Consumption Insurance and Household Vulnerability: Evidence from Thailand

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Abstract

An assessment of risk and vulnerability provides insight into how risk affects household's well-being and the effectiveness of coping strategies. This paper uses the 2005, 2007, 2010, and 2012 panel data sets from Socio-economic Survey (SES) of Thailand to investigate the extent of consumption insurance and household vulnerability across socioeconomic groups. The results are supportive of partial insurance. Consumption appears to be better insured in rural areas than urban areas. Empirical estimates indicate that households with educated heads and living in an owned house are more resilient to shocks. In contrast, households with self-employed heads, infants and small children, engaging in farm activities, and female heads are more vulnerable groups. Furthermore, idiosyncratic health shocks had no significant effect on vulnerability. Household's coping strategies including savings, borrowing, and remittances help protect them from economic shocks. Thailand's formal safety nets also contribute to reducing vulnerability except for the public pension payment.

Keywords: Risk, Consumption Insurance, Vulnerability, Economic Shocks, Safety Nets, Thailand.

1. Introduction

Most people in the developing world face numerous risks, including illness, natural disasters, harvest failure, political unrest, involuntary loss of employment, and economic mismanagement. Economic shocks would be likely to undermine growth, resulting in drastic declines in people's living standards. However, it is likely that the negative impact of economic shock is not evenly distributed across socioeconomic groups (Townsend, 1995; Glewwe & Hall, 1998; Jalan & Rallavion, 1999; Gerry & Li, 2010). Poor households in rural areas are particularly afflicted with a high level of income risk, thus lacking reliable income and assets as collateral to access funds from formal credit and insurance markets. Consequently, they are often considered as the most vulnerable group since they are less able to protect their consumption against income fluctuation (World Bank, 2000). In response, governments in most countries place a strong emphasis on a social protection scheme that provides income support and increases access to basic social services in order to mitigate the impact of economic crises and other adverse shocks.

Extensive research has applied various risk-sharing models to examine how well households are able to insure their consumption against shocks using micro panel data (Mace, 1991; Cochrane, 1991; Townsend, 1994 & 1995; Deaton, 1997; Jalan & Rallavion, 1999; Skoufias, 2003). Household's risk-coping strategies can be divided into two main categories: (i) intertemporal coping to smooth consumption over time through savings, borrowing and lending and (ii) risk-sharing arrangements to provide state-contingent transfers and remittances across households in a community at a given time (Alderman & Paxson, 1994). The literature on risk and insurance has provided evidence that household consumption is partially insured from income risks, that is, their consumption is correlated with both individual household income and average community income or consumption. It is commonly observed in developing countries that households are likely to combine intertemporal coping via saving and borrowing decisions and risk-sharing arrangements in formal and informal markets (Dercon, 2004). Examples of such mechanisms include savings (Paxson, 1992; Sirisankanan, 2013), borrowings from informal sources (Udry, 1994), receiving remittances (Paulson, 2000), shifting labor from farm to off-farm employment (Kochar, 1999), and taking children out of

school to work (Jacoby & Skoufias, 1997). However, it may be the case that community risk sharing and other informal arrangements become less effective in response to large downside shocks (Morduch, 1999).

Vulnerability is a concept pertaining to the likelihood of a decline in well-being after a shock occurs and how well household responses to insure their consumption against an adverse economic shock. Therefore, better understanding of vulnerability and formal and informal insurance arrangements provides guidance for policy makers concerned with strengthening social protection programs to eradicate poverty and improve welfare for all groups in society. In spite of growing interest in economic vulnerability in developing countries in recent years, there is probably less consensus on methodological approaches for measuring vulnerability. For example, if a household is more likely to end up with consumption lower than the poverty line, so it is more vulnerable to poverty. On the other hand, a household experiencing larger than average declines in consumption is considered as vulnerability to risk exposure.[1] The analysis carried in this paper follows the latter approach since it enables one to assess the impacts of observed shocks on a decline in household well-being, without specifying probabilities. Little is known about who is vulnerable, or how vulnerable households cope with adverse shocks in developing countries. To conduct rigorous analyses, the availability of panel data is required.

Thailand is an interesting case for such analysis because of faltering economic growth and the availability of panel data at the household level that span recent economic shocks. Specifically, the panel SES data were initially collected by National Statistical Office (NSO) of Thailand in 2005.The Thai economy has expanded continuously after the 1997 Asian financial crisis; however, it has slowly expanded in recent years. Table 1 provides selected economic indicators for Thailand during the period 2007-2013. As can be seen, the annual GDP growth rate decelerated from 8.0 percent to 2.7 percent during 2007-2013, with a large variation ranging from -0.5 to 11.9 percent. Meanwhile, poverty incidence, as measured by per capita household expendi-ture, has been decreased over the same period, from 20 percent in 2007 to

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[1] See Hoddinott and Quisumbing (2008) for comprehensive details.

about 11 percent in 2013. Despite economic fluctuation, price stability and low unemployment were observed, which reflects that the government has implemented sound macroeconomic policies. During the past decade, the Thai economy has been experienced substantial domestic risks as well as the contagion effects of global turbulence. Examples of such events include the 2006 Coup detat, the 2008 subprime financial crisis, the 2009 political unrest, the 2011 severe flood, and economic slowdown of major trading partners such as China, Japan, and United States.

Table 1. Selected Economic Indicators for Thailand, 2007-2013

Indicator	2007	2008	2009	2010	2011	2012	2013
GDP (billion baht)	9,076	9,707	9,659	10,808	11,307	12,357	12,921
GDP growth (%)	8.0	6.9	-0.5	11.9	0.8	7.2	2.7
GDP per capita (baht)	135,312	143,520	142,200	157,088	166,644	177,333	181,195
Unemployment (%)	1.38	1.38	1.49	1.04	0.68	0.66	0.72
Inflation (%)	2.30	5.50	-0.90	3.30	3.80	3.00	2.20
Exchange rate (baht/U.S.$)	34.56	33.36	34.34	31.73	30.49	31.08	30.73
Poverty ratio (%)	20.0	20.4	17.9	16.4	13.2	12.6	10.9

Source: Bank of Thailand and National Statistical Office of Thailand, 2016

This paper applies an empirical vulnerability model derived from the theory of risk-sharing to examine the extent of consumption insurance and assess the major determinants of household vulnerability explaining why some groups are less resilient recovery from economic shocks. The household-level panel data are constructed from 2005, 2007, 2010 and 2012 rounds of Socioeconomic Survey (SES) of Thailand. The main aim in the paper is to systematically investigate why some groups are less resilient recovery from economic shocks and assess main household's risk-coping strategies including savings, borrowing, and remittances, together with formal safety nets whether reduce vulnerability. The empirical findings shed some light on the effectiveness of household's risk-coping strategies and public safety net assistance in response to economic shocks. This paper also contributes to help design effective formal safety nets to protect the most vulnerable groups.

The rest of the paper is organized as follows. Section 2 summarizes the theoretical framework that has been empirically implemented in the literature on risk and insurance. Section 3 provides the empirical approach, model specifications, and hypothesis testing regarding consumption insurance and household vulnerability. Section 4 describes the data set and summary statistics of the sample. Section 5 presents the estimation results and checks the robustness of the results. Section 6 concludes the paper and discusses some policy implications.

2. Theoretical Framework

The full risk sharing model is developed on the ide.a that a group of risk-averse households can use state-contingent transfers to share all risks in the Arrow-Debreu complete market structure (Wilson, 1968; Cochrance, 1991; Mace, 1991; Townsend, 1994). The model predicts that changes in individual consumption are solely dependent of changes in the average community consumption since all idiosyncratic shocks are fully diversified within the group. Following Mace (1991), the Pareto-optimal allocation is a solution to the social planner's problem of maximizing the weighted sum of the expected lifetime utilities of the individual household in a community, subject to the aggregate resource constraint as follows:

$$\text{Max} \sum_{h=1}^{N} \omega_i \sum_{t=0}^{\infty} \beta^t \sum_{s=1}^{S} \pi_{st} u\left(c_{hst}, b_{hst}\right) \tag{1}$$

$$\text{s.t.} \quad \sum_{h=1}^{N} c_{hst} = \sum_{h=1}^{N} y_{hst} \tag{2}$$

where π_{st} represents the probability of state s at date t; c_{hst} is household consumption; b_{hst} is an individual preference shock; y_{hst} is household income; ω_h is the planner's weights for household i satisfying $0 < \omega_h < 1$ and $\sum \omega_h = 1$; and β is the discount factor, $0 < \beta < 1$. The first-order condition for Equation (1) subject to Equation (2) with the associated Lagrange multiplier for household h, μ_t, in state s is:

$$\omega_h \beta^t \pi_t u'\left(c_{ht}, b_{ht}\right) = \mu_t \tag{3}$$

Assume that preferences are power utility satisfying the constant-relative-risk-aversion (CRRA).[2] The specific form of the utility function is

$$u\left(c_{ht}, b_{ht}\right) = -\frac{1}{\sigma} c_{ht}{}^{\sigma} e^{\sigma b_{ht}}, \ \sigma < 1 \tag{4}$$

The First-order condition after logarithmic transformation and first-differencing over time yields:

$$\Delta log\left(c_{ht}\right) = \Delta log\left(c_t^a\right) + \frac{\sigma}{1-\sigma}\left[\Delta b_{ht} - \Delta b_t^a\right] \tag{5}$$

where $c_t^a = exp\left\{\frac{1}{N}\sum_{i=1}^{N} log\left(c_{ht}\right)\right\}$ and $b_t^a = \frac{1}{N}\sum_{i=1}^{N} b_{ht}$.

The main implication of Equation (5) is that individual consumption growth is positively determined by the aggregate consumption growth. Specifically, if consumption is fully protected across households within the group at a given time, idiosyncratic shocks such as illness or job loss of a household member should have no effect on household consumption, once the aggregate consumption has been taken into account. This provides empirically an implementable test for consumption insurance across socioeconomic groups. The realized extent of consumption insurance can be compared to the full risk sharing model. Empirical results in developing and developed countries are less supportive of full risk-sharing. It is widely observed that an individual household consumption growth is both positively correlated with the growth rates of average income within villages and individual income (Alderman & Paxson, 1994). Hoddinott and Quisumbing (2008) extend this framework to the empirical vulnerability model and examine how well households are able to cushion the impacts of shock.

3. Empirical Approach

The central theme of the paper is to examine the effects of economic shocks on whether certain groups of households are more susceptible to uninsured risk. Three specific questions are addressed: (1) How well Thai

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[2] As noted by Alderman and Paxson (1994), the CRRA utility function is attractive for the purpose of estimation since it often fits with the household-level panel data.

households are able to smooth their consumption pooled between households within communities against income shock? (2) What are the factors explaining why some households are more vulnerable? and (3) How effective are various household strategies adopted to protect them from a large decline in their consumption? The empirical vulnerability model implemented in this paper will be discussed in more detail in the following subsections.

3.1 Consumption and Household Income

To investigate the extent to which households are capable to smooth their consumption against income risk, one can use the panel data to estimate the following regression commonly applied in the empirical studies (Cochrance, 1991; Ravallion & Chaudhuri, 1997; Deaton, 1997; Jalan & Ravillion, 1999; Skoufias, 2003; Hoddinott & Quisumbing, 2008; Gerry & Li, 2010):

$$\Delta \ln c_{htv} = \sum_{tv} \delta_{tv} \left(D_{tv} \right) + \beta \Delta \ln y_{htv} + \delta X_{htv} + \Delta \varepsilon_{htv} \tag{6}$$

where $\Delta \ln c_{htv}$ is the change in log consumption per capita of household h, in community v, in period t and $\Delta \ln y_{htv}$ is the change in log household income per capita. The term D_{tv} is a set of dummy variables identifying Tambon (sub-district), survey round, and their interaction to control for the covariant shocks within a given community and survey round. X_{htv} is a vector of household and household head characteristics. Lastly, ε_{htv} is an unobserved household-specific error term. In this specification, the full risk sharing model predicts that changes in household income will not result in consumption variation after controlling covariant shocks or the coefficient of income growth should not differ from zero ($\beta = 0$). Hence, the parameter β represents an estimate of the extent of consumption insurance expecting evidence of partial risk-sharing within communities that $0 < \beta < 1$.

Equation (6) is estimated separately for three subgroups of the population: urban, rural, and the whole Kingdom. Three main consumption expenditure categories are examined: food expenditure, non-food expenditure, and total expenditure. The differences in the income coefficients for urban and rural areas may reflect the role of formal and informal insurance mechanisms to protect household consumption from idiosyncratic shocks. Furthermore, food consumption is possibly expected to be better insured than non-food and

total consumption since households may alter their consumption patterns by spending less on non-food or directly produce consumption goods to smooth food consumption during an economic shock (Glewwe & Hall, 1998; Skoufias, 2003; Skoufias & Quisumbing, 2005).

3.2 Observed Household Characteristics and Vulnerability

The next procedure is to investigate the relationship between detailed household characteristics including idiosyncratic shocks experienced by the household and vulnerability, as measured by the household consumption growth. The specification in Equation (6) implies that all shocks faced by the household influence the consumption growth through the income shock. Following Dercon and Krishnan (2000) strategy, specific shocks can be used as explanatory variables instead of household income. Additionally, shocks that might have impacted on household consumption can be potentially used as an instrumental variable for household income commonly subject to measurement error (Skoufias & Quisumbing, 2005). Thus, the following regression is estimated:

$$\Delta \ln c_{htv} = \sum_{tv} \delta_{tv} \left(D_{tv} \right) + \sum_{i} \beta_i S(i)_{htv} + \delta X_{htv} + \Delta \varepsilon_{htv} \qquad (7)$$

where $S(i)_{htv}$ denotes a set of dummy variables indicating specific idiosyncratic health and labor-market shocks. Notice that change in log household income $\Delta \ln y_{htv}$ in Equation (6) is supplanted by idiosyncratic risks $S(i)_{htv}$ for this specification. More specifically, three dummy variables are created representing observed idiosyncratic risks including household head being admitted in hospital, involuntarily unemployed, and retired.[3] In addition, household vulnerability can be explained by some household and household head characteristics such as education, household size, and household composition which are represented by X_{htv}.

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[3] Although retirement is predictable or self-imposed that the mandatory retirement age is 60 for formal workers in Thailand, some people might have a difficult transition period since they are not well prepared for post-retirement income and long-term care expenses, especially for those not covered by a formal pension system. Many households with retired heads are also likely affected by economic shocks such as return on financial assets, unexpected, massive health care expenses, and the rising cost of living. It is probably that those households are more vulnerable. Thus, the analysis in this paper specifies the household head's retirement status as an idiosyncratic risk.

3.3 Assessing Risk-coping Strategies

Coping strategies aim to minimize the negative effect of a shock maintaining household wellbeing. One would expect that household's ability to cope with shocks are likely to vary across households, depending on their resource and the availability of formal and informal risk-sharing arrangements. To examine the effect of existing household's risk-coping strategies and formal safety nets on vulnerability, the regression is extended to include both the idiosyncratic risks and coping responses expressed as explanatory variables expressed in Equation (8). Notice that the regression controls for community, survey round, and observed household and household head characteristics as follows:

$$\Delta \ln c_{htv} = \sum_{tv} \delta_{tv} \left(D_{tv} \right) + \sum_{i} \beta_i S(i)_{htv} + \delta X_{htv} + \gamma Z_{htv} + \Delta \varepsilon_{htv} \qquad (8)$$

where Z_{htv} is a vector specifying household's coping responses.

It is worth to note that coping strategies are not exogenous, usually depending on the characteristics of households and household heads. Using the first difference specification in Equation (8) will remove the household fixed effects and potentially reduce bias in the estimates. The coefficients γ can be interpreted as changes in the coefficients of the specific coping strategy between periods (see Glewwe & Hall, 1998). Specifically, if the household responses or government transfers indeed reduce vulnerability, the estimates should be significantly positive. A final issue is that the role of intertemporal strategies (through saving and borrowing behavior) might differ from that of risk-sharing across households (mainly from private transfers and remittances from household members) at any one point in time in terms of smoothing consumption after a shock occurs. To summarize, the empirical approach developed in this section allow one to test hypotheses pertaining to vulnerability and household's coping strategies in response to economic shocks using household panel data.

4. Data and Summary Statistics

The data used in this paper are from the Thai Panel Socioeconomic (SES) Survey for the years 2005, 2007, 2010 and 2012, obtained from Thailand's National Statistical Office. The sample is stratified into regions and

administrative areas, the latter of which correspond to urban and rural areas. The Panel SES survey contains detailed information on income, expenditures, and demographic information at the household level, as well as, the individual level data including age, gender, level of education, occupation, and their employment status. Income is classified by sources of income, which consist of wages and salary, profits from farm and non-farm businesses, and non-labor income. Detailed expenditure categories include food and beverages, non-food consumption such as housing, transportation, rent and utilities, education, and health. The data also provide information on household assets, debt, debt repayment, and transfers. The number of samples varies from 5,930 to 6,133 households for each survey round. In conducting the empirical analysis in this paper, the sample is limited to households that present for all four consecutive survey rounds with positive income and expenditures and have the same household heads throughout the four waves of data. These restrictions reduce the sample to 4,190 households, out of which 1,409 (34 percent) were urban and 2,781 (66 percent) rural.

Table 2 presents the average monthly household income and expenditure in each round of the survey for the entire household sample and for urban and rural households separately. All income and expenditures are adjusted to 2012 prices using the regional consumer price index from Thailand's Bureau of Trade and Economic Indices.[4] Non-food expenditure appears to be the major share of expenditure for Thai households, accounting for nearly 60 percent. Moreover, the annual growth rate of household income (3.2%) was slightly higher than that of household expenditure (2.4%) during 2005-2012. It should be noted that household expenditure has become noticeably less volatile than income, especially for food consumption expenditure. These figures suggest that there may be risk-sharing arrangements (presumably informal) across households to insulate their food consumption from income shocks.

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[4] The provincial price indices are available in Thailand reflecting the average prices computed from urban and rural price indices, but the data are not reported separately for urban and rural areas. As noted by Levinsohn, Berry, and Friedman (2003), the provincial price changes may not be a good proxy in remote rural areas since the inflation rates in rural areas are usually higher than in urban areas. Thus, this paper employs the regional price indices, which account for the differences between urban and rural areas.

Table 2. Average Monthly Household Income and Expenditure, 2005-2012

Year	Income			Food cons.			Non-food cons.			Total cons.		
	Whole	Urban	Rural	Whole	Urban	Rural	Whole	Urban	Rural	Whole	Urban	Rural
2005	24,319	37,474	17,654	5,687	7,176	4,933	6,775	11,137	4,565	12,413	18,145	9,508
2007	24,038	36,465	17,782	6,085	8,410	4,915	7,523	11,938	5,308	13,686	20,325	10,344
2010	25,525	37,073	19,817	5,793	7,966	4,719	8,809	12,593	6,939	14,529	20,430	11,612
2012	29,715	34,146	27,470	5,837	7,138	5,179	8,789	11,479	7,427	14,534	18,503	12,523
Mean	25,899	36,286	20,677	5,851	7,671	4,936	7,975	11,783	6,061	13,790	19,345	10,998

Note: All income and expenditure values are in constant (2012) baht.

In addition, the cross-tabulation in Table 2 reveals the marked differences in income and spending patterns between urban and rural households. For example, the average household monthly income for urban households is 36,286 baht, about 43 percent higher than the average for rural households, 20,677 baht. The average non-food expenditure is 11,783 baht for urban areas, while only 6,061 baht for rural areas (49 percent lower than in urban areas). The average food expenditure in rural areas is approximately 36 percent lower than in urban areas. There is a strong possibility that rural households, most engaging in farm activities, may adopt subsistence farming as their income declines. This is not feasible for urban households. However, urban-rural differences in income and expenditure have continuously decreased for the period 2005 to 2012. These figures are consistent with Kilenthong (2016), reporting that consumption inequality has been decreasing and the poor has greatly benefited from Thailand's pro-poor growth policy over the past two decades.

The descriptive statistics of key variables used in the regression analysis are shown in Table 3. Seven dummy variables were included for the household head's occupation (agriculture, manufacture, self-employed, public sector, private sector, laborer, and not working). Roughly one third of household heads are in agricultural sector, and 17 percent are in self-employed businesses, suggesting that those households are more likely to face high income volatility than those with heads working as salaried employees in public or private sector. Almost half of the sampled households have at least one member of the household engaged in farm activities. It indicates that Thai agricultural households do not rely on farm income alone, but they also generate income from non-farm activities. Such diversified income sources may enhance household's adaptive capacity to cope with negative shocks.

The average agricultural land holding per household is 21 rai (about 3.4 hectares), of which approximately 77 percent are owned by the household. In terms of residential ownership, it indicates that around 85 percent of the sampled households live in their owned houses in 2005. Estate ownership may typically reflect the extent of self-insurance that increases the ability of a household to properly manage risk, thereby reducing vulnerability. The demographic information of the sample with respect to household size

Table 3. Descriptive Statistics for Regression Analysis

Variable	2005		2007		2010		2012	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Log of monthly household income per capita	8.302	1.207	8.303	1.150	8.382	1.156	8.596	1.105
Log of monthly food expenditure per capita	7.214	0.708	7.251	0.708	7.194	0.732	7.230	0.959
Log of monthly non-food expenditure per capita	7.040	1.044	7.155	1.057	7.289	1.088	7.316	1.258
Log of monthly total expenditure per capita	7.887	0.776	7.966	0.800	8.018	0.812	8.052	1.009
Household size	3.681	1.721	3.746	1.761	3.705	1.778	3.647	1.795
Head's age	50.627	13.044	52.617	13.029	55.127	12.911	57.923	12.876
Head's years of education	7.677	3.362	7.223	3.702	7.373	3.695	7.624	3.501
Married head (0/1)	0.744	0.437	0.743	0.437	0.738	0.440	0.729	0.444
Single head (0/1)	0.056	0.230	0.053	0.225	0.048	0.215	0.046	0.210
Unemployed head (0/1)	0.080	0.272	0.066	0.248	0.065	0.246	0.042	0.202
Retired head (0/1)	0.107	0.310	0.126	0.332	0.162	0.368	0.200	0.400
Head's admitted in hospital (0/1)	0.017	0.131	0.021	0.143	0.031	0.173	0.036	0.185
Female head (0/1)	0.295	0.456	0.297	0.457	0.296	0.457	0.296	0.457
Head's occupation choice								
Agriculture (0/1)	0.323	0.468	0.315	0.465	0.330	0.470	0.322	0.467
Manufacture (0/1)	0.044	0.205	0.027	0.162	0.016	0.124	0.014	0.116
Merchandise and self-employed business (0/1)	0.174	0.379	0.188	0.391	0.173	0.378	0.167	0.373
Government or state enterprise employee (0/1)	0.093	0.290	0.095	0.293	0.088	0.283	0.078	0.268
Company or business employee (0/1)	0.130	0.337	0.142	0.349	0.142	0.349	0.128	0.334
General worker and laborer (0/1)	0.079	0.270	0.061	0.239	0.035	0.183	0.032	0.175

Table 3. Descriptive Statistics for Regression Analysis (cont.)

Variable	2005		2007		2010		2012	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Agricultural household (0/1)	0.489	0.500	0.495	0.500	0.497	0.500	0.474	0.499
Total agricultural land (rai)	18.481	35.136	23.603	62.506	21.285	56.977	20.813	50.918
Owned agricultural land (rai)	15.393	33.459	18.124	84.045	15.782	22.208	15.591	22.279
Own a house in 2005 (0/1)	0.850	0.357	0.033	0.088	0.028	0.079	0.023	0.072
The ratio of males between 0 and 5 years	0.036	0.092	0.052	0.111	0.045	0.102	0.040	0.101
The ratio of males between 6 and 12 years	0.056	0.116	0.050	0.110	0.052	0.113	0.050	0.113
The ratio of males between 13 and 19 years	0.048	0.112						
The ratio of males between 20 and 59 years	0.265	0.208	0.262	0.209	0.258	0.211	0.259	0.223
The ratio of males over 60 years	0.062	0.155	0.072	0.164	0.089	0.178	0.111	0.198
The ratio of females between 0 and 5 years	0.031	0.085	0.031	0.085	0.026	0.076	0.019	0.065
The ratio of females between 6 and 12 years	0.052	0.112	0.048	0.108	0.042	0.099	0.039	0.098
The ratio of females between 13 and 19 years	0.049	0.112	0.048	0.110	0.047	0.106	0.047	0.110
The ratio of females between 20 and 59 years	0.314	0.212	0.302	0.209	0.298	0.213	0.288	0.223
The ratio of females over 60 years	0.087	0.190	0.100	0.203	0.114	0.211	0.138	0.229
Household members aged under 12 years	0.778	0.909	0.758	0.921	0.657	0.863	0.569	0.837
Household members aged over 60 years	0.445	0.688	0.514	0.724	0.603	0.763	0.726	0.824
Proportion of poor households	0.186	0.389	0.214	0.410	0.202	0.401	0.183	0.387

Note: A rai, a unit of area, is equal to 0.16 hectares. All income and expenditure values are in constant (2012) baht

and household members by gender and age groups is also provided in Table 3. The average household size in the sample is 3.7 members. It reveals that the household proportion of children age under 12 decreases by 5.4 percentage points, but the household proportion of elderly aged 60 years and over increases from 14.9 percent in 2005 to 24.9 percent in 2012. It is likely attributable to the continued fertility decline and population aging in Thailand. Moreover, around 70 percent of the sample is male headed households; most of the heads are shown as married (74 percent).

In terms of the idiosyncratic shock variables, only few households (3 percent) reports that their heads of household were admitted to the hospital over the past 12 months. The proportion of retired heads has increased almost twice from 11 percent to 20 percent during the period of 2005-2012. On the other hand, the proportion of unemployed heads has slightly declined from 8 percent to 4 percent over the same period. Hence, one would hypothesize that these idiosyncratic health and labor-market shocks may lead to lowering household's resilience when a shock occurs. Finally, the proportions of households with incomes lower than the official expenditure poverty line obtained from National Statistical Office of Thailand fall between 18 and 21 percent during 2005-2012.

5. Results

5.1 Consumption Insurance

The first set of results considers the extent of consumption insurance in Thailand using the above empirical strategies. Table 4 presents the Ordinary least squares (OLS) regression coefficients of the changes in household income on the changes in household consumption. A set of dummy variables identifying community and survey rounds is added to control for covariant risks for the households within any given community and survey round, as in Equation (6). The OLS regression with household fixed effects is also estimated to remove time-invariant characteristics across households in any given year in order to eliminate the effects of measurement errors. The two specifications are estimated separately for the whole Kingdom and then divided into urban and rural areas. The dependent variables are changes in expenditures per capita on total consumption, food, and non-food, respectively. Additional explanatory

variables include household size, age and age squared of household head, work and marital status of household head, as specified in the work by Skoufias (2003).

Table 4. The Impact of Changes in per capita Household Income on Consumption

Regional areas	N	Total cons.		Food cons		Non-food cons.	
		Pooled	Fixed Effect	Pooled	Fixed Effect	Pooled	Fixed Effect
Whole Kingdom	4,190	0.107***	0.106***	0.075***	0.071***	0.125***	0.128***
		(0.006)	(0.008)	(0.007)	(0.008)	(0.009)	(0.010)
Urban	1,409	0.172***	0.192***	0.113***	0.098***	0.199***	0.239***
		(0.013)	(0.017)	(0.014)	(0.020)	(0.018)	(0.023)
Rural	2,781	0.087***	0.081***	0.064***	0.058***	0.105***	0.098***
		(0.008)	(0.009)	(0.008)	(0.010)	(0.010)	(0.012)

Notes: *** Significant at the 0.01 level. The robust standard errors clustered at the sub-district (tambon) level are shown in parentheses.

The results provide evidence for partial consumption insurance within communities in Thailand. Although the full risk-sharing is overwhelmingly rejected for all specifications and subsamples, the results indicate that the growth rate of household consumption is less dependent of the growth rate of individual household income. More specifically, the coefficients of household income are all statistically different from zero at the 1% level but the magnitudes are quite low ranging from 0.06 to 0.24. The empirical results seem robust to model specification since fixed effect estimates are quite close to the pooled OLS estimates of the panel. Overall, the coefficients of per capita income changes by including household fixed effects in regression are slightly lower than those obtained from the pooled OLS except for total and non-food consumption in urban areas.

It is worthy to note that covariant shocks proxied by community and survey rounds are also significant determinants of household consumption

changes (results not reported here). Moreover, it appears that consumption is better insured in rural areas than urban areas, consistent with Townsend (1995) and Shawong (2014) using Thai household data.[5] However, the results are different from evidence in other developing countries (Skoufias, 2003; Skoufias & Quisumbing, 2005). These estimates may suggest the limited role of formal financial institutions to facilitate risk-sharing arrangements at least for urban households — presumably better access to credit markets. Further scrutiny shows that food consumption is better insured from idiosyncratic shocks than non-food consumption. There seem to be two possibilities in explaining this difference in the income coefficients. The first may be due to household preferences that food is much more of a necessity compared to other expenditure categories (Skoufias & Quisumbing, 2005). The second is that existing formal and informal insurance arrangements are in favor of protecting food consumption from income shocks.

5.2 Household Vulnerability

The second set of results investigates the determinants of household vulnerability and their adaptive capacity to cope with shocks. The dependent variable is the growth rate of per capita monthly household consumption. The explanatory variables in regressions consist of characteristics of household, household head, communities, and geographic variables such as age, education level, marital status and occupation, household composition, residential status, urban/rural areas, and the set of dummy variables indicating communities and survey rounds. Three dummy variables are created to quantify the impacts of idiosyncratic shocks at the household level, consisting of household head being admitted in hospital, unemployed, and retired.

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[5] It should be noted that the authors use different data sets in Thailand. Townsend (1995) uses cross-sectional nationwide Socioeconomic Surveys (SES) during 1975-1990, while Shawong (2014) uses panel data in six provinces from four regions during 2005-2009.

The regression results of Equation (7) are presented in Table 5.[6] Observable household and household' head characteristics are the main factors in explaining differences in the consumption growth across households. To begin with, household size and household composition variables have a significant and strong negative impact on consumption growth. Specifically, households with children and elderly members lead to the significant decline of consumption growth about 6-9 percent, significant at least the 5% level. On the other hand, households living in an owned house are more resilient, recording an average growth rate of consumption 6 percent higher than the base category (significant at the 10% level). This suggests that household assets that can be used as collateral would help households to smooth consumption when experiencing economic hardships. Moreover, the head's years of education has a non-linear positive impact on consumption growth, consistent with the literature (Glewwe & Hall, 1998; Maitra, 2003; Gerry & Li, 2010).[7] This empirical evidence supports the Schultz's (1975) hypothesis that households with better educated heads adjust more successfully to dealing with disequilibrium associated with shocks. Consumption growth slightly falls with the age and age squared of the head, significant at the 1% level. In addition, female headed households are more vulnerable, with an average consumption growth 5 percent lower than male headed households (significant at the 10% level). There are no systematic differences in consumption growth across urban and rural areas. However, it is surprising that households living in the Northern and Southern region have experienced higher consumption growth than those living in Bangkok and vicinity (the base category). It can

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[6] Note that household income change variable is excluded from the analyses in order that one can evaluate the impacts of these idiosyncratic shocks and their observable characteristics on household vulnerability directly. This specification already removes the household fixed effects; therefore, the OLS regression results of Equation (7) provide insights into a vulnerability assessment which would appropriate for policy purposes.

[7] I supplant head's years of education with years of education of household member attaining the highest education level for the estimation of a reduced-form regression of household vulnerability, as in Equation (7). The estimated coefficient is almost zero and statistically insignificant, which may imply that the head of household is likely to be the main decision-maker regarding the allocation of household resources in Thailand.

be implied that non-poor households are not necessarily less susceptible than poor households.

Almost half the sampled households have one or more member working in the agricultural sector (two family members on average). The estimation results, not very surprisingly, indicate that agricultural households are much more vulnerable as economic circumstances change. More specifically, the growth rate of consumption falls about 17 percent compared to non-agricultural households, which is statistically significant at the1% level. Thai farmers, as in most developing countries, are often afflicted by numerous risks such as weather condition, market price fluctuations, and the incidence of natural disasters. In addition, they tend to choose a safer, but less profitable technologies rather than riskier, but more profitable as informal self-insurance strategies, thereby being more vulnerable. However, the number of household members engaged in farm activities and the amount of owned agricultural land are not major determinant of household vulnerability.[8] Occupations of the head of the household also contribute to explaining household vulnerability. The regression results reveal that households with self-employed heads are one of the most vulnerable groups, reporting a large decline in the consumption growth about 17 percent which is statistically significant at the 1% level. However, it seems surprising that households with head working as public and private sector workers also have a negative and significant effect on consumption growth. For example, households headed by public sector employees have also experienced a substantial decline in the consumption growth 12 percent (significant at the 5% level).

Turning to assessing quantitatively the impact of idiosyncratic shocks on household vulnerability, households whose head is retired or unemployed are more vulnerable since they have experienced a considerable decline in consumption growth, which is statistically significant at least the 10% level. More specifically, the head's unemployment has a slightly stronger negative impact on consumption growth than the head's retirement, about 2 percentage points. Possibly the most intriguing finding shows that idiosyncratic health

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[8] When the amount of total agricultural land (owned and rented) is used in regression instead of owned agricultural land, the estimate appears to be unchanged and not statistically significant.

Table 5. Determinants of Change in per capita Household Consumption

Variables	Change in log cons.	
	Coeff.	Robust SE
Own a house (0/1)	0.059*	(0.032)
Head of the household		
Age	-0.021***	(0.006)
Age squared	0.0002***	(0.0001)
Married (0/1)	-0.220***	(0.048)
Widowed (0/1)	-0.149***	(0.052)
Divorced (0/1)	-0.080	(0.082)
Separated (0/1)	-0.030	(0.081)
Unemployed (0/1)	-0.096***	(0.034)
Retired (0/1)	-0.068*	(0.039)
Admitted in hospital (0/1)	-0.004	(0.054)
Female (0/1)	-0.052*	(0.027)
Years of education	0.046***	(0.017)
Years of education squared	-0.004***	(0.001)
Head's occupation		
Agriculture (0/1)	0.019	(0.041)
Manufacture (0/1)	-0.081	(0.083)
Merchandise and self-employed business (0/1)	-0.161***	(0.039)
Government or state enterprise employee (0/1)	-0.130**	(0.051)
Company or business employee (0/1)	-0.073*	(0.043)
General worker and laborer (0/1)	-0.040	(0.059)
Household size	-0.108***	(0.006)
Agricultural households (0/1)	-0.181***	(0.045)
Number of agricultural workers	0.006	(0.017)
Owned agricultural land	0.0002	(0.0002)
Number of children (age not over 12)	-0.100***	(0.016)
Number of elderly (age 60 and over)	-0.057**	(0.023)
Non-municipal (0/1)	-0.029	(0.029)
Central (0/1)	0.151	(0.275)
North (0/1)	0.505*	(0.284)
Northeast (0/1)	0.303	(0.276)
South (0/1)	0.534**	(0.273)
Intercept	0.854***	(0.276)
R-squared	0.20	
F-statistic	27.35	
Sample size	4,190	

Note: * Significant at the 0.1 level; ** Significant at the 0.05 level, *** Significant at the 0.01 level. The robust standard errors clustered at the sub-district (tambon) level are shown in parentheses. Additional explanatory variables included but not reported are the set of dummy variables identifying community and survey rounds to control covariant risks at the community level.

shock captured by the head of household being admitted to the hospital over the past 12 months, has no effect on the household consumption growth.[9] The potentially important factor contributing to this observation is perhaps successful expansion of the Universal Health-care Coverage Scheme, initially launched in 2001, recently covering 76 percent of Thailand's population not covered by other health insurance schemes. Thus, nearly all Thai citizens currently have access to health care services without the fear of catastrophic health care costs (International Labour Office, 2016). This finding is contrast with Gertler and Gruber (2002) conducted in Indonesia which yields that the household consumption growth is negatively associated with the severity of illness, as measured by the Activities of Daily Living index (ADLs).

5.3 The Role of Coping Strategies and Formal Safety Nets

In practice, household's risk responses to economic shocks are varied, depending on the sources of risk and available risk-sharing mechanisms. Following the terminology of Alderman and Paxson (1994), risk coping strategies consist of (i) savings behavior to smooth consumption intertemporally and (ii) group-based risk sharing mechanisms to insulate the effect of income risk across households at a point in time. In effect, households tend to combine multiple coping strategies to protect their consumption against income shocks across households and over time. Three specific household's resilient strategies considered in this paper based on recent panel data studies include (i) household assets (savings behavior), (ii) private transfers (mainly domestic remittances), and (iii) various government transfers (in-kind included). Asset strategies is self-insurance through savings and debt accomplished by involving formal or informal credit and insurance transactions, in which households are likely to save more in good times that allows more spending or even net borrowing in bad times to smooth their consumption. One would expect that changes in saving or debt lead to reducing vulnerability. Private transfers are also considered as one of informal insurance arrangements in developing countries

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[9] For robustness check, the same regression analysis is limited to poor households that their income are less than or equal to the expenditure poverty line at least one survey round. The sample size decreases from 4,190 to 1,820 households. The coefficient of interest is almost the same and not statistically significant.

where credit markets are highly imperfect. Transfers received are expected to reduce household vulnerability to uninsured risk. For example, about 40 percent of Thai households surveyed in 2012 received remittances. Finally, government transfers consist of public pension, unemployment compensation, and other government assistance programs typically targeting to the poor. It is worthy to mention that almost 70 percent of sampled households benefit from government assistance, while only 7 percent are covered by public pension and unemployment compensation.

An additional set of regression analyses is performed to evaluate the effect of household's coping strategies and their combination on household vulnerability, as expressed in Equation (8). The dependent variable is the log of household consumption per capita change. Six explanatory variables are added to the model representing household's coping responses and formal safety nets. The variables are in logarithmic form for those with positive values; it is set to be zero otherwise. Table 6 summarizes the regression coefficients of coping strategies and public safety nets on the household consumption growth. The first regression examines whether asset strategies via changes in savings and debt tend to reduce vulnerability. The results show that both household savings and debt have a significant positive impact on consumption growth; however, the magnitudes are quite small, reporting an increase in consumption of 0.4 and 0.7 percent (significant at least the 5% level). However, one possible interpretation is that observed savings, loans, and income may suffer from measurement errors, thereby attenuating their impacts on vulnerability. The second regression in Table 6 provides strong evidence that private transfer — typically major informal insurance arrangement for rural households in Thailand (see Paulson (2000)) — substantially reduces vulnerability. More specifically, the magnitude of private transfers (1.4 percent) is much larger than those of savings and debt, which the differences in estimated coefficients are statistically significant at the 5% level. This finding underlines the role of informal group-based mechanisms in Thailand providing state contingent transfers between migrants and their households of origin in order to cushion the impact of income shocks.

Table 6. The Impact of Coping Responses and Government Transfers on Consumption

Variables	Household assets		Transfers received		Safety net assistance	
	Coeff.	Robust S.E.	Coeff.	Robust S.E.	Coeff.	Robust S.E.
Change in household savings	0.007***	(0.002)				
Change in household debt	0.004**	(0.002)				
Private transfers received			0.014**	(0.003)		
Unemployment compensation					0.018*	(0.009)
Public pension					-0.009	(0.007)
Government transfers received					0.021***	(0.003)
R-squared	0.20		0.20		0.20	
F-statistic	26.30		27.53		26.47	
Sample size	4,190		4,190		4,190	

Note: All monetary variables are adjusted to the value of year 2012 using consumer price index. * Significant at the 0.1 level; ** Significant at the 0.05 level, *** Significant at the 0.01 level. The robust standard errors clustered at the sub-district (tambon) level are shown in parentheses. The models include all explanatory variables shown in Table 5.

Household consumption growth varies across types of government transfers. The amount of public pension received has, on the whole, no effect on consumption growth. The lack of statistical significance may be due to the fact that only few households benefit from such programs. Moreover, such benefits can be considered as household's anticipated income that has less explanatory power for their consumption growth based on the prediction of permanent income hypothesis. However, the results highlight the importance of government assistance, in which initially aimed to transfer income to the poor and help them generate income, do simultaneously reduce vulnerability. On average, it increases the household consumption growth by 2.1 percent, statistically significant at the 1% level. Notice that households receiving unemployment compensation are also less vulnerable; it is positively associated with the consumption growth, about 1.8 percent (significant at the 10% level). More importantly, the effectiveness of public safety net programs appears to be greater in reducing vulnerability than household risk-coping strategies.

5.4 Household Composition Heterogeneity and Robustness Checks

To check the robustness of the results, the regression analyses are performed supplanting the total consumption growth with food and non-food consumption growths as the dependent variables in assessing household vulnerability. The estimation results (not reported here) are consistent with those shown in Table 5. For example, the head's education significantly increases food and non-food consumption growth by 3.1 and 6.8 percent, respectively. The estimates of household composition variables such as household size, number of children, and number of elderly are almost the same as in Table 5. In contrast to total and non-food consumption, households with their heads admitted as inpatient experienced food consumption falls 8.9 percent, significant at the10% level. It is probable that those households may adjust spending patterns by substituting cheaper food or engaging subsistence farming in response to health shock.[10]

Furthermore, the analysis is extended to check for the possibility of household composition heterogeneity. The model is estimated replacing the number of children and elderly members with ten additional household age-gender variables, which are males and females separately for the following categories: 0-5 years; 6-12 years; 13-19 years, 20-59 years; and 60 years and over. The base category is females aged 25-59. The regression coefficients represent the effect of household composition on household total consumption growth are given in Table 7. In contrast to the main analysis provided in Table 5, the coefficient of female elderly member is small, negative, and not significant. Additionally, the coefficient of male elderly member turns to be positive appeared to reduce vulnerability. These estimates provide weak evidence that households with many elderly members are more vulnerable to economic shocks.

Households with many children are more vulnerable to economic shocks in this specification; however, the household consumption growth

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[10] This would be also the case for the poor households (1,820 households or 43 percent). When the analysis is limited to this subsample, the estimate shows a decline in food consumption by 14.4 percent or 5.5 percentage points greater than that of the entire sample (significant at the 5% level). However, there is no evidence of total and non-food consumption declines.

becomes less negative for higher age groups. Furthermore, households with female children are more vulnerable than those with male children for all age groups. This result should, however, be treated with some caution because most households with children benefit from the provision of Thailand's basic education for 15 years without charge (3 years for pre-primary, 6 years for primary, and 6 years for secondary).[11] In practice, children enrolled in a school receive a tuition exemption, textbooks, uniform, and other school supplies for the whole academic year. In addition, the government has also provided specific financial assistance targeting children from poor households.

Table 7. The Impact of Household Age-Gender Composition on Consumption

Variables	Coeff.	Robust S.E.
The ratio of males between 0 and 5 years	-0.689***	(0.147)
The ratio of males between 6 and 12 years	-0.251*	(0.135)
The ratio of males between 13 and 19 years	-0.208*	(0.119)
The ratio of males between 20 and 59 years	0.187**	(0.088)
The ratio of males over 60 years	0.202*	(0.115)
The ratio of females between 0 and 5 years	-0.877***	(0.150)
The ratio of females between 6 and 12 years	-0.423***	(0.130)
The ratio of females between 13 and 19 years	-0.214*	(0.111)
The ratio of females over 60 years	-0.021	(0.083)
R-squared	0.20	
F-statistic	23.38	
Sample size	4,190	

Note: * Significant at the 0.1 level; ** Significant at the 0.05 level, *** Significant at the 0.01 level. The robust standard errors clustered at the sub-district (tambon) level are shown in parentheses. The omitted category is females aged 20-59. The models include all explanatory variables shown in Table 5.

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[11] Thailand's basic education was extended from 12 years to 15 years in 2009 by including 3 years of pre-primary education.

In contrast, households with children under the age of five (less likely to benefit from the provision of free basic education) experienced considerable consumption falls about 44 and 58 percentage points more than those with children aged 6-12 and 13-19, respectively. Still another possibility is that secondary school-age children (13 to 19 years), particularly from low-income families, may drop out of school and enter the labor market, yielding much smaller negative coefficients. Overall, the results reveal that households with children aged under 5 years are among the most vulnerable group, statistically significant at the 1% level. The estimates suggest that in addition to implementing free basic education, specific assistance programs in place to subsidize the poor households with infants and small children are recommended.

6. Conclusion

This paper uses panel household data from Thailand collected in 2005, 2007, 2010, and 2012 to investigate the extent of consumption insurance against income shocks and assess household vulnerability. Motivated by recent household panel data studies, an empirical vulnerability model was developed for this study. The results have shown that the full risk-sharing hypothesis is overwhelmingly rejected; however, the effect of household income on their consumption appears to be small, once controlling for covariant shocks. Further investigation indicates that food consumption is better protected from idiosyncratic shocks than non-food and total consumption. Households in rural areas are better insured than those in urban areas. Evidence indicates the significance of informal insurance across Thai households, even far from perfect. This finding suggests a possible improvement for formal financial services that assist households to better manage risk and increase household's adaptive capacity during economic shocks.

The analysis also provides evidence on major determinants of household vulnerability. Households with collateral assets measured by residential ownership are less susceptible to shocks. Better educated household heads reduce vulnerability. Agricultural households appear to be one of the most vulnerable groups. Moreover, larger households and self-employed heads are positively associated with vulnerability. Female headed households are more vulnerable than male headed households. Idiosyncratic shocks in the

labor market (retired and unemployed) lead to increased vulnerability; however, health shock has no impact on a consumption fall. Assessing household vulnerability confirms empirical evidence on partial consumption insurance in Thailand since the idiosyncratic labor-market shock variables still result in a considerable drop in household consumption growth.

It is demonstrated that households are likely to adopt multiple coping strategies to protect their consumption response to observed shocks, including drawing savings, positive borrowing as intertemporal consumption smoothing, and receiving private transfers as informal insurance within a community or extended household. The analysis has also examined whether existing public safety net programs reduce vulnerability. The results show that unemployment compensation and other government assistances lead to lowering vulnerability, except only for public pension. Not only do public safety net programs transfer income to poor households, but also protect them from exposure to uninsured risks.

These findings have policy implications for improving public safety nets to protect the most vulnerable groups from uninsured risk exposure. First, additional subsidies targeting the low-income families with infants or small children should be encouraged. In addition to informal insurance arrangements, increasing access to formal credit and insurance markets may help them better cope with risks. Finally, while basically effective, there remains some scope for improvement in establishing a specific safety net program to assist the unemployed during recessionary period.

Nevertheless, it should be noted that this analysis has been primarily concerned with household vulnerability to uninsured risks. Thus, vulnerable households are not necessarily the poor, as long as their current income is above the poverty threshold. Future research is needed to examine the pattern of risk exposure for certain groups who are more potentially vulnerable to shocks like households with few collateral assets, larger or female-headed households, and engaging in farm activities. Such analyses would provide greater insight into household's resilience to shocks and help design appropriate safety nets enhancing the most vulnerable groups' adaptive capacity during economic shocks.

Acknowledgements

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