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Abstract:

This paper focuses on the impact of financial infrastructures in rural areas on saving decisions of rural households in China. In order to investigate the functions of rural financial systems from the viewpoint of rural households, portfolio selection models on household financial assets are estimated to clarify the effects of rural financial infrastructures and income variability. Rural household data of Shanxi province from MHTS panel data during 1986-2001 are used for sample villages. The results show that the development of financial infrastructures in rural China has made a strong contribution to the mobilization of household savings in that sector. Combined with the increase of permanent income, the establishment of RCC service stations within village has made accessibility to formal finance in rural area much easier, and this has caused a shift of portfolio selection from cash holdings to deposit savings.

Keywords household saving, portfolio selection, mobilization of saving, income variability

JEL classifications D14, G11, G28

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1. Introduction

Household saving decisions are key factors in stability and development of the economy. Higher household savings guarantee a stable macro economic development, particularly in the transition process from a planned economy to a market economy. Institutional settings essentially determine whether or not stability can be accomplished. Under the planned economy of China, economic surplus was strictly controlled by the planning of the government, and the living standard of households was suppressed at the lower level. Households could only afford marginal expenses, and household saving decisions did not work. Those systems were maintained by state owned enterprises (SOE) in urban areas and by peoples' communes in rural locales.

At the start of transition, however, communes collapsed, and the agricultural production responsibility system gradually started to run commercial agriculture in rural area. The SOE regained the right to decide operation, including wage levels for employees. In this transition process, financial flow in the economy changed substantially. Household decisions about savings became an important factor in the financial flow of whole China.

Still, the financial system of China is strictly regulated by the government, especially in rural areas. The Rural Credit Cooperative (RCC), under the control of Agricultural Bank of China (ABC), has been playing an exclusive role in formal finance during the transitional period. While the monopolistic position of the RCC causes a loss in efficiency and discipline problems in management, the restriction of competition among financial institutions also helps to curtail moral hazard behavior among financial intermediaries and promotes financial deepening in the economy as a whole.

Relative to the above discussion, a theory of "financial restraint" has recently attracted much attention. A financial restraint policy implies that the government can create rent opportunities for financial institutions through deposit rate controls and restrictions on competition. These rents create a "franchise value" which further attracts investment in the financial industry. Particularly, Hellmann

et al [1997, 1998] evaluate the ways in which financial restraint creates incentives for financial institutions to develop a deposit-taking infrastructure in rural areas, thus contributing to the mobilization of household savings.

It is debatable whether a financial restraint policy has been properly practiced in China or not. This paper focuses on the impact of financial infrastructures in rural areas on saving decisions of rural households in China. Specifically, rural households will probably hold more financial assets offered by financial institutions as their access to the financial network improves, and the creditability of formal financial institutions increases. At the same time, these households will hold fewer assets in the form of cash, gold, and jewels. The proposition of whether or not establishments of rural financial stations have effects on portfolio selection in rural households during the period of economic transition can be tested by using micro data of households. A primary contribution of this paper is to introduce variables related to the foundation of rural financial stations into a portfolio selection model and to estimate effects qualitatively.

When we investigate the portfolio selection of rural household in less developing countries (LDCs), it is necessary to pay attentions to the variability of household income. Rural households in LDCs are likely to face a substantial risk of income variability. Because of this risk and imperfect information, formal insurance arrangements are seldom available, and poor households must use self-insurance mechanisms to mitigate risk and cope with income shocks. Therefore, variability and level of income appear to influence the portfolio selections of rural households. Characteristics of portfolio selections of rural household in connection with the variation of income are also examined.

This paper is structured as follows: Section 2 describes the structure of financial flows in China using a flow-of-funds table to clarify the importance of the household sector in terms of financial flow. Based on aggregated data of rural household panel surveys, characteristics of financial behavior on rural households are examined. Section 3 looks at the specific example of four villages

from Shanxi province and estimates portfolio selection on cash and savings deposit holdings using household panel data. A summary of major findings and concluding remarks are presented in Section 4.

2. Characteristics of Financial Behavior in the Household Sector and in Rural Households

(1) Change of I-S balance by sectors since 1978

The structure of financial flow in China using the flow-of-funds table is first examined. Figure 1 presents the change of I-S (investment-savings) balances since 1978. In this figure, economic unit are separated into four sectors: household, enterprise (including the financial sector), government, and foreign sectors. Values presented in Figure 1 are the difference of savings minus investments divided by GDP total.¹

Figure 1 shows that the amount of household savings has been more than that of household investment, and the household sector has been one of a surplus of money flow. At the time of economic reform in 1978, the I-S level of the household sector was roughly in balance. Since 1978, savings in the household sector has been increasing, and the I-S balance has consistently been in surplus. The level of surplus was below 10% of the GDP during the 1980's. Since then, the surplus has grown still more, maintaining a value over 15%. The large amount of funds has been provided by the household sector. Surplus for the household sector, however, decreased to about 10% in 2000. This decline may be due to stagnation of income growth and a real-estate boom in urban areas.

In contrast to the household sector, the I-S balance on the enterprise sector has been in deficit. This means that the enterprise sector has been conducting investment activity aggressively. The large amount of investment funds used was raised by external financing. Since the middle of the 1980's,

¹ Tang [2003] has made a more systematic investigation of the structure of I-S balances of each sector.

the deficit of the enterprise sector has grown rapidly, and the deficit reached a level of 10 to 15%. Due to economic stagnation caused by the Tiananmen incident, the deficit decreased toward the end of the 1980's. However, the Chinese economy has shown an economic boom, and enterprises have conducted aggressive investment activities since the Southern Tour Lecture by Dong Xiaoping in 1992. Consequently, the level of the deficit was about 15% in the middle of the 1990's.

Figure 1 also shows that the government and foreign sectors have been keeping equilibrium in I-S balances and are not so influential relative to the financial flow in China. Although the government sector showed a surplus before economic reform, this surplus decreased rapidly, and the I-S balance reached a level of equilibrium at the end of the 1980's. This seems to indicate that the capital surplus of the government sector was transferred to the household sector. This was partially due to liberalization and reform in the rural area; an agricultural production responsibility system was introduced, and free markets for agricultural products were restored.

Important implications of the above findings are: (1) that the surplus of savings in the household sector has been transferred to be funds of investment in the enterprise sector, and (2) the structure of those financial flows has sustained rapid and continuous economic growth in China. Furthermore, low dependence on government spending and foreign capital contributes to the stability of the Chinese economy. Because the surplus of the household sector has been used for investment funds in the form of lending, these funds for investment can be raised without adopting an inflationary money supply policy. In this sense, the financial structure of China can be contrasted with that of Eastern Europe and the CIS after economic transition.²

In order to make clear the importance of savings deposits in the household sector, a composite of household financial assets is presented in Figure 2. Considerable portions of financial assets are in the form of savings deposits, and these account for about 60-70% of total financial assets. The

² The characteristics of economic transition in East Europe and CIS are briefly summarized in EBRD [1999] and chapter 1 in this book.

percentage share of currency holdings, in contrast, has been gradually decreasing from 20% to 10%. The proportion of securities holdings and reserves for the insurance business has been rising since the middle of the 1990's. This is due to a boom in the stock market and reform of the insurance system.

(2) Characteristics of saving behavior on rural households

From the above, it may appear that the mobilization of savings from the household sector in China has been accomplished during the transition from a planned economy to a market economy. However, the mechanism of mobilization and the structure of household saving decisions have not been studied sufficiently from a microeconomic viewpoint, and it is necessary to analyze this mechanism using household micro data. The rural household becomes the focus for investigation of changes in financial behavior and characteristics of portfolio selection.

To examine the economic situation of the rural household, the "Rural Household Survey" (RHS) conducted by the National Statistics Bureau (NSB) provides the most comprehensive survey data. However, total average data and income class average data on the balance of deposits and borrowings is not officially published. Therefore, utilization of the RHS is restricted for purposes of analyzing portfolio selections on rural households.

Instead of the RHS, longitudinal rural household survey data (Rural China Fixed Point Observations, hereafter the RCFPO) is used in this study. These observations were jointly compiled by the China Communist Party (CCP) and the Ministry of Agriculture. Aggregated data on household financial assets during the period from 1986 to 1999 were officially published. The RCFPO covers all provinces except Tibet, and the sample size of this compilation is about 300 villages and 25,000 households for each year.

Figure 3 shows a summary of the change in financial asset composition in rural households

since 1986. As shown in this Figure, the percentage share of cash holdings in financial assets was around 50% in 1986 and then fell dramatically to 30% in the beginning of the 1990's. In contrast, the percentage share of savings deposits rose from 35% to 60% during these periods. Thus, savings deposits have become the prime financial asset in rural households. These trends have been observed to greater or lesser extent in every area (Eastern, Middle, and Western China) and in all income classes.

Next, consideration is given to the level of financial assets compared with household income and amount of production assets possessed by rural households. Table 1 shows the amount of financial assets and the relative value of financial assets compared with rural household income and production assets. Financial assets increased steadily during the period from 1986 to 1999. Although the relative value of financial assets compared with household income changed rose from 50% to around 80% during the period from 1986 to 1991, increases in financial assets grew smaller in the middle of the 1990's, and this number dropped to around 60%. The relative value of financial assets compared with production assets shows the same trends, despite the fact that the amount of financial assets has been more than that of production assets.

From earlier discussions of I-S balances and the composition of financial asset in rural household, it seems evident that financial assets of the household sector, especially in the form of saving deposits, have been utilized for investment funds of the enterprise sector. These assets have been supporting rapid and steady economic growth in China. Further, the proportion of deposits in financial assets of rural households increased remarkably at the beginning of the 1990's. A change of portfolio selection in rural households probably took place in this period.

3. Analysis of the Portfolio Selection of Rural Households Using MHTS Panel Data from Shanxi Province

This section concerns the influences of savings mobilization policies on the financial asset portfolio selection of rural households in China. In order to investigate the characteristics of the portfolio selection, we conduct the econometric estimations on the financial portfolio selection using household level data of four villages. A supplemental field survey of financial structure in Dingxiang County of Shanxi Province was conducted in November, 2002 and July, 2004.³ Dingxiang County is one of the areas in which econometric estimations are made using household level data. Information was collected on activities of financial branch offices on the village level, incentive mechanisms of workers, and savings behaviors of rural households.

(1) Financial institution in village level

Like other LDCs, not only formal finance such as state-owned commercial banks (i.e. Agricultural Bank of China) and cooperative credit unions (i.e. Rural Credit Cooperative (RCC)) have been functioning as an essential part of rural finance in China, but also informal finance such as ROSCAs (Rotating Savings and Credit Associations) and Rural Cooperative Funds (RCFs). ROSCA has developed especially in the southeast coastal area (Zhejiang, Fujian etc.), and the funds from ROSCA have functioned as investment and working capital for enterprises and household businesses. In Shanxi, however, the development of informal finance has been limited, and formal finance systems have been playing a central role in deposit collecting and in lending. Although the existence of RCF's is not negligible in Shanxi, this discussion concentrates on systems of formal finance.

Dingxiang County is located 100 km northeast from Taiyuan, the capital of Shanxi. The

³ Field surveys and interviews were conducted with great help from the Department of Agriculture in Shanxi Province and Dingxiang County. Data were gathered in Dingxiang County and Taiyuan November 21st to 24th in 2002 and July 12th to 15th in 2004.

presence of RCC has been crucial in villages of Dingxiang County. Branch offices of RCC, which are called “service stations” (*fuwu zhan*) or “savings offices” (*chuxi suo*), were started from the 1950’s, and the number of such offices increased rapidly in the 1980’s. In 2004, Dingxiang had 12 branch offices and 255 service stations of RCC. About 80 % of the total amount of savings in Dingxiang is deposited in service stations.

Service stations are operated as side jobs, and the individuals who manage these stations are usually educated, having stable income sources. They generally have good accounting and/or store management skills. Customer service at service stations is restricted to the management of deposits and withdrawals; procedures involving remittance and loans are not available. RCC provides service stations with a calculator, a machine for detecting counterfeit bills, and a strongbox. In return, the home or shop of the service station worker is used as a window of the service station. At least three times a month, staff of the branch office visits service stations to check accounts.

Workers in RCC service stations are paid according to the amount of deposits made at each station. Dingxiang is uniformly regulated, and 0.85 yuan is paid per ten thousand yuan of total deposit. If the amount of deposits is 3 million yuan, the wage of the worker is 255 yuan a month. Hence, it appears that workers in service stations make an effort to improve the quality of service in order to attract more deposits. This wage payment system works as an incentive to improve services and make more effort to collect larger deposits from the village people. Account records of each household are used for credit inquiry in loan decisions. Thus, the development of service stations has contributed to the mobilization of household savings and financial deepening of rural areas.

(2) Description of sample villages and households

The MHTS (Minor set of High-quality Time Series) panel database is a resampling database of RCFPO. It was developed as an international joint project among the Rural China Research Center

(RCRE) in China, Kyoto University, and Hitotsubashi University during the period from 1999 to 2002. The MHTS panel dataset covers 14 provinces and 54 villages. Among these, Shanxi province was selected as the subject of research. Reasons for selecting Shanxi were as follows: (1) Non-sampling errors of Shanxi data are fewer than those in the data of other provinces, and continuity as a fixed-point survey is higher. (2) Because MHTS panel data include data of seven villages in Shanxi, it is suitable for comparing the difference of village structures. (3) As mentioned, the development of informal finance is limited in Shanxi, so attention can be focused on the formal financial sector.

Shanxi province is located in the northern middle part of China, and the income level of rural areas is just below that of the average of all rural China. Based on economic structure and income level, four villages were selected as a sample. These villages are located in different counties including Linqiu, Dingxiang, Taigu and Linyi. Hereafter, in order to maintain anonymity, these four villages will be denoted by their county name. Basic information on these villages is shown in Table 2. Linqiu County is located 225km northeast from Taiyuan. Due to its location in the hilly and cold northern district of Shanxi, the natural conditions of Linqiu village are not suitable for crop production. The major industries of Linqiu are dairy farming and forestry. Manufacturing and non-farm household businesses have not developed and a large part of the labor is migrating to nearby townships. Linqiu village has been officially designated a poor village (*pinkun cun*) since the middle of the 1980's.

Dingxiang village is a relatively large village comprised of about 750 households. From the middle of the 1980's, individual businesses and private enterprises were developed within the village, and income levels were higher than other villages in the same county. However, manufacturing industries have been stagnant since the end of 1990's. Dingxiang is officially designated as a "well-off village" (*xaiokang cun*). Taigu County is 60 km south from Taiyuan. Owing to a mild

climate, rich soil and a well-developed irrigation system, Taigu County is a model district of agricultural modernization in Shanxi. The major industry of Taigu village is farming. This includes not only crop production but also cash crop cultivation such as vegetables and fruits. Taigu village is also officially designated a “well-off village”.

Finally, Linyi County is located in the southwest part of Shanxi near the provincial boundary with Henan and Shaanxi provinces. Linyi is a middle size village that holds 300 households, and engages in crop production. Except for crop production, cash crops have been flourishing in this village. Although the per capita income of Linyi village in 1986 was relatively low, income has rose remarkably during the 1990’s and has reached the same level as that of Dingxiang village.

Summing up the characteristics of each village, Linqiu faces a severe natural environment, and the living standard of Linqiu is just above the poverty line. Though the size of each village is different, Taigu and Linyi are similar with regard to agricultural conditions and types of farming. The development of Dingxiang preceded that of other villages. However, with the exception of Linqiu, agricultural modernization and the development of off-farm works in Taigu and Linyi have reduced the disparity of income levels among these four villages.

(3) Characteristics of portfolio selection in sample villages

Before conducting econometric analysis on portfolio selection of rural households, the change of asset holdings on sample villages during the period of 1986 to 2001 must be viewed. First, the amount of total assets and the proportion of assets possessed in the form of financial assets to production assets are shown in Table 3.⁴ The amount of assets is increasing steadily in all villages. While the ratio of financial assets is rising or continuing to be high in Dingxiang and Taigu, it is decreasing in Linqiu. The proportion of financial assets in Linyi increased until the middle of the

⁴ Production assets do not include agricultural land, housing, or consumer durable goods. Further, production assets are evaluated at book prices, not taking depreciation into account.

1990's, a reverse trend has been observed since then. Thus, a distinction in the pattern of asset holdings can be observed, and the pattern of Dingxiang and Taigu is different from that of the other villages.

Second, the composition of financial assets is presented in Table 4. Financial assets may be decomposed into deposit savings, cash in hand, and others. As shown in Table 4, except for Dingxiang, the percentage share of cash in hand was over 50% in 1986. This means that cash holdings were a major form of assets in the middle of the 1980's. Since then, the percentage share of deposit savings has grown rapidly in Taigu and Linyi villages, while it has decreased in Linqiu village owing to a decline in the standard of livings.⁵

Except for Linqiu, the proportion of deposits increased during the 1990's to a level of about 80% to 90% the remaining villages. Thus, there has been a change in portfolio selection from cash to deposit savings holdings in those three villages. By contrast, the trend of financial asset holdings in Linqiu village shows a bewildering change does not seem to follow a particular pattern. This may be due to missing data in savings deposits in Linqiu. Data is especially lacking after 1997, so estimates in the econometric model of Linqiu households are based on 1986-1996 data in order to reduce bias.

The relative value of financial asset compared with household total income is also reported in Table 4. In Dingxiang villages, the relative value has been over 100% since 1986 and was over 200% in 2001. A gradual increase in this value can be observed in Taigu and Linyi villages except for 1991. Accordingly, the accumulation of household assets in financial form has advanced to a greater or lesser extent in those three villages. On the other hand, in Linqiu, the relative value has stayed around 20% to 40%, and the accumulation of financial assets has remained at a lower level.

⁵ The percentage share of households under the poverty line in Linqiu has risen from 55% in 1986 to 72% in 1991. The poverty rate in Linqiu villages is calculated based on the official poverty line (per capita household income below 635 yuan (price in 1998)) as defined by the National Bureau of Statistics. The definition of poverty line is briefly described in *Rural Survey Organization of National Bureau of Statistics* ed. [2000].

Last, the situation of financial institutions in sample villages is explored. Table 5 shows number and year of establishment for FCC service stations, tabled by village. Except for Dingxiang village, where the founding of service stations preceded other villages, almost all stations were established around 1990. The period in which service stations were founded coincides with a period in which a shift of asset holdings from cash to deposits in Taigu and Linyi villages was occurring. It seems probable that a causal relationship exists between the founding of service stations and changes in portfolio selection in those villages. Therefore, focusing on service station foundation years, the change of portfolios in rural households is investigated next.

(4) Review of portfolio selection in LDCs; setting econometric models

Since the risks related to income variability are like to be uninsured in rural households of LDCs, these households must deal with these risks using various measures. Existing studies have mainly focused on household savings from the viewpoint of liquidity constraints or preliminary savings.⁶ Articles that investigate the relationship between income variability and portfolio selection in rural households are limited.

Rosenzweig and Binswanger [1993] measured the risks of farmers' investment portfolios in terms of their sensitivity to weather variation using panel data of the ICRISAT Indian village survey. Using household data of the ICRISAT Burkina Faso survey, Zimmerman and Carter [2003] developed a stochastic dynamic programming model with endogenous asset price risks in order to explore savings and portfolio decisions in poor resource environments as characterized by risk and subsistence constraints. By taking into account differences of income shock across income groups, Alderman [1996] examined differences in marginal rates of financial and physical savings in rural

⁶ See Deaton [1992] and Besley [1995]. Guiso, Jappelli, Terlizzese [1996] and Carroll and Samwick [1997] examine relationships among portfolio selections, changes in permanent income, and/or income shocks in Developed Countries.

households of Pakistan. With regard to rural households in China, Jalan and Ravallion [2001] studied portfolio and other behavioral responses to idiosyncratic risk using RHS panel data.

These studies have not specifically examined the impact of financial infrastructure development on portfolio selections of rural households. The study presented in this chapter introduces the variable of access to financial system (as indicated by the foundation of service stations) into portfolio selection models and estimates the effect of this variable numerically. In order to explore the influence of permanent income and transitional income on portfolio selection, a revision of the model adopted in Jalan and Ravallion [2001] is used.

First, permanent income is defined as the predicted value of an income function as follows:

$$Y_{it} = X'_{it}\beta + \varepsilon_{it} \quad (1)$$

where Y_{it} is the income of household i in time t , and X_{it} is a vector of exogenous variables. The error structure is assumed as follows:

$$\varepsilon_{it} = \eta_i + v_{it} \quad (2)$$

where η_i is an individual effect of household i , and v_{it} is random i.i.d. error. Since a Hausman test of all villages leads to rejection of the null hypothesis that η_i is uncorrelated with X_{it} , Y_{it} can be estimated using a Fixed Effect Model.⁷

In order to divide true income into predicted permanent income and transitional income, transitional income is specified as the difference between true income and predicted permanent income. Predicted income is defined as the sum of the fit value of (1) and an individual effect:

⁷ Jalan and Ravallion [2001] adopted a first-stage autoregressive formulation for v_{it} , and using white noise ω_{it} , defined “household-specific income uncertainty” as follows:

$$\hat{\sigma}_{i,y}^2 = \sum_{t=1}^T (\omega_{it} - \bar{\omega})^2 / T \quad (T : \text{total survey years})$$

Although the same approach was tried here for estimation of the portfolio selection model, the result of this estimation is neither stable nor robust. Therefore, a more direct definition of income uncertainty, as mentioned in the text, is used in this chapter.

$$\hat{Y}_{it}^P = X_{it}'\hat{\beta} + \hat{\eta}_i \quad (3)$$

True income does not necessary coincide with predicted permanent income. It is natural that some of disparities exist. This spread can be defined as transitional income that means a shock to household income.

$$\hat{Y}^T = Y_{it} - \hat{Y}_{it}^P \quad (4)$$

The effect of transitional income may not be the same on positive and negative shock. Unlike positive income shocks, negative income shock usually has a serious impact on rural households. This is because the income level of rural households is generally low, and even slight negative shocks directly influence household behaviors owing to limited formal insurance arrangements in poor households.

Transitional income is therefore divided into two parts: (1) positive income shock (\hat{Y}_{it}^{+T}) and (2) negative income shock (\hat{Y}_{it}^{-T}). In this formulation, transitional income includes both idiosyncratic shocks and collective shocks. Instruments that do not correlate with household specific components and represent aggregated (or village-level) shocks (such as regional rainfall data or inflation indices of local areas) are needed to single out idiosyncratic shocks. However, such instruments are difficult to find in village surveys of the RCFPO or in other sources. Although the above formulation of transitional income is not sufficient for representing household specific risks, aggregated shocks can be controlled to some extent by introducing a year dummy variable in the estimation of income function.

In order to test for the portfolio effects of income risk and access to financial institutions, the following equation for estimation may be used:

$$S_{it} = Z_{it}'\theta + \gamma_1 \hat{Y}_{it}^P + \theta_1 \hat{Y}_{it}^{+T} + \theta_2 \hat{Y}_{it}^{-T} + D^{SS} + \pi_t + e_{it} \quad (5)$$

where S_{it} is the share of deposit savings to total cash in hand and deposit savings of household i in

time t , Z_{it} is a vector of exogenous variables which can influence portfolio selections, π_t is real deposit interest rate, and D^{SS} is a dummy variable which takes a value of 1 after the first foundation of a service station (SS) in each village. However, foundation of a service station is not necessarily independent of income level or the saving ratio of each village; it must be determined simultaneously. For controlling the endogeneity of D^{SS} , first lagged variables of the permanent income and the share of deposit savings are used as instruments for D^{SS} . The village averages of those lagged variables (\bar{Y}_{it-1}^P and \bar{S}_{it-1}) are utilized for IV estimations.

The effects on service stations cannot be fully shown before and after the year of their foundation. In time, the reliability of rural banking systems generally rises after the establishment of service stations. In order to capture the “vintage effect” of rural banking branches, D^{SS} is replaced with a “vintage index” (which takes on a value of 1 at the year of service station foundation and increases by 1 every year thereafter) and a “vintage squared” which expresses the nonlinear effect of vintage on S_{it} . Table 6 summarizes basic statistics for the empirical variables used in estimations.

(5) Results of estimations

Table 7 reports the results for estimations of the income function. Exogenous variables of the income function include three types of dummy variables: (1) educational level, (2) occupational training, and (3) cadre. These indicate the accumulation of human capital and networks within the village. In addition to these, land area, number of household laborers, amount of production assets, and the type of farm management are included as exogenous variables. The definition of a part-time farm household type II is based on the proportion of off-farm workdays to total workdays. When this proportion falls below 10%, these households are defined as “agricultural households”. The households that the proportion is from 10% to 49% are defined as “part-time farm households type I” and the households that the proportion is over 50% are denoted as “part-time farm households

type II". Since no find prominent distinction in income could be found between agricultural households and part-time farm households type I, only a dummy variable for part-time farm households type II was inserted as an explanatory variable.

Since use of the Hausman test led to rejection of the null hypothesis that individual effects are uncorrelated with the explanatory variables in every village, the income function was estimated by use of a fixed effect model. Table 7 shows that income levels are significantly affected by production factors such as household labor and land area. Although some coefficients of dummy variables are statistically significant, those for education and cadre are not. Coefficients of part-time farm households type II are significantly positive in every village, and this indicates that procurement of off-farm work leads to an increase in the income level of rural households.

Based on the results obtained from the income function, permanent income and two types of transitional income can be predicted, and the portfolio selection model presented in Equation (4) can be estimated. In order to control household characteristics, the number of household laborers, part-time workers of farm households (type I and type II) and a coefficient of dependents (total number of household members divided by number of household laborers) are added as explanatory variables. The real deposit rate (official deposit rate minus the CPI of rural Shanxi) indicates the profitability of savings deposits, and this is introduced as an independent variable. We expect that the coefficient of real deposit rate would take the positive sign, because the rise of real deposit rate would increase return of possessing the saving deposits. Results are reported in Tables 8 and 9. The definition of the service station variable is different in these two tables. Table 8 includes the dummy variable of service station foundation, and Table 9 replaces this dummy variable with the vintage and vintage square of service station establishment.⁸

⁸ Based on the statistical value of the Hausman test, estimation methods have been determined to be significant ($p < .05$). A Random Effect Model (REM) is adopted relative to Linqiu in Table 8 and in Linqiu, Dingxiang, and Linyi in Table 9. A Fixed Effects Model (FEM) is adopted for Dingxiang, Taigu sand Linyi in Table 8 and for

Table 8 shows that with the exception of Linyi, the coefficient of permanent income is significantly positive. This indicates that an increase of permanent income is likely to induce a shift of financial asset holdings from cash holdings to savings deposits. With the exception of Linqiu, the coefficients for negative income shock are significantly positive in three villages. However, those for positive income shock are not significant in all villages. This implies that unexpected negative income shock tends to reduce the ratio of savings in financial assets. Positive income shock, however, does not give rise to a change in financial asset holdings. Hence, negative income shock is a more influential factor on portfolio selection of rural households than positive income shock. It is somewhat surprising that both coefficients of income shock are not significant in Linqiu, the poorest village. This may be related to the fact that the proportion of households in Linqiu that had positive deposit savings was relatively low compared with other villages.⁹ Since households in Linqiu can not afford deposit savings, the savings ratio is probably unresponsive to variations in income.

Some parameters representing household characteristics, such as the number of household laborers and part-time farm households type II, are significant. Except for Linyi, the coefficient for number of household laborers is significantly negative. The reasons for a negative relationship between household labor and the ratio of savings deposits are not clear, but factors related to the household life cycle could be related. In Dingxiang and Taigu, the coefficient of part-time farm households type II is significantly positive relative to the saving ratio. This indicates that part-time farm households type II earn much more income than agricultural and type I households. Type II households tend to retain their assets in the form of saving deposits. Since the development of part-time farms in Dingxiang and Taigu has precedence, this effect seems particularly striking.

Taigu in Table 9.

⁹ The percentage share of households that had positive deposit savings in Linqiu drastically decreased from 59% in 1986 to 21% in 1991. This low level has remained consistent since that time, while other villages have maintained a ratio of 70 to 90% during the survey period.

The estimate for the coefficient of the real deposit rate is different among villages. The sign of the coefficients for Dingxiang and Taigu are positive and statistically significant, while the coefficients are negative and not significant for Linqiu and Linyi. Results for Dingxiang and Taigu are consistent with our expectations. Real deposit ratios for Linqiu and Linyi households were not significant, and this may be attributed to an income effect which offsets the substitution effect of the real deposit rate. It may also be due to the degree of financial market integration, specifically the underdevelopment of financial markets and the failure of financial markets in those villages that affect portfolio selection in rural households.

The coefficient for the service station dummy variable is significant for three villages, but signs differ. While the foundation of service stations has a positive effect on Taigu and Linyi as expected, it has a negative effect on Linqiu. The estimated parameters of service stations in Taigu and Linyi are 0.44 and 0.53 respectively. This indicates that the establishment of service stations probably facilitated deposit savings and gave rise to a considerable portfolio shift from cash holdings to deposit savings in Taigu and Linyi. By contrast, it probably created a significant decrease in the ratio of deposit savings in Linqiu. As mentioned, economic conditions at the end of 1980's in Linqiu were getting worse, and the establishment of service stations may have been an impetus for the withdrawal of money from saving accounts in order to make ends meet. Hence, the establishment of service stations may contribute to the mobilization of rural household savings in developing areas, but may not do so in less developed areas.

The effects of establishing service stations, however, are not totally explained by the service station dummy term, and those effects may change with the passing of time. In order to evaluate the effect of founding service stations in terms of making rural financial systems more reliable, the variable of vintage was substituted for the service station dummy variable. In this formulation, the effect of service stations in Dingxiang, where they were established before 1986, can be estimated.

The result is reported in Table 9. The coefficient of vintage is significantly positive in Taigu and Linyi and significantly negative in Linqiu. These results are consistent with those of Table 8. The parameter of vintage squared is significantly positive in Linqiu and Dingxiang, and significantly negative in Linyi. This result shows that the effects of vintage take a positive concave form in Taigu and Linyi, a negative concave form in Linqiu, and a positive convex form in Dingxiang. The sign of the total vintage effect in Linqiu turns positive in 1996, and this indicates that it may take time for the effects of service station establishment to appear in this poor village.

As seen in Table 9, the coefficient of PI is significant in Linyi and not significant in Taigu. This is not consistent with results seen in Table 8. This may be due to the correlation between PI and vintage variables. Results for estimates of income shock are virtually the same in Tables 8 and 9. Except for Linqiu, negative income shock appears to have a significant positive effect on savings deposit holdings. Positive income shock is significantly positive only in Linyi. Results for income shock are relatively robust, regardless of specifications. The coefficient for real deposit rate is significant only in Linyi, but with a negative sign. This implies that rural households do not necessarily decide to save money based only on considerations of profitability for savings deposits. The profitability of production asset investments also seems to affect the portfolio of financial asset holdings.¹⁰

4. Conclusions

This paper has included an examination of the relationship between savings decisions of rural households and the development of rural financial networks in China. In order to investigate the

¹⁰ Rosenzweig and Binswanger [1993] point out that the profitability of production asset investment is related to the portfolio of financial asset holdings. Here, the profitability of production assets was calculated in order to introduce in Equation (4) an explanatory variable. However the estimated values of production asset profitability were neither reasonable nor robust; it is not therefore used here.

functions of rural financial systems from the viewpoint of rural households, portfolio selection models on household financial assets are estimated to clarify the effects of rural financial infrastructures and income variability. Rural household data of Shanxi province from MHTS panel data were used for sample villages.

Major results of this paper are summarized in following three points. First, using the flow-of-funds table and RCFPO, it can be confirmed that the assets of the household sector, especially in the form of savings deposits, have been used as investment funds by the enterprise sector. These have supported rapid and steady economic growth in China without depending heavily on government spending or foreign capital. The proportion of deposits in financial assets of rural households substantially increased in the early 1990's, and a change in portfolio selection for rural households probably took place in this period.

Second, with the field survey on Dingxiang County in Shanxi, it was found that branch offices of the RCC (called service stations) increased rapidly in the 1980's. These service stations have played important roles in rural finance. Station workers are paid according to the amount of deposits in each service station, and this creates an incentive for collecting more deposits from the village people. In turn, this contributes to a mobilization of savings at the village level.

Third, the estimated result of portfolio selection models between cash holdings and saving deposit holdings demonstrated that the foundation of service stations at the village level has contributed to a rise in the ratio of savings deposit holdings in every village except for Linqiu, the poorest village. This indicates that the effects of service station establishment are not the same among villages. The establishment of service stations significantly contributes to the mobilization of rural household savings in middle level and upper level villages. Further, the increase of predicted permanent income is likely to induce a shift from cash to savings deposit holdings. Unexpected negative income is likely to impede mobilization of deposit savings in rural households. However,

positive income shock does not necessarily lead to an increase in the saving deposit ratio for financial assets.

From this study, it seems evident that the development of financial infrastructures in rural China has made a strong contribution to the mobilization of household savings in that sector. Combined with the increase of permanent income due to the decentralization and development of the rural economy, the establishment of service stations has made accessibility to formal finance in rural area much easier, and this has caused a shift of portfolio selection from cash holdings to deposit savings.

It must be remembered that the behaviors of rural households on financial asset selection are not the same among all villages. Especially in poor areas, the development of financial branch offices has not necessarily contributed to the mobilization of savings. This suggests that the indiscriminate development of a financial infrastructure may not directly led to the mobilization of household savings in less developed areas and may actually impose a heavy economic burden on the formal financial sector. In evaluating the effects of the financial infrastructure on the rural level, differences in the economic structure of each village as well as the efficiency of financial networks as a whole must be taken into consideration.

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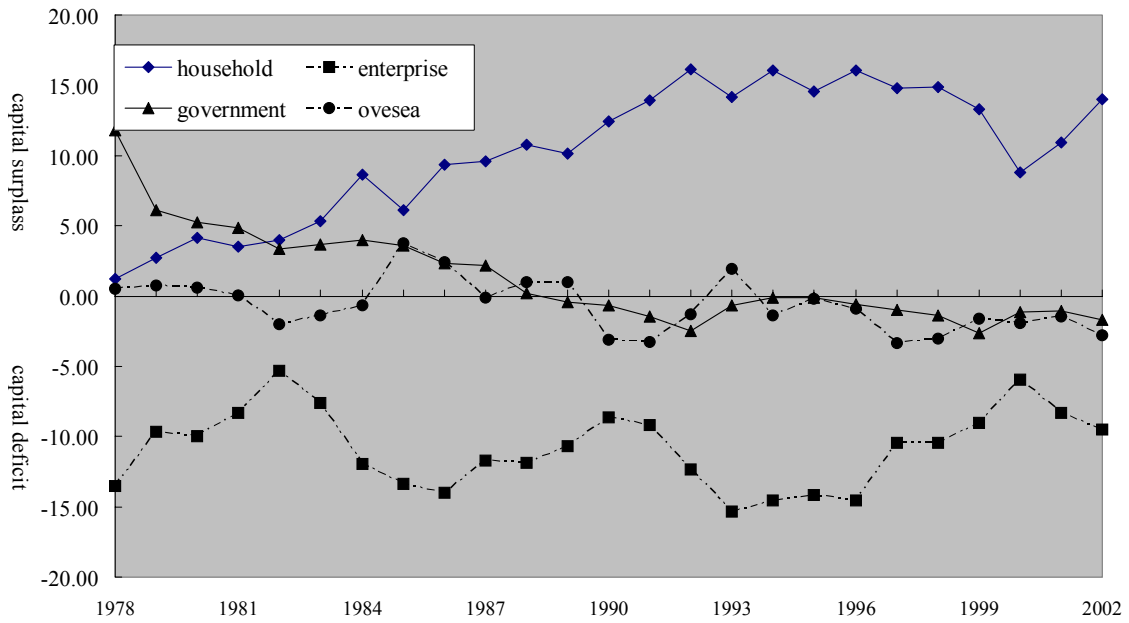
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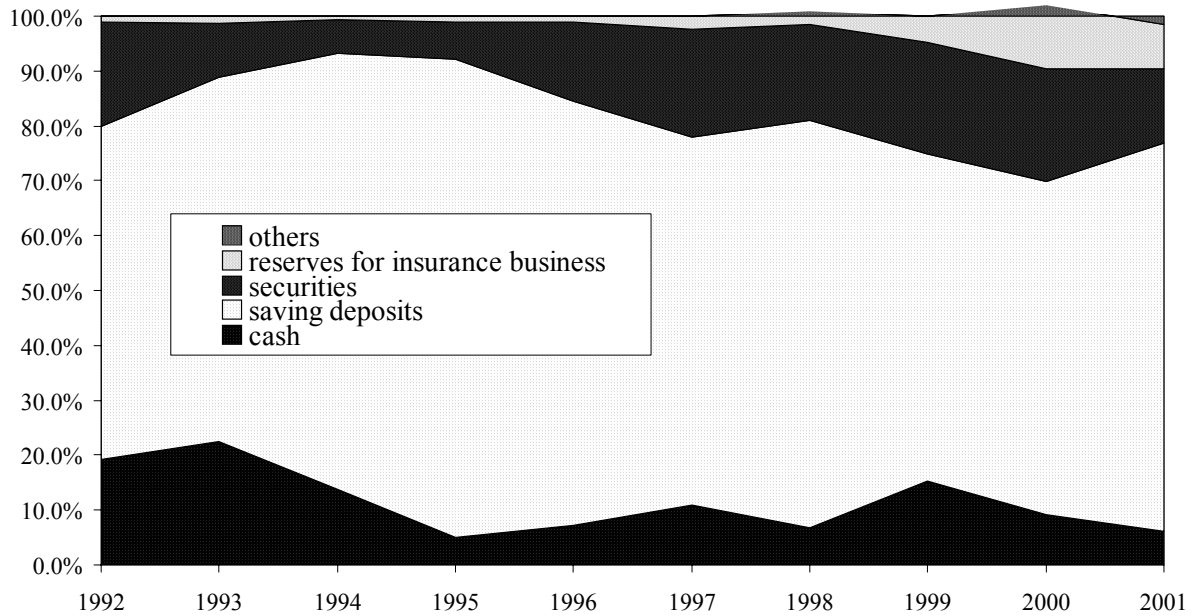
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Figure 1 Change of I-S balance since 1978



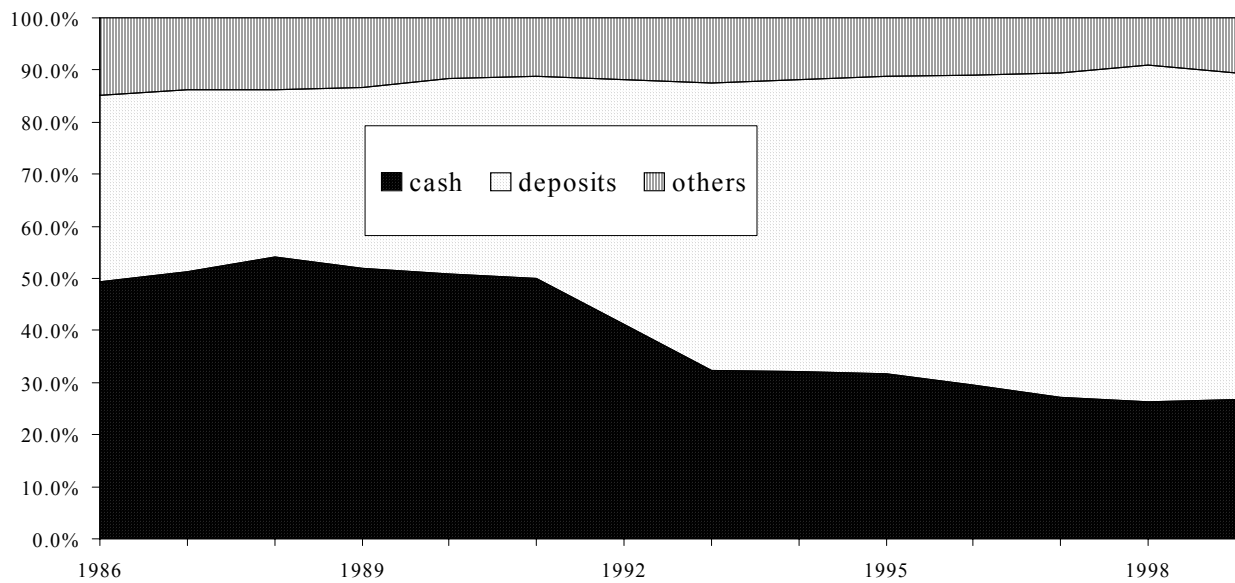
Source: Tang [2003], The People's Bank of China, *Quarterly Statistical Bulletin* (various issues).

Figure 2 Composition of household financial assets since 1992



Source: The People's Bank of China, *Quarterly Statistical Bulletin* (various issues).

Figure 3 Change of financial asset composition in rural households since 1986



Source: Office for Policy Research of CCP and Office on RCFPO of Ministry of Agriculture eds. [2001].

Note: Because household survey was not conducted in 1992 and 1994, the numbers of those years are calculated by an average of before and after year years.

Table 1 Structure of asset holdings on RCFPO households

	(a)household income	(b)finanical asset	(c)production asset	(b)/(a)	(b)/(c)
1986	2,444	1,263	941	51.7%	134%
1987	2,945	1,719	1,070	58.4%	161%
1988	3,505	2,187	1,292	62.4%	169%
1989	3,722	2,592	1,421	69.6%	182%
1990	3,920	2,983	1,502	76.1%	199%
1991	4,093	3,280	1,745	80.1%	188%
1992					
1993	5,966	3,524	2,639	59.1%	134%
1993					
1995	9,840	4,798	3,954	48.8%	121%
1996	10,214	5,812	4,558	56.9%	128%
1997	10,576	6,951	4,725	65.7%	147%
1998	10,232	7,071	5,247	69.1%	135%
1999	10,256	7,891	5,465	76.9%	144%

Source: Office for Policy Research of CCP and Office on RCFPO of Ministry of Agriculture eds. [2001].

Note: Financial assets include cash on hand, deposits and others (lending, securities etc). Production assets include agricultural assets (agricultural machinery, farm tools and draft animals) and non-agricultural production assets. The production assets are evaluated at book prices.

Table2 Characteristics of sample villages

	Geographical features	Number of households		Per capita income		Others
		1986	2001	1986	2001	
Linqiu	mountain	75	76	215	1,188	officially acknowledged poor village
Dingxiang	plain	755	756	736	2,583	"well-off" village
Taigu	plain	70	76	634	3,018	"well-off" village
Linyi	hill	246	335	362	2,480	

Source: MHTS panel database and village level survey data.

Table 3 Composition of asset holdings for sample villages

Linqiu	Total	financial assets	production assets	Taigu	Total	financial assets	production assets
1986	919	35.0%	65.0%	1986	3,138	37.2%	62.8%
1991	1,208	30.0%	70.0%	1991	8,051	67.8%	32.2%
1996	4,118	23.8%	76.2%	1996	9,519	62.2%	37.8%
2001	7,930	10.2%	89.8%	2001	19,108	66.0%	34.0%

Dingxiang	Total	financial assets	production assets	Linyi	Total	financial assets	production assets
1986	3,866	70.3%	29.7%	1986	1,673	26.4%	73.6%
1991	8,716	76.5%	23.5%	1991	3,355	42.9%	57.1%
1996	13,035	76.0%	24.0%	1996	7,549	65.2%	34.8%
2001	20,383	86.9%	13.1%	2001	10,519	58.9%	41.1%

Source: MHTS panel database.

Note: See Table 1.

Table 4 Change of financial assets for sample villages

Linqiu	(a)Income	(b)Financial asset				(b)/(a)
			deposit	cash	others	
1986	818	322	22.4%	73.2%	4.4%	39.3%
1991	882	363	1.7%	98.3%	0.0%	41.1%
1996	2,459	979	52.2%	31.7%	16.1%	39.8%
2001	3,880	810	23.8%	59.7%	16.5%	20.9%
Dingxiang	(a)Income	(b)Financial asset				(b)/(a)
			deposit	cash	others	
1986	2,688	2,719	74.2%	11.0%	14.8%	101.2%
1991	4,784	6,670	75.0%	16.8%	8.2%	139.4%
1996	8,403	9,907	87.3%	9.7%	3.1%	117.9%
2001	8,537	17,706	85.5%	8.7%	5.8%	207.4%
Taigu	(a)Income	(b)Financial asset				(b)/(a)
			deposit	cash	others	
1986	2,760	1,166	39.3%	55.8%	4.9%	42.2%
1991	3,837	5,461	63.5%	32.1%	4.5%	142.3%
1996	7,483	5,926	72.1%	18.1%	9.8%	79.2%
2001	10,879	12,613	84.9%	14.9%	0.2%	115.9%
Linyi	(a)Income	(b)Financial asset				(b)/(a)
			deposit	cash	others	
1986	1,738	441	18.9%	58.2%	22.8%	25.4%
1991	2,901	1,439	48.4%	45.8%	5.8%	49.6%
1996	10,286	4,926	84.0%	15.6%	0.5%	47.9%
2001	9,605	6,198	87.6%	11.9%	0.5%	64.5%

Source: MHTS panel database.

Table 5 Number of RCC service stations by village

Village	Service Station	Year Funded
Linqiu	2	1989, 91
Dingxiang	6	1979, 85
Taigu	2	1988, 90
Linyi	2	1988, 92

Notes: 1) Branches of the RCC were funded from 1958 to 1959 in all townships for every village

2) Three service stations of Dingxiang village were funded in 1979, and another three were funded later by the Joint RCCs, the China Construction Bank, and the Agricultural Bank of China which were reorganized as service stations of the RCC in 2002.

Table 6 Basic statistics for sample data

Variable	Unit	Linqiu		Dingxiang		Taigu		Linyi	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Saving ratio (S_{it})	(deposit savings)/(deposit savings+cash in hand)	0.163	0.289	0.726	0.308	0.564	0.351	0.480	0.380
Real income (Y_{it})	Household income deflated by CPI	775.8	647.3	2827.5	1682.2	2735.5	1538.1	2512.7	1469.1
Income shock(-) (\bar{Y}_i^{-T})	See text	-125.9	191.8	-368.2	531.1	-329.4	521.7	-385.8	559.2
Income shock(+) (\bar{Y}_i^{+T})	See text	125.9	261.4	368.2	664.1	329.4	569.7	385.8	701.5
Permanent income (\bar{Y}_i^P)	See text	775.8	531.2	2827.5	1354.8	2735.5	1245.7	2512.7	1027.4
Cadre	Dummy variable, 1 if household head is a member of cadre in village or town office, 0 if not	0.098		0.036		0.092		0.036	
Middle school	Dummy variable, 1 if educational level of household head is middle school, 0 if not	0.349		0.304		0.526		0.615	
High school	Dummy variable, 1 if educational level of household head is more than high school, 0 if not	0.121		0.087		0.034		0.107	
Occupational training	Dummy variable, 1 if anyone of household members is taking or has already taken occupational training, 0 if not	0.046		0.066		0.162		0.051	
Labors	Number of household labors	1.923	0.823	2.352	0.955	2.388	1.077	2.623	1.061
Type I	Dummy variable of agricultural type, 1 if the proportion of off-farm work days to total work days is 10% to 49%, 0 if not	0.349		0.182		0.310		0.269	
Type II	Dummy variable of agricultural type, 1 if the proportion of off-farm work days to total work days is over 50%, 0 if not	0.164		0.474		0.235		0.123	
Land area	Total area for cultivation, tree planning and breeding including land of subtenancy	3.549	3.168	11.807	8.629	8.267	3.784	12.922	4.704
Production assets	Total of agricultural and non-agricultural production assets deflated by CPI, and evaluated at book prices	491.6	719.3	587.7	1166.6	1263.0	1496.7	967.2	876.0
Coefficient of dependents	(number of household member)/(number of household	1.916	0.709	1.715	0.532	1.747	0.563	1.882	0.694

Source: MHTS panel database.

Table 7 Result of regression on income

	Linqiu		Dingxiang		Taigu		Linyi	
	coefficient	<i>t</i> -statistic	coefficient	<i>t</i> -statistic	coefficient	<i>t</i> -statistic	coefficient	<i>t</i> -statistic
Cadre	55.7	0.69	152.1	0.54	245.8	1.05	350.7	1.70
Middle school	168.2	2.75 ***	74.9	0.56	20.1	0.18	-120.4	-1.16
High school	88.5	0.66	-2.0	-0.01	183.5	0.64	-259.7	-1.60
Occupational training	23.0	0.22	-65.8	-0.32	93.3	0.72	1198.8	7.29 ***
Labors	121.3	3.15 ***	452.9	7.07 ***	321.5	6.19 ***	194.9	4.70 ***
Land area	632.4	10.30 ***	594.9	5.47 ***	868.5	8.17 ***	591.8	6.53 ***
Type II	18.9	1.91 *	47.0	6.15 ***	116.4	6.63 ***	83.6	8.39 ***
Production assets	0.285	8.13 ***	-0.009	-0.22	0.247	7.43 ***	0.077	1.95 *
Constant	164.7	1.66	616.7	2.87 ***	-76.3	-0.37	-246.8	-1.22
Sample Size	634		1,032		936		1,949	
R ² : Within	0.427		0.186		0.413		0.338	
Between	0.425		0.232		0.523		0.343	
Overall	0.413		0.209		0.469		0.324	
F test that all $X_i = 0$	F(91, 526)=4.05 ***		F(98, 912)=7.82 ***		F(100, 8147)=3.83 ***		F(163, 1764)=3.21 ***	

Notes: Owing to reliability of saving data on Linqiu after 1997, data from 1986 to 1996 are used for estimations on Linqiu.

*** significant at 1% level, ** at 5% level, and * at 10% level.

Table 8 Estimation results for the portfolio selection model (service station dummy)

	Linqiu(REM)		Dingxiang(FEM)		Taigu(FEM)		Linyi(FEM)	
	coefficient	asym. <i>t</i> -statistic	coefficient	asym. <i>t</i> -statistic	coefficient	asym. <i>t</i> -statistic	coefficient	asym. <i>t</i> -statistic
Income Shock(-)	3.14E-05	0.49	6.05E-05	2.99 ***	6.04E-05	2.66 ***	1.35E-04	7.35 ***
Income Shock(+)	-2.16E-05	-0.48	3.96E-06	0.25	2.45E-05	1.19	2.01E-05	1.43
Permanet Income(PI)	1.45E-04	3.81 ***	8.71E-05	2.82 ***	3.19E-05	1.76 *	-8.36E-06	-0.50
Service Station	-0.175	-3.37 ***			0.438	10.77 ***	0.531	10.13 ***
Type I	0.005	0.18	0.031	0.97	-0.013	-0.46	-0.037	-1.65
Type II	0.068	1.59	0.071	2.10 **	0.090	2.54 **	0.020	0.60
Labors	-0.047	-2.02 **	-0.063	-2.38 **	-0.050	-2.51 **	0.006	0.34
Coefficient of dependents	-0.031	-1.58	-0.002	-0.06	-0.038	-1.32	0.026	1.23
Real deposit rate	-1.20E-03	-0.68	4.24E-03	2.66 ***	1.22E-02	6.24 ***	-4.10E-04	-0.23
Constant	0.306	3.92 ***	0.614	6.98 ***	0.283	2.90 ***	0.032	0.38
Sample Size	614		1,020		921		1,894	
F or Wald statistics for zero slope	$\chi^2(9) = 48.42$ ***		F(8, 913) = 5.75 ***		$\chi^2(9) = 3514.0$ ***		$\chi^2(9) = 3667.4$ ***	

Notes: 1. Owing to reliability of saving data on Linqiu after 1997, data from 1986 to 96 are used for estimations on Linqiu.

2. In order to control the endogeneity of the service station dummy, first lag of the permanent income and the share of deposit savings are used for IV of service station dummy. The village averages of those lagged variables are utilized for IV estimations.

*** significant at 1% level, ** at 5% level, and * at 10% level.

Table 9 Estimation results for portfolio selection model (Vintage)

	Linqiu(REM)		Dingxiang(REM)		Taigu(FEM)		Linyi(REM)	
	coefficient	<i>t</i> -statistic	coefficient	<i>t</i> -statistic	coefficient	<i>t</i> -statistic	coefficient	<i>t</i> -statistic
Income Shock(-)	2.09E-06	0.03	6.20E-05	3.19 ***	7.73E-05	3.55 ***	1.26E-04	7.56 ***
Income Shock(+)	-3.47E-06	-0.08	1.92E-06	0.13	8.06E-06	0.41	2.40E-05	1.88 *
Permanet Income(PI)	9.48E-05	2.44 **	5.61E-05	4.00 ***	3.44E-06	0.19	8.49E-05	6.69 ***
Vintage	-4.28E-02	-3.22 ***	-2.18E-02	-1.47	4.12E-02	4.94 ***	4.69E-02	7.35 ***
(Vintage) ²	5.64E-03	3.27 ***	9.75E-04	2.04 **	-8.80E-04	-1.42	-2.96E-03	-6.53 ***
Type I	-2.52E-03	-0.10	1.33E-02	0.44	-1.32E-02	-0.50	-3.91E-03	-0.19
Type II	0.051	1.27	0.017	0.55	0.046	1.30	-0.024	-0.86
Labors	-0.016	-0.76	-0.030	-1.64 *	-0.035	-1.81 *	-0.026	-2.05 **
Coefficient of dependents	-0.028	-1.44	0.020	0.81	-0.014	-0.48	0.005	0.31
Real deposit rate	-1.38E-03	-0.81	2.50E-03	1.52	8.09E-04	0.42	-1.05E-02	-7.05 ***
Constant	0.190	2.87 ***	0.698	5.35 ***	0.460	5.19 ***	0.251	4.00 ***
Sample Size	614		1,020		921		1,894	
F or Wald statistics for zero slope	$\chi^2(10)=49.69^{***}$		$\chi^2(10)=69.01^{***}$		F(10, 810)=20.22 ^{***}		$\chi^2(10)=270.7^{***}$	

Notes: Owing to reliability of saving data on Linqiu after 1997, data from 1986 to 1996 are used for estimation on Linqiu.

*** significant at 1% level, ** at 5% level, and * at 10% level.