Southeast Asian Journal of Economics 2(2), December 2014: 49-75

Risk Sharing in Rural and Urban Areas in Thailand

Jiraporn Shawong
School of Economics, University of the Thai Chamber of Commerce, Bangkok, Thailand
Corresponding author: jiraporna555@gmail.com

Abstract

This study tests the full insurance model using panel data taken from Townsend Thai Data, which was collected annually between 2005 and 2009 in six provinces in four regions of Thailand. The full insurance model is statistically rejected in most regions and provinces; however, Thais in rural areas share risks better than those in urban areas in most of the country's regions and provinces. The findings show that there are statistical differences in risk sharing in various occupations and types of work, but that no one in any urban area is better at risk sharing than those who live in rural areas.

Keywords: Risk Sharing, Full Insurance, Consumption Insurance, Consumption Smoothing

1. Introduction

People face risks throughout most of the developing countries of the world. These risks include human illness, sickness or death of animals used in plowing, crop pests and diseases, erratic monsoon rains, earthquakes, floods, and the involuntary loss of one's job, all of which cause fluctuations in people's net income. While household income in developing countries varies greatly, consumption is remarkably smooth (Townsend, 1994). Why this situation occurs? Are people well insured? Do they have full insurance or not or have partial insurance? These problems rise up. One way to explain these problems is to test for full insurance or full risk-sharing hypothesis.

The idea of full insurance or full risk-sharing hypothesis comes from Pareto optimal allocation at which optimal allocation consumption depends on aggregate endowment, not individual endowment. Changes or fluctuations of household income should not affect household consumption.

An optimal allocation of risk bearing implies that all individual consumptions are determined by aggregate consumption, no matter what the date and history of shocks, and so individuals' consumptions will move together. This proposition implies that income, sickness, and other idiosyncratic shocks should not influence consumption at all once aggregate consumption is controlled for. This implication is important and interesting to test because if there are full insurance or full risk sharing in the society which is Pareto optimal allocation, the interventions from government or social planner will cause someone in the society worse off. But if there are not full insurance or full risk sharing, government or social planner can have policies and strategies to help people in the society to be better off without making anyone worse off.

Some possible sources of insurance include insurance among family members, relatives and friends, contracts between the employer and employees, unemployment insurance, crop insurance, borrowing and lending in a credit market, and selling and buying on the stock market.

According to the theory of full insurance, if the risks are idiosyncratic as the empirical evidence argues (e.g. Mace (1991), Cochrane (1991), Townsend (1994), and Townsend (1995)), then risk-averse households should group together to share all risks. Households receive help primarily through networks of friends and relatives. Risks can be shared by using flexible, zero interest informal loans (e.g. Udry, 1994), gifts, remittances, savings, purchases and sales of real capital assets (including livestock, rice and consumer durables), or an increased labor supply. If the risks are shared efficiently, household consumption should be unaffected by idiosyncratic risks. A number of economists have tested full insurance in different countries, including Mace (1991) who tested in the United States, Cochrane (1991) also in the United States, Townsend (1994) who tested in villages in India, and Townsend (1995) who tested in Thailand.

These all studied consumption insurance with specifications related to regression. The full insurance model is statistically rejected in most of the studies. However, what I find most interesting from these studies is the remarkable aspect of the analysis of Townsend (1994) and Cochrane (1991) that consumption insurance may hold more closely among groups which are closed through relationships (such as relatives, friends, or colleagues), or by geography (living in the same village or rural amphoe). This can explain why Cochrane's 1991 study rejected consumption insurance based on a sample distributed throughout the United States and change in households income have more impact to changes in households consumption than the study of Townsend (1994) which studied in the three villages in India. Comparing these two studies implies that risk sharing in rural areas may be more successful than in urban areas. However, these studies were done in different countries and at different times. Therefore, in order to make it clear that risk sharing in rural areas is done better than in urban areas, I had to conduct my study by comparing risk sharing in both Thai rural areas and urban areas in the same time period. This was my motivation in studying in this topic.

The objective of this study is to test the full insurance model in Thailand and test for differences in risk sharing between rural and urban areas for all samples, separated by both geographical area (regions and provinces) and types of work and occupations. This study uses panel data from the Townsend Thai data, which was collected annually in both rural and urban areas between 2005 and 2009 in 4 different regions, in 6 provinces in Thailand. The principal finding is that the full insurance model is statistically rejected in most of regions and provinces. People in rural areas shared risks better than those in urban areas in all of the samples and in most regions and provinces. When investigating by types of work and occupation, this study finds that there are statistical differences in each type, but that no one in any urban area is better at risk sharing than those living in rural areas.

The contribution of this study is in comparing risk sharing between rural and urban areas by using panel data in between 2005 and 2009. To the best of my knowledge, no one had ever conducted a study by comparing risk sharing between rural and urban areas by using the same type of data in the same economy.

A related study is by Rungruxsirivorn, (2007). However, she did not use panel data. She used the Townsend Thai Data (Urban area) for the year 2005, which in the past was funded by the Thai Ministry of Finance. The data is cross-sectional with a total of 1,440 households from 96 villages in 6 provinces. She classified the districts into rural and urban areas on the basis of population density, though this data set is actually for urban areas. Furthermore, her study was about risk management or risk response, which is related to risk sharing, but is not the same.

This paper is arranged as follows. Section 2 explains the theoretical framework. Section 3 describes the data used in the analysis. Section 4 contains the methodology and results, which are divided into 2 parts. Part 4.1 is a test of full insurance for all samples, rural areas and urban areas, for 4 regions and 6 provinces. This part this study uses first difference for exponential utility and separates it into 2 cases. The first case uses change in demographic terms, such as household size, as an explanatory variable, while the second does not. Furthermore, this study includes a log of income and consumption for power utility for robustness. Part 4.2 is a test for the differences in risk sharing between rural and urban areas, separated for geography and the type of work and occupations. Section 5 contains my conclusions and makes recommendations for further research.

2. Theoretical Framework

Many studies, whether based on household-level or on aggregate-level data, have documented that consumption is less volatile than income both over time and across households. This is known as consumption smoothing; that is, consumption tends to smooth out fluctuations in income. Among the different theories proposed to explain this important phenomenon are the life cycle-permanent income hypothesis and the risk-sharing hypothesis. The smoothing of consumption studied by the permanent income hypothesis is sometimes called intertemporal smoothing, because it focuses mainly on consumption variation over time. The form of smoothing analyzed by risk sharing hypothesis, on the other hand, can be appropriately called cross-sectional smoothing, because it emphasizes the effect of resource pooling by agents in coping with risk. Many researchers have investigated each of these two hypotheses separately. There are only a few have considered both of them together e.g. Attanasio and Davis (1996) and Hayashi, Altonji, and Kotlikoff (1996), which reported evidences against the risk sharing hypothesis.

On the other hand, Zhang and Ogaki (2004) also compare both hypotheses together using the International Crops Research Institute in Semi-Arid Tropics (ICRISAT) dataset. They find no evidence against risk sharing hypothesis at the village level when allowing Decreasing Relative Risk Aversion (DRRA) and find evidence against permanent income hypothesis. At least three other articles also studied the consumption smoothing in ICRISAT villages using both risk sharing hypothesis and permanent income hypothesis. Lim (1993) studies disentangling permanent income and risk sharing. He uncovered that the amount of consumption smoothing found in the data is larger than that implied by permanent income hypothesis. Ligon (1998) examined the fit of permanent income hypothesis and risk sharing hypothesis against a private information model and found that the latter seems to garner the most support from the data. Lim and Townsend (1998) analyzed the household asset data and found little support for risk sharing hypothesis and permanent income hypothesis.

My study focuses on testing risk sharing hypothesis, not permanent income hypothesis. Both risk sharing hypothesis and permanent income hypothesis try to explain consumption smoothing, but different in concepts and methodologies.

The idea of full insurance or full risk-sharing hypothesis comes from Pareto problem which is a problem of the social planner in Arrow-Debreu complete market. The standard general equilibrium theory and welfare economics show that a Pareto optimal resource allocation implies that a distribution of the aggregate endowment equalizes weighted marginal utilities across individuals. The major implication of perfect risk sharing is that individual consumption varies positively with aggregate consumption but not with idiosyncratic variables such as individual income.

Consumption insurance studies households' ability to smooth consumption over states of nature. Under full insurance, consumption should be independent of idiosyncratic shocks that make a household's income fluctuate. If a household has full insurance, it can smooth consumption even if its income fluctuates.

If risks are largely idiosyncratic, then risk averse households should group together to share all risks. If the risks are fully pooled, a change in household consumption should track the change in the group's average consumption. Movements in average group consumption represent aggregate risk. The amount of risk sharing that actually takes place thus can be compared to the benchmark of perfect (or full) risk sharing. If risk sharing is complete, the coefficient on group consumption will be one, and the coefficient on household income and any other shocks will be zero.

From Pareto problem which is a problem of the social planner, there is linkage to Pareto optimal allocation and from the optimal allocation to full risk sharing.

Described below are the general characteristics of the economy, including the information structure, preferences and endowments.

1. Information

Suppose there is some initial date t = 0 in the distant past and one future doomsday date T. Individual's common information at time t is represented by h_t, $h_t = (\varepsilon_1, \ldots\ldots, \varepsilon_t)$, h_t includes states which is prior history of states $(\varepsilon_1, \ldots\ldots, \varepsilon_{t-1})$ and contemporary state ε_t or shocks in the past and shocks today.

2. Preferences

There are k infinitely lived consumers. Consumer k has preferences for the consumption good. EU^k is expectation of utility of agent k, k = 1,2,………,K, $\pi(h_t)$ denote the ex ante probability at date t = 0 of this history and contemporary realization. The date t = 0 ex ante expected utility of individual k can be written as

$$EU^k = \sum_{t=1}^{T} \pi(h_t)\, U(c_t^k)$$

3. Endowments

Each individual k receives an exogenous endowment of the consumption good. $e^k(h_t)$ is endowment or income of agent k in state h^t.

Pareto problem

The social planner maximizes the weighted sum of the expected utilities of the k individuals.

$$\max_{c} \sum_{k=1}^{K} \lambda^k \{E[\sum_{t=1}^{T} \beta_t \sum_{h_t} \pi(h_t)\, U^k(c_t^k(h_t), A_t^k(h_t))]\} \tag{1}$$

subject to resource constraint

$$\sum_{k=1}^{K} c_t^k(h_t) = \sum_{k=1}^{K} e^k(h_t) = e(h_t) \tag{2}$$

where λ^k is the planner's weights associated with individual *k* in the family *i*.

$$0 < \lambda^k < 1,\ \sum_{k=1}^{M} \lambda^k = 1, \tag{3}$$

The planner's weights are between zero and one. Summation of the planner's weights is equal to one. M is the number of individuals in the economy. E is for expected utilities. β_t is time discount factor from t = 1 to one future doomsday date T.

$$h_t = (\varepsilon_1, \ldots\ldots, \varepsilon_t) \tag{4}$$

h_t is states which includes prior history of states $(\varepsilon_1, \ldots\ldots, \varepsilon_{t-1})$ and contemporary state ε_t or shocks in the past and shocks today, $\pi(h_t)$ is probability that states (shocks) occur, $c_t^k(h_t)$ is consumption of individual *k* which is depend on states.

$$c_t^k(h_t) \geq 0 \tag{5}$$

Consumption is nonnegative. $e^k(h_t)$ is individual's endowment. Summation of all individual's endowments is equal to e which is aggregate endowment.

$A_t^k(h_t)$ is male equivalent index. This study uses A_t^k in the same way as Townsend (1994) to adjust household consumption and household income to be male equivalent consumption and male equivalent income. This is from a dietary survey by Ryan, Bidinger, Pushpamma, and Rao (1985) which measured caloric intake at the individual level for distinct age-sex categories. This male equivalent index (A_t^k) weights are 1.0 for adult males, 0.9 for adult females, 0.94 and 0.83 for males and females aged 13-18 years respectively, 0.67 for children aged 7-12 regardless of gender, 0.52 for children aged 4-6, 0.32 for toddlers aged 1-3, and 0.05 for infants.

Pareto optimal allocation

If preferences are exponential utility

$$U^k(c_t^k(h_t), A_t^k(h_t)) = -\frac{1}{\sigma_j} e^{\frac{-\sigma_j c_t^k}{A_t^k}} \tag{6}$$

σ_j is absolute risk aversion of household j.

Assume homogeneous risk preference.

$$\sigma_i = \sigma_j = \sigma \quad \forall i,j \in N$$

The optimal solution for all individuals is

$$c_t^j = \frac{1}{\sigma_j}(\log\lambda_j - \frac{1}{N}\sum_i \log\lambda_i) - \frac{1}{\sigma_j}\left[\frac{\sum_{k=1}^{N_t^j} A_t^k \log A_t^k}{\sum_{k=1}^{N_t^j} A_t^k} - \frac{1}{N}\sum_{i=1}^{N}\frac{\sum_{k=1}^{N_t^i} A_t^k \log A_t^k}{\sum_{k=1}^{N_t^i} A_t^k}\right] \tag{7}$$

$$+ \frac{1}{N}\sum_{i=1}^{N}\left(\frac{\sum_{k=1}^{N_t^i} c_t^k}{\sum_{k=1}^{N_t^i} A_t^k}\right)$$

The first term $(\log\lambda_j - \frac{1}{N}\sum_i \log\lambda_i)$ denotes fixed effect of household j, it does not change overtime. λ_j denotes the planner's pareto weight which represent wealth. When time change, relative wealth are the same, so when this study takes first difference, it's gone.

The second term $\left[\frac{\sum_{k=1}^{N_t^j} A_t^k \log A_t^k}{\sum_{k=1}^{N_t^j} A_t^k} - \frac{1}{N}\sum_{i=1}^{N}\frac{\sum_{k=1}^{N_t^i} A_t^k \log A_t^k}{\sum_{k=1}^{N_t^i} A_t^k}\right]$ denotes the demographic term such as age, education, household size.

The third term $\frac{1}{N}\sum_{i=1}^{N}\left(\frac{\sum_{k=1}^{N_t^i} c_t^k}{\sum_{k=1}^{N_t^i} A_t^k}\right)$ denotes average aggregate consumption which depends on aggregate endowment.

Reduced form is

$$c_t^j = \alpha^j + \delta^j \tilde{A}_t^j + \gamma^j \bar{c}_t + \beta^j Y_t^j + u_t^j \qquad (8)$$

where c_t^j is male equivalent consumption for household j, $c_t^j = \sum_{k=1}^{N_t^j} c_t^k / \sum_{k=1}^{N_t^j} A_t^k$, $\tilde{A}_t^j$ is the demographic term such as household size,

$$\tilde{A}_t^j = \left[\frac{\sum_{k=1}^{N_t^j} A_t^k \log A_t^k}{\sum_{k=1}^{N_t^j} A_t^k} - \frac{1}{N}\sum_{i=1}^{N}\frac{\sum_{k=1}^{N_t^i} A_t^k \log A_t^k}{\sum_{k=1}^{N_t^i} A_t^k}\right],$$

$\bar{c}_t$ is average aggregate consumption, $\bar{c}_t = \frac{1}{N}\sum_{i=1}^{N}\left[\frac{\sum_{k=1}^{N_t^i} c_t^k}{\sum_{k=1}^{N_t^i} A_t^k}\right]$,

Y_t^j is male equivalent income for household j, $Y_t^j = \sum_{k=1}^{N_t^j} Y_t^k / \sum_{k=1}^{N_t^j} A_t^k$, and u_t is the disturbance term.

This study tests whether or not the male equivalent consumption depends on male equivalent income. According to the theory, if there is full risk sharing, the coefficient of household income (β) should be zero (insignificant).

Using aggregate consumption as an independent variable leads to a bias which is called the Deaton critique (Ravallion M. and Chaudhuri S. 1997), so this study instead uses a village-time dummy as was done in J. Jalan, M. Ravallion (1999). Aggregate income risk is captured by the (interacted) village-time dummies, while idiosyncratic income risk is captured by changes in the household income. If there is full insurance within the village, changes in household income will have no effect on consumption after controlling for the common village-time effects, β = 0.

Full risk sharing is implication of Pareto optimal allocations.

Empirical strategies

Formal equation

$$c_t^j = \alpha^j + \delta^j \tilde{A}_t^j + \gamma^j \bar{c}_t + \beta^j Y_t^j + u_t^j \tag{8}$$

The standard risk sharing regression (8) which is reduced form can be rewritten in a first difference form as (9). When we take first difference, the constant term (α^j) is gone and when we use village-time dummy instead of average aggregate consumption, the equation would be changed to be (9). This paper uses this first difference equation:

First difference equation

$$\Delta c_t^j = \delta^j \Delta\tilde{A}_t^j + \sum_{jk} \alpha^{jk} D_{vt}^{jk} + \beta^j \Delta Y_t^j + \Delta u_t^j \tag{9}$$

where Δc_t^j is change in male equivalent consumption for household j, $\Delta\tilde{A}_t^j$ is change in the demographic term such as household size, D_{vt}^{jk} is a village-time dummy variable equal to one when j is in village v and $k = t$ and zero otherwise, ΔY_t^j is change in male equivalent income for household j and Δu_t^j is change in the disturbance term.

This study also uses growth rate which means takes log on change in male equivalent income and male equivalent consumption for power utility for robustness.

Growth rate equation

$$\Delta \log c_t^j = \delta^j \Delta \tilde{A}_t^j + \sum_{jk} \alpha^{jk} D_{vt}^{jk} + \beta^j \Delta \log Y_t^j + \Delta u_t^j \tag{10}$$

3. Data

This study uses data from the Townsend Thai Project Household Survey 2005-2009 (Rural Areas) and the Townsend Thai Project Household Survey 2005-2009 (Urban Areas). [1st Data Distributor Version: NORC at the University of Chicago (Producer). Bangkok, Thailand: The University of Chicago-UTCC Research Center (distributor).] The data was collected from July through September of each year. Data for rural and urban areas from 2005-2009 came from six provinces: Chachoengsao and Lopburi in the Central Thailand, Buriram and Srisaket in the Northeast, Phrae in the North, and Satun in the South. Data for the rural and urban areas is from the same provinces, but the rural data was taken from villages and the urban data is from the municipal area.

The rural data from 2005 through 2009 is from these six provinces; 4 sub-districts were selected at random for each province. Within each sub-district, 4 villages were selected at random and 15 households from each village. Thus there were 240 households chosen for each province, making a total of 1,440 the 6 provinces. Urban data from 2005 to 2009 came from the same 6 provinces. For each province, 16 communities were selected in the municipal area from the same amphoe as the rural survey, giving a total of 96 communities from the six provinces. 15 households were selected per each community, so there were 1,440 households in total (240 households for each province). This study uses a balanced panel data (keep only households that have data every year), so the sample was size reduced from 1,440 to 1,037 for rural data during 2005 to 2009. The sample size was reduced from 1,440 to 1,001 for urban data during 2005-2009. This shows that the same households used in this study provided about 70-72 percent of data.

This study adjusts data to real terms by using the Rural Consumer Price Index (RPI) by each region for rural data and the Consumer Price Index (CPI) by each region for urban data. It uses data in the items Household Identification, Expenditure and Income to test full insurance and for the differences in risk sharing between rural and urban areas separated by geography; it uses Household Composition to find the male equivalent index. The study also uses Occupation and Type of Work to test for the differences in risk sharing between rural and urban areas separated by each type. Some data has been cut off, for example as in households where data is incomplete because they did not know the answer, refused to answer, had missing or invalid values, or did not appear every year. The data is neither seasonally adjusted nor de-trended prior to an estimate.

A summary of the statistics is presented in tables 1 and 2.

Table 1. Summary of statistics

a. All samples including both rural and urban areas

Variable Description	Obs	Mean	Std. Dev.	Min	Max
Household variables (year 2008)					
Household Income (Baht)	2038	215836	270581	1097	6372550
Household Consumption (Baht)	2038	76277	77043	1600	1640663
Male equivalent income for each HH: Yjt (Baht)	2038	63514	79870	293	1966836
Male equivalent consumption for each HH: Cjt (Baht)	2038	23621	26073	842	585951

b. Rural areas

Variable Description	Obs	Mean	Std. Dev.	Min	Max
Household variables (year 2008)					
Household Income (Baht)	1037	178831	282748	1097	6372550
Household Consumption (Baht)	1037	63038	63201	1600	1278120
Male equivalent income for each HH: Yjt (Baht)	1037	52062	78810	293	1966836
Male equivalent consumption for each HH: Cjt (Baht)	1037	18494	17890	842	327723

c. Urban areas

Variable Description	Obs	Mean	Std. Dev.	Min	Max
Household variables (year 2008)					
Household Income (Baht)	1001	254172	251836	8406	2987194
Household Consumption (Baht)	1001	89992	87078	10464	1640663
Male equivalent income for each HH: Yjt (Baht)	1001	75378	79265	3644	821679
Male equivalent consumption for each HH: Cjt (Baht)	1001	28932	31586	3327	585951

Table 2. Summary of statistics, panel data, 2005-2009

a. All samples including both rural and urban areas

Variable Description	Obs	Mean	Std. Dev.	Min	Max
Household variables					
Change in household Income (Baht)	8152	17347	263330	-7808041	7581912
Change in household Consumption (Baht)	8152	5093	79033	-1534883	1495015
Change in male equivalent income: Yjt (Baht)	8152	5557	83447	-1808703	1884728
Change in male equivalent consumption: Cjt (Baht)	8152	2041	28846	-548173	631155

b. Rural areas

Variable Description	Obs	Mean	Std. Dev.	Min	Max
Household variables					
Change in household Income (Baht)	4148	20781	219724	-5809594	5704650
Change in household Consumption (Baht)	4148	5584	67258	-791150	1199194
Change in male equivalent income: Yjt (Baht)	4148	6429	78427	-1808703	1884728
Change in male equivalent consumption: Cjt (Baht)	4148	1981	26216	-442173	631155

c. Urban areas

Variable Description	Obs	Mean	Std. Dev.	Min	Max
Household variables					
Change in household Income (Baht)	4004	13789	301921	-7808041	7581912
Change in household Consumption (Baht)	4004	4584	89619	-1534883	1495015
Change in male equivalent income: Yjt (Baht)	4004	4653	88348	-1723629	1670502
Change in male equivalent consumption: Cjt (Baht)	4004	2102	31342	-548173	545828

4. Methodology and Results

The section on methodology and results consists of 2 parts. Part 4.1 is a test of full insurance for all samples, both the rural and urban areas for 4 regions and 6 provinces. To accomplish this, the study uses first difference for exponential utility and separates it into 2 parts. The first part uses changes in the demographic terms, such as household size as an explanatory variable. The second part does not use this variable. Furthermore, it also considers the log of income and consumption for power utility for robustness. The results are a bit different and not reported in the paper, but they are available from the author on request. Part 4.2 is a test for the difference of risk sharing between rural and urban areas separated by geography and by types of work and occupations.

4.1 Test of full insurance for all samples, both rural and urban areas for 4 regions and 6 provinces.

Equation used in this study:

$$\Delta c_t^j = \delta^j \Delta \tilde{A}_t^j + \sum_{jk} \alpha^{jk} D_{vt}^{jk} + \beta^j \Delta Y_t^j + \Delta u_t^j$$

where $c_t^j = \sum_{k=1}^{N_t^j} c_t^k / \sum_{k=1}^{N_t^j} A_t^k$, c_t^k is consumption of individual k at time t, is household consumption at time t which compose of individual consumption k = 1…N, $\sum_{k=1}^{N_t^j} A_t^k$ is the summation of male equivalent index in each household, Δc_t^j is changes in male equivalent consumption in household j, $\Delta c_t^j = c_t^j - c_{t-1}^j$, $\tilde{A}_t^j$ is the demographic term such as household size,

$$\tilde{A}_t^j = \left[\frac{\sum_{k=1}^{N_t^j} A_t^k \log A_t^k}{\sum_{k=1}^{N_t^j} A_t^k} - \frac{1}{N} \sum_{i=1}^{N} \frac{\sum_{k=1}^{N_t^i} A_t^k \log A_t^k}{\sum_{k=1}^{N_t^i} A_t^k} \right],$$

D_{vt}^{jk} is a village-time dummy variable which is equal to one when $j = v$ and $k = t$ and zero otherwise, $Y_t^j = \sum_{k=1}^{N_t^j} Y_t^k / \sum_{k=1}^{N_t^j} A_t^k$, Y_t^k is income of individual k at time t, $\sum_{k=1}^{N_t^j} Y_t^k$ is household income at time t which is composed of individual income k = 1…N, ΔY_t^j is change in male equivalent income in household j, $\Delta Y_t^j = Y_t^j - Y_{t-1}^j$, and Δu_t^j is change in the disturbance term.

The study tests that whether or not changes in the male equivalent consumption depend on changes in male equivalent income. According to the theory, if there is full risk sharing, the coefficient of change in the male equivalent income (β) should be zero (insignificant). Changes in the male equivalent consumption should depend on changes in household size ($\tilde{A}_t^j$) and changes in the aggregate endowment, which is represented by village-time dummies (D_{vt}^{jk}).

If the coefficient (ΔY_t^j) is significant, it means that it rejects full insurance (full risk sharing). Changes in the male equivalent consumption depend on changes in the male equivalent income. The rejection of the hypothesis does not necessarily imply that idiosyncratic shocks are never insured among households. The rejection results may suggest a situation where asymmetric information leads not to full insurance, but to partial insurance (or partial risk sharing).

This study divided the test of first difference into 2 parts: without $\tilde{A}_t^j$ (table 3.1) and with $\tilde{A}_t^j$ (table 3.2).

Table 3.1 (without $\tilde{A}_t^j$) and 3.2 (with $\tilde{A}_t^j$), all coefficients of ΔY_t^j are close to each other (difference only .0007 or less) or have the same value. All $\tilde{A}_t^j$ for all samples, rural and urban areas, are insignificant, so it is not important to use $\tilde{A}_t^j$ in the estimate equation. Changes in household size do not affect the male equivalent consumption.

Judging from Table 3.1, when considered by region, Central Thailand and the Northeast are the regions that reject full insurance in all samples, both rural and urban. In the South, however, full insurance is rejected in rural and urban areas but not rejected in all samples. The North is the only region which does not reject full insurance in all samples, both rural and urban. Where full insurance is rejected, male equivalent consumption to some degree depends on the male equivalent income. Idiosyncratic shocks cause income fluctuation, and when people are faced with income fluctuation, consumption cannot proceed smoothly.

The rejection of the hypothesis does not necessarily imply that idiosyncratic shocks are never insured among households. The rejection results may suggest the case where asymmetric information leads to not full insurance, but partial insurance (or partial risk sharing).

The coefficient for all samples is around 3.8% means that the result reject null hypothesis of full risk-sharing (H_0: change in household income does not affect change in household consumption). The coefficient is low means that people have partial insurance, changes or fluctuations of household income have little effect on household consumption. When household income changes, it affects household consumption to be changed only 3.8%. (Indeed household consumption changes a lot more than this 3.8% by comoving with average aggregate consumption).

For the village-time dummy, aggregate income risk is captured by the (interacted) village-time dummies, while idiosyncratic income risk is captured by changes in household income. If the coefficients of the village-time dummies are significant in some village-years, it indicates that the male equivalent consumption co-moves with aggregate consumption in that year. This study regresses the village-time dummies, but because there are several village-time dummies, we do not show the results of all village-time dummies in these tables.

Table 3.1 Test of full insurance for all samples, rural area and urban area by 4 regions (without $\tilde{A}_t^j$)

a. All samples include both rural and urban areas					
	All samples	Central	North	Northeast	South
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.0377***	0.0250***	0.00788	0.0973***	-0.0424
	(9.56)	(3.89)	(0.87)	(15.88)	(-1.94)
Obs.	8152	3188	1072	3060	832
b. Rural areas					
	All samples	Central	North	Northeast	South
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.00994	-0.0192*	0.0181	0.208***	-0.115**
	(1.87)	(-2.51)	(1.70)	(16.30)	(-3.16)
Obs.	4148	1660	384	1696	408
c. Urban areas					
	All samples	Central	North	Northeast	South
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.0609***	0.0735***	-0.00998	0.0772***	0.0539**
	(10.53)	(7.05)	(-0.64)	(9.88)	(2.64)
Obs.	4004	1528	688	1364	424

Note: t statistics in parenthesis

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 3.2 Test of full insurance for all samples, rural and urban areas by 4 regions (with $\tilde{A}_t^j$)

a. All samples includes rural and urban areas					
	All samples	Central	North	Northeast	South
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
$\Delta\tilde{A}_t^j$	-2927.8	-8020.1	505.0	-4120.2	14427.3
	(-0.32)	(-0.50)	(0.02)	(-0.36)	(0.50)
ΔY_t^j	0.0377***	0.0250***	0.00788	0.0973***	-0.0425
	(9.56)	(3.88)	(0.86)	(15.88)	(-1.95)
Obs.	8152	3188	1072	3060	832
b. Rural areas					
	All samples	Central	North	Northeast	South
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
$\Delta\tilde{A}_t^j$	-3714.4	-9063.0	60172.7	-8311.7	-2801.5
	(-0.32)	(-0.49)	(1.01)	(-0.68)	(-0.05)
ΔY_t^j	0.00992	-0.0192*	0.0186	0.208***	-0.115**
	(1.86)	(-2.51)	(1.75)	(16.31)	(-3.15)
Obs.	4148	1660	384	1696	408
c. Urban areas					
	All samples	Central	North	Northeast	South
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
$\Delta\tilde{A}_t^j$	-2100.0	-6983.4	-20001.8	365.7	26894.7
	(-0.15)	(-0.26)	(-0.53)	(0.02)	(1.07)
ΔY_t^j	0.0609***	0.0735***	-0.0103	0.0772***	0.0532**
	(10.53)	(7.04)	(-0.66)	(9.88)	(2.60)
Obs.	4004	1528	688	1364	424

Note: t statistics in parenthesis

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

After considering the rejection of full insurance by region, this study also considers the rejection of full insurance by province in table 4.1 (without $\Delta\tilde{A}_t^j$) and 4.2 (with $\Delta\tilde{A}_t^j$).

In Table 4.1 (no $\Delta\tilde{A}_t^j$) and 4.2 (with $\Delta\tilde{A}_t^j$) all coefficients of ΔY_t^j are closed to each other (difference only .0007 or less) or have the same value. All $\Delta\tilde{A}_t^j$ for all samples, rural and urban areas, are insignificant, so it is not important to use $\Delta\tilde{A}_t^j$ in the estimate equation. Changes in household size do not affect the male equivalent consumption.

From table 4.1 we can see that if we consider full insurance by provinces, Buriram and Srisaket both they reject it in all samples, rural and urban. Chachoengsao and Satun reject full insurance in rural and urban areas, but for all samples they do not reject it. Lopburi rejects full insurance in all samples and urban areas, but it does not reject it in rural areas. Phrae is the only province and the North the only region that do not reject full insurance in all samples, rural areas and urban areas.

Table 4.1 Test of full insurance for all samples, rural and urban areas, by 6 provinces (without $\Delta\tilde{A}_t^j$)

a. All samples including rural and urban areas							
	All	Central		North	Northeast		South
	samples	Chachoeng	Lopburi	Phrae	Buriram	Srisaket	Satun
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.0377***	-0.00346	0.0508***	0.00788	0.133***	0.0830***	-0.0424
	(9.56)	(-0.37)	(5.78)	(0.87)	(10.99)	(12.20)	(-1.94)
Obs.	8152	1608	1580	1072	1500	1560	832
b. Rural areas							
	All	Central		North	Northeast		South
	samples	Chachoeng	Lopburi	Phrae	Buriram	Srisaket	Satun
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.00994	-0.0756***	0.00778	0.0181	0.165***	0.257***	-0.115**
	(1.87)	(-6.61)	(0.75)	(1.70)	(8.83)	(14.98)	(-3.16)
Obs.	4148	848	812	384	812	884	408

Table 4.1 Test of full insurance for all samples, rural and urban areas, by 6 provinces (without $\Delta\tilde{A}_t^j$) (cont.)

c. Urban areas							
	All	Central		North	Northeast		South
	samples	Chachoeng	Lopburi	Phrae	Buriram	Srisaket	Satun
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.0609^{***}	0.0365^{*}	0.140^{***}	-0.00998	0.120^{***}	0.0637^{***}	0.0539^{**}
	(10.53)	(2.56)	(9.13)	(-0.64)	(7.15)	(7.58)	(2.64)
Obs.	4004	760	768	688	688	676	424

Note: t statistics in parenthesis
* p<0.05, **p<0.01, *** p<0.001

Table 4.2 Test of full insurance for all samples, rural and urban areas, by 6 provinces (with $\Delta\tilde{A}_t^j$)

a. All samples including rural and urban areas							
	All	Central		North	Northeast		South
	samples	Chachoeng	Lopburi	Phrae	Buriram	Srisaket	Satun
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
$\Delta\tilde{A}_t^j$	-2927.8	-12385.7	-3227.3	505.0	-10335.9	4957.9	14427.3
	(-0.32)	(-0.52)	(-0.15)	(0.02)	(-0.63)	(0.31)	(0.50)
ΔY_t^j	0.0377^{***}	-0.00347	0.0508^{***}	0.00788	0.133^{***}	0.0830^{***}	-0.0425
	(9.56)	(-0.37)	(5.77)	(0.86)	(10.98)	(12.19)	(-1.95)
Obs.	8152	1608	1580	1072	1500	1560	832
b. Rural areas							
	All	Central		North	Northeast		South
	samples	Chachoeng	Lopburi	Phrae	Buriram	Srisaket	Satun
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
$\Delta\tilde{A}_t^j$	-3714.4	-13454.3	-5103.1	60172.7	-10166.4	-11022.0	-2801.5
	(-0.32)	(-0.61)	(-0.17)	(1.01)	(-0.56)	(-0.67)	(-0.05)
ΔY_t^j	0.00992	-0.0757^{***}	0.00777	0.0186	0.165^{***}	0.257^{***}	-0.115^{**}
	(1.86)	(-6.61)	(0.75)	(1.75)	(8.79)	(14.98)	(-3.15)
Obs.	4148	848	812	384	812	884	408

Table 4.2 Test of full insurance for all samples, rural and urban areas, by 6 provinces (with $\Delta\tilde{A}_t^j$) (cont.)

c. Urban areas

	All	Central		North	Northeast		South
	samples	Chachoeng	Lopburi	Phrae	Buriram	Srisaket	Satun
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
$\Delta\tilde{A}_t^j$	-2100.0	-14618.6	2656.1	-20001.8	-8947.4	13334.5	26894.7
	(-0.15)	(-0.32)	(0.09)	(-0.53)	(-0.31)	(0.43)	(1.07)
ΔY_t^j	0.0609***	0.0365*	0.140***	-0.0103	0.120***	0.0637***	0.0532**
	(10.53)	(2.56)	(9.13)	(-0.66)	(7.15)	(7.58)	(2.60)
Obs.	4004	760	768	688	688	676	424

Note: t statistics in parenthesis
* p<0.05, **p<0.01, *** p<0.001

If we want to compare risk sharing between rural and urban areas, we cannot do so by using the coefficients in tables 3 and 4 because they come from different data sets. Instead, this study uses the Chow test to see if the coefficients in rural and urban areas are equal or unequal.

4.2 Test for the differences of risk sharing between rural and urban areas

This study uses the Chow test to determine whether or not the coefficients in rural areas are equal to the coefficients in urban areas. H_0: βrural = βurban

$$\Delta c_t^j = \beta_1 \Delta Y_t^j + \beta_2 (Darea \times \Delta Y_t^j) + \sum_{jk} \alpha^{jk} D_{vt}^{jk} + \Delta u_t^j$$

where ΔC_t^j is change in male equivalent consumption of household j, $\Delta c_t^j = c_t^j - c_{t-1}^j$, ΔY_t^j is change in male equivalent income of household j, $\Delta Y_t^j = Y_t^j - Y_{t-1}^j$, Darea is the dummy for areas, urban = 1, rural=0. D_{vt}^{jk} is the village-time dummy. Δu_t^j is change in the disturbance term.

From table 5.1, this study tests if βrural = βurban by using urban areas as a dummy area (urban = 1, rural = 0). The study concentrates on the coefficients of Darea × ΔY_t^j. If the coefficient is significant, it rejects the null hypothesis (H_0), so βrural ≠ βurban. If the coefficient is significant and has a positive sign, it means that rural areas share risks better than urban areas. If the coefficient is significant and has negative sign, it means that urban areas share risks better than rural areas.

From panel a. we see that in all samples, the Central, the Northeast and the South, the coefficients are significant, so βrural ≠ βurban. Risk sharing in rural and urban areas is different in these regions. The positive sign in the coefficients of Darea × ΔY_t^j in all samples, the Central, and the South (0.0510, 0.0927 and 0.169 respectively) indicates that rural areas share risks better than urban areas. The Northeast is the only region where the coefficient has a negative sign (-0.131), which indicates that urban areas are better than rural areas in risk sharing. The North is the only region which it does not reject that βrural = βurban.

From table 5.1 panel b. in Chachoengsao, Lopburi, Srisaket and Satun the coefficients are significant, so βrural ≠ βurban. Risk sharing in rural and urban areas is different in these provinces. Chachoengsao, Lopburi and Satun have a positive sign in the coefficients of Darea × ΔY_t^j (0.112, 0.132 and 0.169 respectively), which indicates that rural areas share risks better than urban areas. Srisaket is the only province where the coefficient has a negative sign (-0.193), which indicates that urban area is better than rural area in risk sharing. Phrae and Buriram are the provinces which do not reject that βrural = βurban.

Table 5.1 Test for the difference of risks sharing between rural and urban areas for all samples and separated by geography (4 regions, and 6 provinces)

a. for all samples and 4 regions

	All samples	Central	North	Northeast	South
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.00994	-0.0192*	0.0181	0.208***	-0.115**
	(1.86)	(-2.52)	(1.62)	(16.39)	(-3.13)
Darea × ΔY_t^j	0.0510***	0.0927***	-0.0281	-0.131***	0.169***
	(6.49)	(7.16)	(-1.49)	(-8.75)	(4.03)
Obs.	8152	3188	1072	3060	832

Table 5.1 Test for the difference of risks sharing between rural and urban areas for all samples and separated by geography (4 regions, and 6 provinces) (cont.)

b. for 6 provinces						
	Central		North	Northeast		South
	Chachoeng	Lopburi	Phrae	Buriram	Srisaket	Satun
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	-0.0756***	0.00778	0.0181	0.165***	0.257***	-0.115**
	(-6.63)	(0.75)	(1.62)	(8.86)	(15.07)	(-3.13)
Darea × ΔY_t^j	0.112***	0.132***	-0.0281	-0.0457	-0.193***	0.169***
	(6.12)	(7.12)	(-1.49)	(-1.82)	(-10.14)	(4.03)
Obs.	1608	1580	1072	1500	1560	832

Note: t statistics in parenthesis
* $p<0.05$, $^{**}p<0.01$, *** $p<0.001$

This study also tests for the difference of risk sharing between rural and urban areas as separated by types of work and occupations, which is shown in table 6.1 for first difference. The overall results are that rural areas share risks better than urban areas.

Table 6.1 is a test for the difference of risk sharing in rural and urban areas separated by types of work in panel a. and by occupations in panel b.

Table 6.1 in this study tests if βrural = βurban or does not by using urban as a dummy area (urban = 1, rural = 0). This study concentrates on the coefficients of Darea × ΔY_t^j . If the coefficient is significant, it rejects the null hypothesis (H_0), so βrural ≠ βurban. If the coefficient is significant and has a positive sign, it means that rural areas share risk better than urban areas. If the coefficient is significant and has a negative sign, it means that urban areas share risks better than rural areas.

In panel a., which tests for the difference of coefficients in rural and urban areas separated by types of work, owner of business is the only type of work that we find the coefficient is significant, so βrural ≠ βurban. Risk sharing in rural and urban areas is different in type of work. The coefficient has a positive sign (0.0402). This means that rural areas are better than urban areas in risk sharing in the case of owner of business. In the other three types of work (employee, unpaid family worker and government worker) risk sharing in rural and urban areas is not different. The overall results show that rural areas share risks better than urban areas.

In panel b., which tests for the difference of coefficients in rural and urban areas separated by occupation, trade and services is the only occupation in which the coefficient is significant, so βrural ≠ βurban. Risk sharing in rural and urban areas is different in this one occupation. The coefficient has a positive sign (0.0274), which means that rural areas are better than urban areas in risk sharing in the case of trade and services. In the other three occupations (farmers, livestock raising and manufacturing) risk sharing in rural and urban areas is not different. The overall results are that rural areas share risk better than urban areas.

Table 6.1 Test for the difference of risk sharing between rural and urban areas separated by types of work and occupations

a. types of work				
	Owner of business	Employee	Unpaid family worker	Government worker
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.00475	0.0472***	-0.00149	-0.0112
	(0.62)	(4.34)	(-0.01)	(-0.60)
Darea × ΔY_t^j	0.0402***	0.00555	0	0
	(3.92)	(0.30)	(.)	(.)
Obs.	4653	1922	383	428
b. occupations				
	Farmer	Livestock	Manufacture	Trade & Services
	ΔC_t^j	ΔC_t^j	ΔC_t^j	ΔC_t^j
ΔY_t^j	0.0471***	0.0357	0.000278	0.0147
	(5.11)	(1.55)	(0.02)	(1.44)
Darea × ΔYtj	0.0242	0	0	0.0274*
	(0.35)	(.)	(.)	(2.23)
Obs.	2261	364	484	3058

Note: t statistics in parenthesis

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

5. Conclusions

This study tests for risk sharing by using the full insurance model in Thailand. The idea of full insurance or full risk-sharing hypothesis comes from Pareto problem which is a problem of the social planner in Arrow-Debreu complete market. An optimal allocation of risk bearing implies that all individual consumptions are determined by aggregate consumption, no matter what the date and history of shocks, and so individuals' consumptions will move together. This proposition implies that income, sickness, and other idiosyncratic shocks should not influence consumption at all once aggregate consumption is controlled for.

The results are that the full insurance model is statistically rejected for all samples and urban samples. It means that Thai society does not have Pareto optimal allocation. Government or social planner can have policies and strategies to help people in the society to be better off without making anyone worse off. However, when investigating by regions and provinces, it is found that a region which is the North, (where Phrae is the only surveyed province) does not reject full insurance. The rejection of the hypothesis does not necessarily imply that idiosyncratic shocks are never insured among households. The results may instead suggest a case where asymmetric information does not lead to full insurance, but partial insurance (or partial risk sharing). However, the coefficients are very low which mean that change in households' income have little effect on change in households' consumption.

The coefficient for all samples is around 3.8%, the coefficient is low means that people have partial insurance, changes or fluctuations of household income have little effect on household consumption. When household income changes, it affects household consumption to be changed only 3.8%. (Indeed household consumption changes a lot more than this 3.8% by comoving with average aggregate consumption.)

When using the Chow test to examine the difference of risk sharing between rural and urban areas, this study finds that risk sharing in rural and urban areas is different in all samples, in most regions except the North, and in most provinces except Phrae and Buriram. Rural areas share risks better than urban areas in all samples, the Central and the South, and in

Chachoengsao, Lopburi and Satun. Urban areas share risks better than rural areas in only one region, namely the Northeast and even there in only one province, Srisaket. Risk sharing shows no difference between rural and urban areas in one region, the North, and in two provinces, Phrae and Buriram.

When using the Chow test to determine the difference of risk sharing between rural and urban areas separated by types of work and occupations, this study also finds that risk sharing in rural areas is better than in urban areas. Risk sharing in rural and urban areas is different in one type of work, namely the owner of business. Rural areas share risks better than urban areas in this type of work. In the other types of work (employee, unpaid family worker, and government worker) risk sharing in rural and urban areas is not different. When viewed by occupation, the study finds that risk sharing in rural and urban areas is different in only one occupation, trade and services. Rural areas share risks better than urban areas in this occupation. In the other three occupations (farming, livestock raising, and manufacturing), risk sharing in rural and urban areas is not different.

In my future research, I will study kinship networks in facilitating consumption smoothing, which has been documented in many settings. Kinship networks may provide the answer to an interesting question: "Why is risk sharing better in rural areas than in urban areas, at least in the case of Thailand?"

References

Attanasio, O. P., & Davis, S. (1996). "Relative Wage Movements and the Distribution of Consumption," *Journal of Political Economy*, 104, pp. 1227-1662.

Chaudhuri, S., & Martin, R. (1997). "Risk and Insurance in Village India: Comment," *Econometrica*, Vol. 65, No. 1, pp. 171-184.

Cochrane, J. H. (1991). "A Simple Test of Consumption Insurance," *Journal of Political Economics*, 99(5): pp. 957-956.

Deaton, A. (1990). "On Risk, Insurance, and Intra-Village Consumption Smoothing," Mimeo, Woodrow Wilson School, Princeton University.

Hall, R. E. (1978). "Stochastic Implications of the Life Cycle-Permanent Income Hypotheses: Theory and Evidence," *Journal of Political Economy*, 86, 971-987.

Hayashi, F., Altonji, J., & Kotlikoff, L. (1996). "Risk-Sharing Between and Within Families," *Econometrica*, 64, 261-294.

Jalan, J., & Ravallion, M. (1999). "Are the Poor Less Well Insured? Evidence on Vulnerability to Income Risk in Rural China," *Journal of Development Economics*, 58: pp. 61-81.

Kohara, M., Ohtake, F., & Saito, M. (2002). "A Test of the Full Insurance Hypothesis: The Case of Japan," *Journal of the Japanese and International Economies*, 16: pp. 335-352.

Ligon, E. (1998). "Risk Sharing and Information in Village Economies," *Review of Economics Studies*, 65, 847-864.

Lim, Y. (1993). "Disentangling Permanent Income from Risk Sharing: A General Equilibrium Perspective on Credit Markets in Rural South India," unpublished dissertation, University of Chicago.

Lim, Y., & Townsend, R. (1998). "General Equilibrium Models of Financial Systems: Theory and Measurement in Village Economies," *Review of Economic Dynamics*, 1, 59-118.

Mace, B. J. (1991). "Full Insurance in the Presence of Aggregate Uncertainty." *Journal of Political Economics*, 99(5): pp. 928-956.

Ravallion, M., & Jalan, J. (1999). "Are the Poor Less Well Insured? Evidence on Vulnerability to Income Risk in Rural China." *Journal of Development Economics*, 58: pp. 61-81.

Ravallion, M., & Shubham C. (1997). "Risk and Insurance in Village India: Comment", *Econometrica*, Vol. 65, No.1 pp.171-184.

Rungruxsirivorn, O. (2007), "Household Risk Management in Rural and Urban Thailand," *Proceedings of the German Development Economics Conference*, Gottingen Research Committee Development Economics, No. 27.

Ryan, J. G., Bidinger, R. D., Pushpamma, P., & Paul Prahlad Rao. (1985). "The Determinants of Individual Diets and Nutritional Status in Six Villages of Southern India," *Research Bulletin* 7, ICRISAT.

Townsend, R. M. (1995). "Consumption Insurance: An Evaluation of Risk-Bearing Systems in Low-Income Economies." *Journal of Economic Perspectives*, Vol. 9, No. 3. pp. 83-102.

Townsend, Robert M. (1994). "Risk and Insurance in Village India," *Econometrica*, Vol. 62, No. 3. pp. 539-591.

Townsend, R. M., & Alem, M. (2008). "An Evaluation of Financial Institutions: Impact on Consumption and Investment using Panel Data and the Theory of Risk-Bearing" MIT working paper.

Udry, C. (1994). "Risk and insurance in a rural credit market: An empirical investigation in Northern Nigeria." *The Review of Economic Studies*, 61, pp. 495-526.

Zhang, Q., & Ogaki, M. (2004). "Decreasing Relative Risk Aversion, Risk Sharing, and the Permanent Income Hypothesis," *Journal of Business & Economic Statistics*, Vol. 22, No. 4, 421-430.