i>Hhsize</i>	10710	4.64	1.66	1	15

Source: the CHNS data.

Note: 1) Calculated based on the sample of 1530 rural households.

2) Variable definitions are introduced in 4.2.

Firstly, a fixed-effects panel model was applied to Eq. (20), and the Wald  $\chi^2$  tests revealed that fixed effects are not significant, meaning that the effect of the unobservable that was presented is insignificant on the one hand, and fixed-effects panel model is not preferable to random-effects regressions on the other hand. Another inconvenient of fixed-effects panel models is its inability to incorporate time-invariant dummies. Therefore, random-effects ML model is chosen.

### 4.3. Results

#### 4.3.1. Existence of Entrepreneurial Choices

According to Eq. (7), households with higher abilities provide greater efforts, and to Eq. (8), the higher the probability of success, the greater the efforts. To test Eq. (8), we reasons that if  $\frac{\partial e^*}{\partial w} > 0$  is established, then  $\frac{\partial}{\partial p} \left( \frac{\partial e^*}{\partial w} \right) = \frac{\partial}{\partial w} \left( \frac{\partial e^*}{\partial p} \right) > 0$  implies that  $\frac{\partial e^*}{\partial p} > 0$ . Therefore, the dependent variable is *Effort\_proba*,  $\frac{e^*}{p}$ , which is an approximation of  $\frac{\partial e^*}{\partial p}$ . If it is significantly positive, we conclude that lower risk leads to bigger effort.

To save space, Table 4 contains all regression results about household choices, market selection and income mobility. They will be presented successively.



**Table 4.** Random-effects ML Regressions

	(1) <i>Effort</i>	(2) <i>Effort_proba</i>	(3) <i>Income</i>	(4) <i>Income_proba</i>	(5) <i>Growth_rate</i>	(6) <i>Growt_rate _proba</i>
<i>w</i>	80.00*** (25.83)	120.01*** (40.16)	1042.03*** (94.32)	1780.44*** (136.55)	0.36*** (0.06)	0.56*** (0.09)
<i>Edu_hh</i>	61.66** (26.02)	97.46** (40.45)	472.52*** (95.00)	716.01*** (137.53)	0.05 (0.06)	0.08 (0.09)
<i>Offfarm_share</i>	416.45*** (66.59)	650.89*** (103.52)	3701.16*** (243.13)	5945.68*** (352.00)	0.97*** (0.15)	1.441*** (0.23)
<i>y</i> <sup>o</sup>	-0.025*** (0.004)	-0.04*** (0.001)	0.55*** (0.01)	0.76*** (0.02)	-0.0002*** (0.00)	-0.0003*** (0.00)
<i>Out_share</i>	-231.90*** (68.10)	-362.91*** (105.87)	-345.47 (248.64)	-294.73 (359.98)	-0.01 (0.15)	0.04 (0.23)
<i>Hhsize</i>	11.23 (9.46)	14.84 (14.71)	-159.38*** (34.54)	-247.20*** (50.00)	-0.06*** (0.02)	-0.09*** (0.03)
Wave dummy	yes	yes	yes	yes	yes	yes
Province dummy	yes	yes	yes	yes	yes	yes
constant	-107.99 (109.32)	-135.81 (169.95)	2,153.18*** (399.13)	1,050.87* (577.86)	2.11*** (0.24)	2.69*** (0.37)
Log likelihood	-93422.14	-98147.82	-107292.19	-111255.19	-27849.17	-32610.05
LR chi2(18)	166.27	173.724	3901.094	3385.92	987.83	871.11
(Prob > chi2)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rho	0	0	0	0	0	0
Number obs.	10710	10710	10710	10710	10710	10710
Number group	1530	1530	1530	1530	1530	1530

Source: the CHNS data.

Note: 1) Variable definitions are introduced in IV.2.

2) Standard errors in parentheses. 3) \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Regressions (1) and (2) are the results of testing entrepreneurial choices. *w* has significant impact on chosen dependent variables with expected signs. This confirms households' entrepreneurial rationality predicted by our theoretical model: households with higher abilities make larger entrepreneurial efforts. As explained earlier, *w* is measured according to the permanent income classes. Complementary variables measuring abilities at the household level have also expected significant effects. Those with more years of education, and larger off-farm income ratio provide greater efforts. As explained, the significance of the coefficient of *w* in regression (2) confirms that the effort is greater the lower the market risk.

#### 4.3.2. Market Selection Effects

According to the theoretical result on market selection, people with higher abilities get larger incomes (Eq. (9)), and as market deepens, leading to higher probability of success, the marginal income of entrepreneurial ability is increasing (Eq. (13)). To estimate this Mathieu effect, as  $\frac{\partial}{\partial p_t} \left( \frac{\partial y}{\partial w} \right) = \frac{\partial}{\partial w} \left( \frac{\partial y}{\partial p_t} \right)$ , we are able to estimate  $\frac{\partial}{\partial w} \left( \frac{\partial y}{\partial p_t} \right)$ . Given that in

Eq. (2), when  $e = e^*$ ,  $y$  is a linear function of  $p_t$ , the dependent variable,  $\frac{\partial y}{\partial p_t}$  can be transformed into  $\frac{y}{p_t}$  with the name of *Income\_proba*.

Results in columns (3) and (4) show that variables reflecting entrepreneurial ability ( $w$ , *Edu\_hh*, and *Offfarm\_share*) are all significantly positive, confirming the existence of market selection effects.

#### 4.3.3. Extent of Income Mobility

Income mobility comes from the difference in income growth rate among households of different abilities. From columns (5) and (6), with income *growth\_rate* ( $\gamma_t$ ) and *growth\_rate\_proba*: ( $\gamma_t/p_t$ ) as dependent variables,  $w$  and *offfarm\_share* are significantly positive, confirming that households with higher abilities got higher upward mobility and this mobility is increasing over time (theoretical prediction expressed in Eq. (15) and Eq. (16)).

Nevertheless, *Edu-hh* is insignificant to explain income growth. One interpretation may be that the aspect of risk-taking, rather than that of intelligence of entrepreneurial ability appears to be more important to explain income mobility.

Lastly, we comment the effects of initial income in all regressions: from the first two estimations,  $y$  has significant negative effect, implying that the poor had more incentive to change their status quo through making larger entrepreneurial efforts. From regressions (3) and (4), initial income had a significant positive effect over current income and this effect was increasing over the periods. This seems to imply that even in a competitive market environment, the rich, other things being equal, had more facilities to get richer. This might be realized through different possibilities that are not dealt with in our model: whereas the probability of success ( $p$ ) and returns of the efforts ( $w$ ) are treated as being independent to initial income, their dependences might exist in the real world. In the last two regressions, it is found that to explain income growth rate and its evolution over time, initial income had a significant negative effect. This seems to imply that albeit the non-neglected role of initial income to favor the rich, this role was exceeded by entrepreneurial ability in the determination of income mobility.

To check the robustness of the econometric tests, other methods to the measurement of income mobility can also be employed. First, with our sample, a Shorrocks index can be applied:

$$M = 1 - \left( \frac{I(\sum_t Y_t)}{\sum_t c_t I(Y_t)} \right). \quad (21)$$

$I$  is inequality measurement (e.g., Gini index). The denominator of the second term on RHS is the average income inequality in year  $t$ , and the numerator is the inequality of permanent income.  $c_t = \frac{u_t}{\sum_t u_t}$  is the weight of the sample's income in year  $t$  ( $u_t$ ) over the sum of weights of the entire period under analysis. Applying Eq. (21), the *Shorrocks index* = 0.2974, significantly larger than zero, implying that in rural China

there was great income mobility during the period.

Another method is to build income mobility matrix between 1989 and 2009. Table 5 gives the result.

**Table 5.** Income Mobility Matrix

		Quintiles 2009					Total
		1	2	3	4	5	
Quintiles 1989	1	23.86%	26.47%	16.66%	18.63%	14.38%	100%
	2	20.26%	20.26%	24.84%	19.93%	14.71%	100%
	3	19.28%	23.20%	21.90%	19.28%	16.34%	100%
	4	21.57%	15.36%	20.91%	21.57%	20.58%	100%
	5	15.03%	14.71%	15.69%	20.59%	33.99%	100%
Total		100%	100%	100%	100%	100%	

*Source:* the CHNS data.

*Note:* 1) Calculated based on the sample of 1530 rural households.

2) Income mobility matrix measures the changes in income quintiles between two time points. For example, 19.28% and 23.20% of the households belonging to 3rd quintile in 1989 went downward into 1<sup>st</sup> and 2<sup>nd</sup> quintiles respectively, and 19.28% and 16.34% of them went upward into 4<sup>th</sup> and 5<sup>th</sup> quintiles respectively in 2009.

A significant mobility is observed. One third of the households belonging to the first quintile went upward into the fourth and fifth quintiles in 2009. 30% of the households belonging to the fifth quintile in 1989 went downward into the first and second quintiles in 2009. This mobility was also observed significant for the households of middle-level income in 1989. The results strongly support the model: market selection over entrepreneurial abilities was working.

The other side of the coin, however, is that a half of the households belonging to the lowest quintile in 1989 still stayed in first and second quintiles in 2009, and a half of the households belonging to the fifth quintile in 1989 stayed in the fourth and fifth quintiles in 2009, indicating the persistent effects of the initial wealth. Another possibility of this persistence may be that the period of 21 years is not enough long to observe more significant income mobility.

## 5. CONCLUDING REMARKS

We have used an inter-temporal model to obtain three theoretical results: 1) under a well-defined market framework with fairly low market risk, households choose to provide their optimal efforts proportional to their entrepreneurial abilities; 2) market has a selection function: it rewards the households with higher abilities. This function, however,

varies among countries, depending on market risk, which, in its turn, is shaped by the capability of the state to provide market infrastructure and the endowment of social capital; 3) market selection produces great income mobility, leading those with higher abilities to go upward and those with less abilities to go downward. Then a sample of 1530 Chinese rural households between 1989 and 2009 was constituted to empirically test these theoretical propositions, and satisfactory results were obtained.

While the force of this study has been on its demonstration of the key role of market selection process on income mobility, one of its limits resides in the assumption that the distribution of entrepreneurial abilities among households is unchanged over time. To be more realistic, these abilities change over generations. It can be expected that with this change, income mobility will become still more dynamic. Another limit is that even though this study has illustrated a strong market selection effect favoring mobility within a competitive market environment, there exists initial level of wealth as a counter force, which could hinder mobility: the rich has larger facility to invest; market risk and chances may vary across initial income. If taking into account the endogenous evolution of entrepreneurial ability and the initial level of wealth, more sophisticated models will be required for describing the role of market selection in income mobility.

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