

Sasiwimon Warunsiri Paweenawat

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Household economic prudence in Thailand

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ADB Working Paper Series

**HOUSEHOLD ECONOMIC PRUDENCE
IN THAILAND**

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Abstract

The countercyclical pattern of saving in Thailand in the 1990s and 2000s challenged the prediction of permanent income theory and raised questions about household saving behaviors in the country. Using constructed pseudo-panel data sets from the Thai Household Socioeconomic Surveys from 1992 to 2011, this paper estimates the intensity of the precautionary saving motive, measured by the coefficient of relative prudence of households in Thailand. By using a dynamic pseudo-panel approach to address concerns with regard to individual heterogeneity causing bias in estimation, the estimated relative prudence of Thai households is around 2, which shows a low precautionary saving motive among these households compared to other countries. Estimates based on disaggregation by demographic characteristics show that as a result of the government-assistance policy, older cohorts and those who live in the rural areas show lower prudence. However, female heads of households and those with a high education level exhibit high prudence, indicating the high income uncertainty faced by these groups in the economy.

Keywords: precautionary saving, prudence, dynamic pseudo-panel, Thailand

JEL Classification: C23, D14, D12

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1. INTRODUCTION

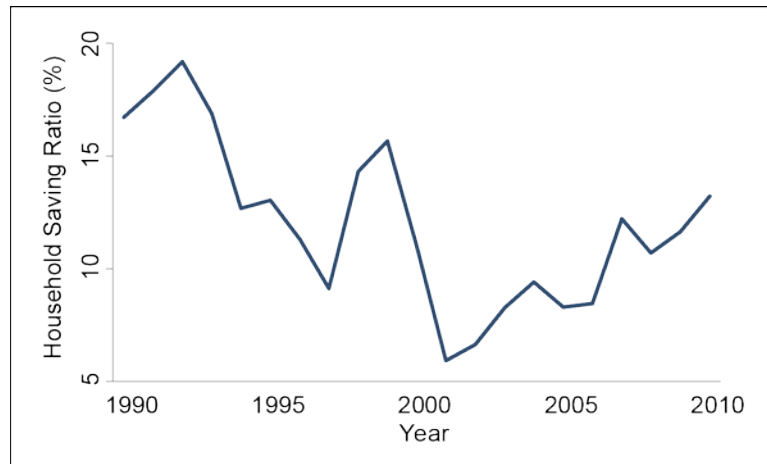
The permanent income hypothesis (PIH) predicts that in order to smooth their consumption over their lifetime, people will save more when the economy is good, and save less when it is poor. However, the PIH fails to explain the household saving behaviors in Thailand during the 1990s. Despite the fluctuation of the economic situation from 1992 to 2011 (Paweenawat and McNown 2014), Thai household saving was countercyclical to the economy in the 1990s and 2000s. For example, after the Asian crisis in 1997, the household saving ratio, which is the ratio of household income saved to household net disposable income, increased dramatically in 1998–1999, but began to decrease in 2000, which was at the beginning of the recovery period (Office of the National Economic and Social Development Board (NESDB) 2012) (see Figure 1). Precautionary savings are considered to count for around 56% of total life cycle savings (Skinner 1988), and the precautionary saving behavior of households is the main reason for the different saving rates during different time periods (Skinner 1990).

Paxson (1992) estimated the precautionary saving among agricultural households in Thailand during the period 1978–1986 and found that most Thai households use saving as the main tool for smoothing their consumption. Thus, the Thai household saving pattern since the 1990s has not only challenged the PIH but also makes Thailand an interesting case study for investigating the precautionary saving motive in a developing country. To measure the intensity of the precautionary saving motive, Kimball (1990) first defined the term “prudence.” The degree of prudence in an economy is a significant indicator for expressing the precautionary saving motive in the economy. The more prudent households are in an economy, the more savings will be accumulated as wealth.

This study attempts to estimate the intensity of the precautionary saving motive, measured by the coefficient of relative prudence of households in Thailand from 1992 to 2011, a period that covers all economic stages (before, during, and after the Asian crisis in 1997) (Paweenawat and McNown 2014). This study will find out whether the estimated index of prudence can explain the trend of household savings in the country over this period and what factors can explain the estimated level of precautionary saving motive found in this study. Although several previous studies have estimated the degree of prudence, for example in the United States (US) (Kimball 1990; Dynan 1993) and the United Kingdom (UK) (Merrigan and Normandin 1996), few studies have paid attention to developing countries, such as Mexico (McKenzie 2002) or Turkey (Ceritoglu 2015). To the best of my knowledge, no study has measured the degree of prudence in Thai households.

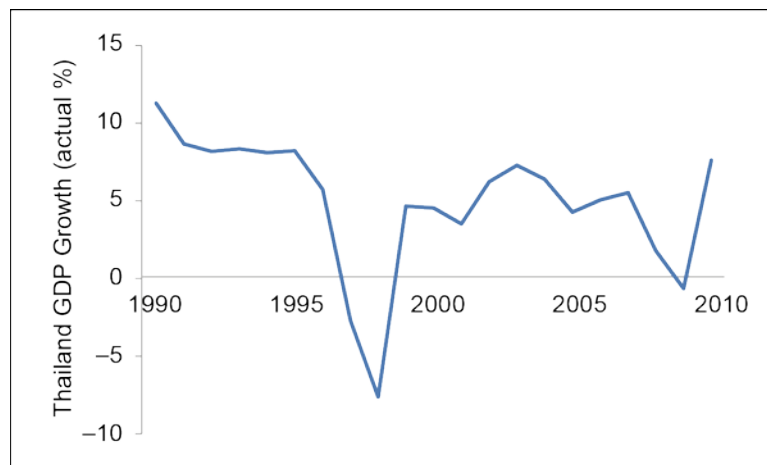
To deal with the problem of unobserved individual heterogeneity, most existing studies, especially in developed countries, employ a panel data set in estimating the level of prudence in households. However, owing to the lack of panel data sets in Thailand, this study uses the dynamic pseudo-panel approach in estimating constructed pseudo-panel data sets from the Thai Household Socioeconomic Survey. By addressing a concern regarding individual heterogeneity causing bias in estimation, a dynamic pseudo-panel method using weighted least squares (WLS) is applied in estimating the coefficient of relative prudence in the country. The main contribution not only reflects the precautionary saving motive in Thai households compared to other economies, but the constructed pseudo-panel data used also allow comparisons across birth year cohorts. This study, then, is extended to estimate the demographic differences in prudence, disaggregated by gender, educational levels, and living areas.

Figure 1: Household Saving Ratio vs. Actual GDP Growth in Thailand (1990–2010)



Definition of household saving ratio: the ratio of household income saved to household net disposable income during the period 1990–2010.

Source: Office of the National Economic and Social Development Board (NESDB) (2012).



Source: World Bank national accounts data (2018).

The main finding shows the low intensity of a precautionary saving motive for Thai households compared to developing economies (e.g., Taipei, China; and Turkey). This low intensity of a precautionary saving motive could explain the lower savings of Thai households during the 2000s. As a larger uncertainty will induce larger present saving (Merrigan and Normandin 1996), the lower savings among Thai households could show the lower uncertainty faced by households in the economy. Two main factors could explain the lower uncertainty in the Thai economy: (1) the structural economic development from an agricultural economy to a manufacturing economy, thereby driving less income uncertainty and leading to less prudence; and (2) the government-assistance policy in the 2000s reducing household borrowing constraints, such as the village fund and the 30-baht medical insurance, to achieve smoother consumption.

Furthermore, this study found that as a result of government policy such as the universal monthly allowance and crop insurance, which targets assistance to older people and those who live in rural areas, these groups have a low-intensity precautionary motive, while women and those with a high education level have a high-intensity precautionary motive; this finding is consistent with other existing studies in many countries. However, high intensity indicates the high income uncertainty faced by these groups in Thailand's economy.

The paper is organized as follows. Section 2 reviews relevant literature concerning the estimation of prudence. Sections 3 and 4 introduce the data and methodology used to estimate the degree of prudence in Thailand. The results and conclusions are found in Sections 5 and 6.

2. LITERATURE REVIEW

The primary theory related to prudence is based on the theory of risk aversion, in which prudence is the degree of convexity of marginal utility (Pratt 1964), and is related to the third derivative of a von Neumann-Morgenstern utility function (Leland 1968). Kimball (1990) defined the term "prudence" as a measurement of the intensity of the precautionary saving motive, which could be measured as an index in relative prudence terms. The following studies empirically estimate the degree of prudence in households in different countries.

Guiso, Jappelli, and Terlizzese (1992) are the pioneers in assessing precautionary saving in Italy using the 1989 Bank of Italy Survey of Household Income and Wealth. The findings implicitly presented a low level of prudence in Italy; their results show that the precautionary saving rate of Italian households is only around 0.1% of permanent income.

Dynan (1993) first directly estimated the degree of prudence in households in the US, measuring risk by employing consumption variability instead of income variability. Using panel data sets from the Consumer Expenditure Survey and a constant relative risk aversion (CRRA) type of utility function, the estimated results show that coefficients of relative prudence are very small—ranging from 0.02 to 0.3—indicating a low level of precautionary motive. Dynan (1993, 1104) also mentioned that "the estimate is too small to be consistent with widely accepted beliefs about risk aversion." Eisenhauer (2000) re-estimated the relative prudence in the US by employing another data set, the survey data form of the University of Michigan's Health and Retirement Study. Estimated relative prudence ranged from 1.51 to 5.15 and the values varied according to age groups, in which older people had a higher degree of precautionary saving than younger people.

Merrigan and Normandin (1996) estimated the coefficient of relative prudence using the time series of a cross-sectional survey from the UK Family Expenditure Survey. The main finding showed that the estimated prudence in the UK data ranged from 0.78 to 1.33. Ventura and Eisenhauer (2006) also employed microdata from – surveys of Italian households in 1993 and 1995 to estimate relative prudence. The estimated values of relative prudence in Italy were between 3.9 and 5.4. Hori and Shimizutani (2006) used micro-level data from the Family Savings Survey and the Family Income and Expenditure Survey to estimate the coefficient of prudence for Japanese households. The estimated coefficient of prudence was around 4 and the estimated value of young households was higher than the value of older ones.

Most previous studies have been undertaken in developed countries in which panel data sets are available. However, the main problem in further investigating this issue in

developing countries is the lack of this kind of data set. Attanasio and Low (2004) and Alan, Attanasio, and Browning (2009) raised this issue and suggested overcoming the problem by focusing on the development of econometric techniques used in estimating degrees of prudence.

McKenzie (2002) was the first to attempt to estimate the degree of prudence in developing countries by applying the dynamic pseudo-panel approach to measure the level of prudence of Mexican consumers. His main finding was that the coefficient of relative prudence was around 2.5–3.4 in Mexico. McKenzie (2006) subsequently applied the same method to a pseudo-panel data set constructed from the Personal Income Distribution Survey (PIDS) to find the degree of prudence in Taipei, China; the coefficient of relative prudence ranged from 8 to 14, indicating a high precautionary saving motive in the country. Furthermore, younger cohorts had a higher degree of prudence than older ones. The study of Ceritoglu (2015) was the most recent one to investigate the degree of prudence in Turkey using a pseudo-panel data set from the Turkish Household Budget Surveys. The main findings show that the degree of prudence in Turkish households was around 8.9–10.2, which is very high compared to advanced economies.

To the best of my knowledge, no study attempts to estimate the degree of prudence, or the intensity of the precautionary motive, among households in Thailand. The closest would be the study of Paxson (1992), who stated that the precautionary savings among agricultural households in Thailand could serve as a guard to protect their consumption from income shock. However, the main focus of Paxson (1992) is on precautionary savings; the study does not mention the motive for precautionary saving and the period of the study was 1978–1986, which was an early period prior to the downward savings trend in the country. Thus, my study could serve as another case study and contribute to the existing literature on estimating prudence in developing countries. By employing the dynamic pseudo-panel approach in the estimation, this study aims to present the coefficient of relative prudence, by measuring the intensity of the precaution saving motive among Thai households during the 1990s and the 2000s.

3. MATERIALS AND METHODS

3.1 Data

The data used in this paper are from the Household Socioeconomic Survey (SES) for the years 1992, 1994, 1996, 1998, 2000, 2001, 2002, 2004, 2006, 2007, 2009, and 2011. This survey is conducted by the National Statistical Office (NSO) of Thailand every two years (except for 2001 and 2007). The SES covers all regions in Thailand, and includes demographics and household members' socioeconomic characteristics such as age, gender, years of education, heads of households, and living areas. The number of observations representing the number of households used in the estimation varied from 5,705 in 1992 to 19,647 in 2011.

The main variables used in the estimation are consumption expenditure data based on household level. In order to measure the consumption profile of each household, this study uses consumption per capita instead of household consumption to capture the changes in family composition over time following Attanasio and Browning (1995), and controls for family size. This variable is deflated to represent real terms corresponding to the consumption price index (CPI) obtained from the World Development Indicators of the World Bank (2016).

In order to control for interest rates affecting household saving behavior over time, the interest rate has been taken into account in the estimation. The variable represents the interest rate and is the deposit rate obtained from the International Monetary Fund (IMF) by the International Financial Statistics (IFS) data set. The discount preference or the subjective time preference rate used here is the annual rate, which equals 0.02 following McKenzie (2002). Note that McKenzie (2002) referred to this rate from Dynan (1993), in which a quarterly rate equal to 0.005 was used.

This study follows the pseudo-panel approach of Deaton (1985) to construct the data sets, referred to as “pseudo-panel” data sets. These data sets are constructed from the 12 survey years. Using households headed by those aged 22–60 during the survey years as one of the main criteria, the constructed data can capture generational cohorts based on year of birth starting from 1951 through to 1970. Instead of following individuals over time like panel data sets, pseudo-panel data follow cohorts (defined by the age of heads of households) over time. There are 177,030 household observations, in which could be classified as the cohort-year cell the number of observations: $20 \times 12 = 240$ cells. Each cell represents “*birth year-year of survey*,” and as the number of observations per cell is more than 100, the sampling error problem does not arise (Verbeek and Nijman 1992, 1993).

McKenzie (2002) then suggested controlling for educational level as different educational levels of heads of household will face different liquidity constraints. Thus, this study classified education into three main categories: (1) primary education and lower, (2) secondary education and lower, and (3) some university or university degree. The study then grouped cohorts using education level and five-year birth cohort to achieve more than 100 observations per cell. Based on this criterion, the number of observations, which is the “*education-birth year-year of survey*,” is 144 cells ($= 3 \times 4 \times 12$).

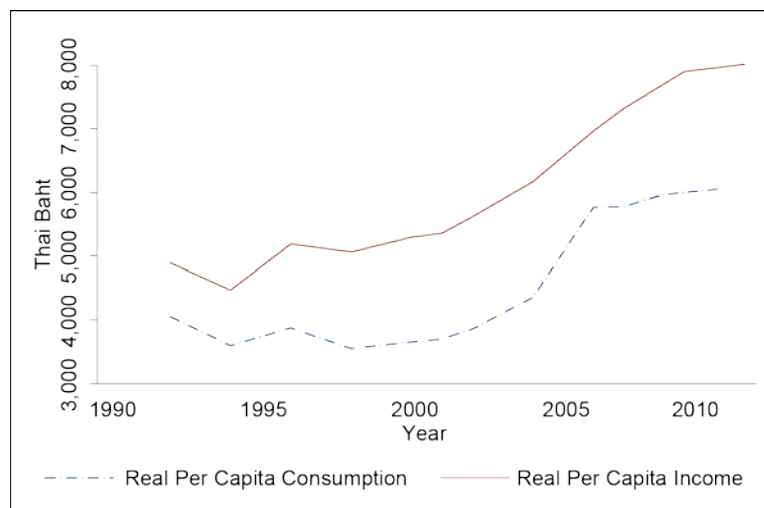
The basic summary statistics in Table 1 show that heads of household in our sample are 43 years old on average, have an average seven years of education, and 70% have their own land. Household income averages 6,360 THB per household, while consumption expenditure averages 4,815 THB per household. The average deposit rate during the period of the study is around 4.8%, with a minimum rate of only 1%. With this low interest rate and the high ratio of household consumption per income (about 75%), this basic information raises a question concerning the leftover money that households will have for their savings as well as their saving motives.

Table 1: Summary Statistics

Variables	(1) N	(2) Mean	(3) SD	(4) Min	(5) Max
Real Per Capita Consumption	177,030	4,815	5,171	179	103,876
Real Per Capita Income	177,030	6,360	8,001	102	99,903
Deposit Interest Rate	177,030	4.813	3.678	1	10.64
Sum of $(r-\delta)/(1+r)$	177,030	0.717	0.140	0.49	0.912
Land Ownership	177,030	0.746	0.435	0	1
Years of Education	177,030	7.659	4.669	0	23
Age	177,030	43.35	7.416	22	60
Sex	177,030	0.734	0.441	0	1
Birth year	177,030	10.908	5.535	1	20
Year	177,030	2003	5.330	1992	2011

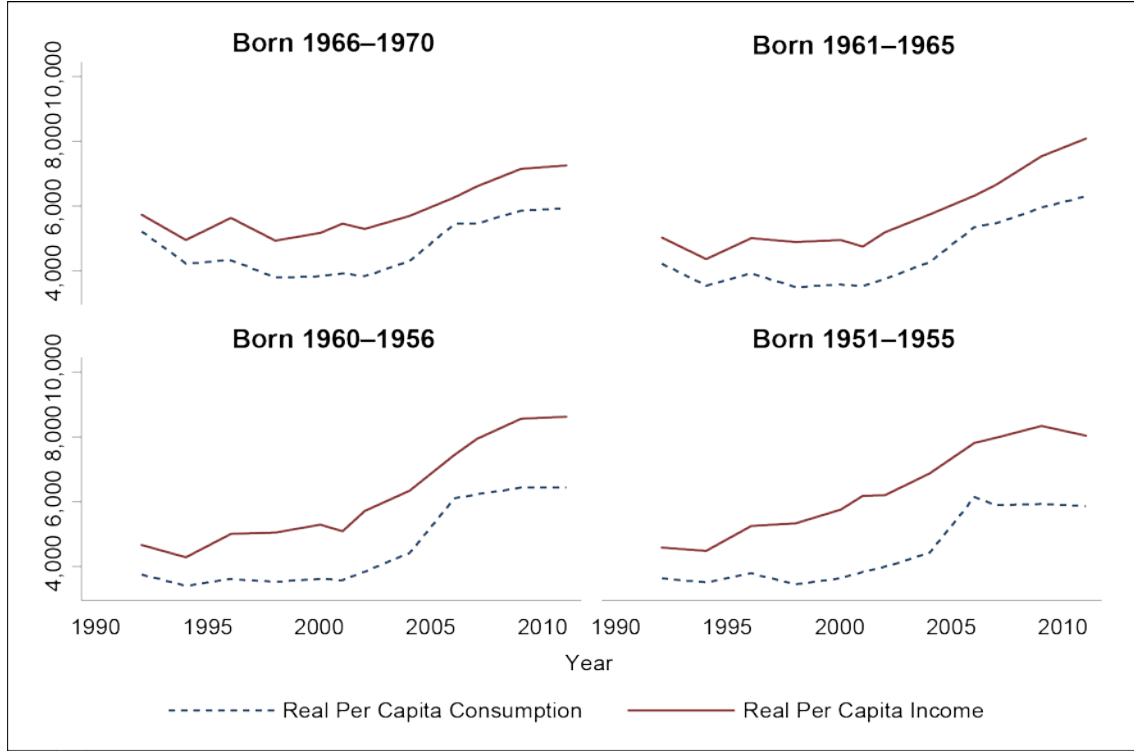
Source: Author's calculation from the SES (1992–2011).

In addition, Figure 2 and Figure 3 present the strongly upward trend of consumption and income per capita in households in the 2000s, for the overall sample and for four birth cohorts, respectively. The income pattern for the overall sample and for cohorts is similar, namely an increasing trend. The consumption trend before the crisis in 1997 for the younger cohort shows a downward trend, while the older cohort appears quite stable; however, after the crisis during the 2000s, consumption for all generations continues to increase over time. The gap between income and consumption for different birth cohorts, which could be used as a proxy for saving, is a mixed pattern, indicating the need for formal regression analysis.

Figure 2: Consumption and Income per Capita of Household (1992–2011)

Source: Author's calculation from the SES (1992–2011).

Figure 3: Consumption and Income per Capita of Household
(classified by cohorts)



Source: Author's calculation from the SES (1992–2011).

3.2 Methodology

This study follows the theoretical framework of Dynan (1993) to derive the estimated equation:

$$\max_{C_{i,t+j}} E_t \left[\sum_{j=0}^{T-t} (1+\delta)^{-j} U(C_{i,t+j}) \right] \quad (1)$$

$$\text{subject to } A_{i,t+j+1} = (1+r_i)A_{i,t+j} + Y_{i,t+j} - C_{i,t+j} \quad (2)$$

where E_t is the expectation at time t and T is the end of the period. C_{it} is the individual consumption of individual i at time t . Y_{it} is labor income and A_{it} is wealth. δ is the subjective time preference rate and r is the interest rate. δ will be assumed to be constant across time and across individuals, while r varies across individuals.

To solve this problem, this study takes the first-order condition (FOC) and obtains:

$$U'(C_{it}) = \left(\frac{1+r_i}{1+\delta} \right) E_t[U'(C_{i,t+1})] \quad (3)$$

Following Dynan (1993), the second-order Taylor expansion of $U'(C_{i,t+1})$ is taken to obtain:

$$U'(C_{i,t+1}) = U'(C_{i,t}) + U''(C_{i,t})(C_{i,t+1} - C_{i,t}) + \frac{1}{2}U'''(C_{i,t})(C_{i,t+1} - C_{i,t})^2$$

It is rearranged to obtain:

$$E_t \left(\frac{C_{i,t+1} - C_{i,t}}{C_{i,t}} \right) = \frac{1}{\xi} \left(\frac{r_i - \delta}{1 + r_i} \right) + \frac{\rho}{2} E_t \left[\left(\frac{C_{i,t+1} - C_{i,t}}{C_{i,t}} \right)^2 \right] \quad (4)$$

where $\xi = -\frac{C_{i,t}U''}{U'}$ is the coefficient of relative risk aversion, while $\rho = -\frac{C_{i,t}U'''}{U''}$ is the coefficient of relative prudence as defined by Kimball (1990). $\rho > 0$ indicated a positive relationship between expected consumption growth and expected consumption growth squared, implying that with high levels of uncertainty, people will have high levels of saving (Dynan 1993). This condition holds in the case of the constant relative risk aversion (CRRA) utility function.

Note that Carroll (1992, 1994) used the variance of the growth of income as a proxy variable for the future risk of unemployment and labor income uncertainty. However, as suggested by Ceritoglu (2015), in addition to income uncertainty, the variance of growth of consumption is the most suitable proxy for capturing the risk and uncertainty. This specification follows Dynan (1993) in suggesting that consumption variability is a better measure of risk as the consumption of household change only corresponds to the unexpected changes of income, which indicates the true risk.

To simplify the model, this study followed Merrigan and Normandin (1996) by multiplying $C_{i,t}$ on both sides of the equation and obtained:

$$E_t(C_{i,t+1} - C_{i,t}) = \frac{1}{\xi^*} \left(\frac{r_i - \delta}{1 + r_i} \right) + \frac{\rho^*}{2} E_t[(C_{i,t+1} - C_{i,t})^2] \quad (5)$$

According to Kimball (1990), $\xi^* = C_{i,t}\xi$ is the coefficient of absolute risk aversion, and $\rho^* = -\frac{U'''}{U''}$ is the coefficient of absolute prudence.

Then, imposing the assumption that all people have rational expectations, the following criteria are applied:

$$C_{i,t+1} = E(C_{i,t+1}) + u_{i,t+1}, \text{ where } E_t(u_{i,t+1}) = 0$$

$$\text{and } E_t(C_{i,t+1} - C_{i,t})^2 = (C_{i,t+1} - C_{i,t})^2 + v_{i,t+1}, \text{ where } E_t(v_{i,t+1}) = 0$$

$$\text{Then, } (C_{i,t+1} - C_{i,t}) = \frac{1}{\xi^*} \left(\frac{r_i - \delta}{1 + r_i} \right) + \frac{\rho^*}{2} (C_{i,t+1} - C_{i,t})^2 + u_{i,t+1} + \frac{\rho^*}{2} v_{i,t+1} \quad (6)$$

where $C_{i,t}$ is individual consumption of individual i at time t and $C_{i,t+1}$ is individual consumption of individual i at time $t+1$. The individual specific equation is represented in equation (6), where i indexes individuals ($i = 1, \dots, N$) and t indexes time periods ($t = 1, \dots, T$). Note that $C_{i,t+1}$ is unobserved individual heterogeneity, which could be considered as unobserved different consumption across individuals at time $t+1$, in which there are unobserved variables in this estimation. Furthermore, this $C_{i,t+1}$ may be correlated with $u_{i,t}$.

In the case of a panel data set, individual fixed effects could be applied to control for unobserved individual heterogeneity. However, most developing countries do not have panel data sets. If applying the ordinary least squares estimates (OLS) to equation (6), the estimates will be biased and inconsistent. To overcome this issue, this study followed Deaton (1985) by defining a set of C ($c=1, \dots, C$) cohorts, based on year of birth; by tracking a person by birth year, and then averaging across the cohort members to obtain the average equation (7), this equation (7) can eliminate individual heterogeneity.

$$(\bar{C}_{c,t+1} - \bar{C}_{c,t}) = \frac{1}{\xi^*} \left(\frac{r_t - \delta}{1 + r_t} \right) + \frac{\rho^*}{2} \frac{1}{n_c} \sum_{i=1}^{n_c} (C_{i,t+1} - C_{i,t})^2 + \bar{u}_{c,t+1} + \frac{\rho^*}{2} \bar{v}_{c,t+1} \quad (7)$$

This equation (7) can be simplified as:

$$(\bar{C}_{c,t+1} - \bar{C}_{c,t}) = \frac{1}{\xi^*} \left(\frac{r_t - \delta}{1 + r_t} \right) + \frac{\rho^*}{2} (\bar{C}_{c,t+1} - \bar{C}_{c,t})^2 + \bar{u}_{c,t+1} + \rho^* \sigma_\eta^2 \quad (8)$$

where $(\bar{C}_{c,t+1} - \bar{C}_{c,t}) = \frac{1}{n_c} \sum_{i=1}^{n_c} (C_{i,t+1} - C_{i,t})^2$. And then:

$$(\bar{C}_{c,t+1} - \bar{C}_{c,t}) = \frac{1}{\xi^*} \left(\frac{r_t - \delta}{1 + r_t} \right) + \frac{\rho^*}{2} (\bar{C}_{c,t+1} - \bar{C}_{c,t})^2 + \varepsilon_{c,t+1} \quad (9)$$

where $\varepsilon_{c,t+1} = \bar{u}_{c,t+1} + \rho^* \sigma_\eta^2$.

In equation (9), $\bar{C}_{c,t}$ is the mean of $C_{c,t}$ over sample observations in cohort c at time t , and $\bar{C}_{c,t+1}$ is the mean of $C_{c,t+1}$ over sample observations in cohort c at time $t+1$.

Then, taking the mean of log consumption in order to obtain equation (10), this study estimated equation (10) to get $\rho = -\frac{CU'''}{U''}$, indicated as the coefficient of relative prudence (Kimball 1990).

$$\Delta \ln \bar{C}_{c,t+1} = \frac{1}{\xi^*} \left(\frac{r_t - \delta}{1 + r_t} \right) + \frac{\rho}{2} (\Delta \ln \bar{C}_{c,t+1})^2 + \varepsilon_{c,t+1} \quad (10)$$

Based on the sample, there are unequally spaced time periods. Thus, equation (10) could be converted to use cohort c at time $t+s$, where s could be either 1 or 2), in order to estimate the cohort-level equation (McKenzie 2006).

$$\Delta \ln \bar{C}_{c,t+s} = \frac{1}{\xi^*} \left(\frac{r_t - \delta}{1 + r_t} \right) + \frac{\rho}{2} (\Delta \ln \bar{C}_{c,t+s})^2 + \varepsilon_{c,t+s} \quad (11)$$

To obtain $\rho = -\frac{C_{i,t} U'''}{U''}$ as the coefficient of relative prudence, presenting the intensity of precautionary saving motive among households, this study estimates equation (11) using the weighted least squares (WLS) estimation on the constructed pseudo-panel data set.

The consumption variable contains only the nondurable consumption, in which the durable purchase is excluded. There are no other controlling variables included in the estimation.

The advantage of using the pseudo-panel approach is that it reduces the endogeneity issues by using the average value in the estimation (Deaton 1985). Note that as the average value is used as the representative of the cell, the year gap does not cause a problem or inefficiency.

WLS has been used as the number of observations per cell is different; thus, the error term ($\varepsilon_{c,t+s}$) is heteroskedastic. This situation could cause biased standard errors; to overcome this problem, Dargay (2007) suggested weighting each cell with the number of observations in the estimation. The estimated ρ presents the degree of precautionary saving motive and, if $\rho > 0$, people at high risk will have a high level of saving. Due to the limitation of data, I use the income as proxy for wealth.

4. RESULTS

Table 2 presents the estimates of equation (11) using the WLS regression on pseudo-panel data in order to empirically estimate the overall degree of prudence among households in Thailand's economy. Columns (1) and (2) display the results of the pseudo-panel data set of one-year cohort means. The degree of prudence, indicating the intensity of the precautionary saving motive of households, can be computed from the coefficient on squared consumption growth (or $\frac{\rho}{2}$). First, whether controls or no

controls are used for birth year, the magnitude of coefficients, which is around 1.2, is not much different. Therefore, the computed relative prudence (or ρ) is around 2.4 (= 1.2 x 2). The positive computed relative prudence indicates that cohorts with higher uncertainty will have higher savings.

Next, instead of using each birth year cohort to control for the education level of heads of household as suggested by McKenzie (2002), the paper combines five-year cohorts into one cohort. Columns (3) and (4) display the results of the pseudo-panel data set of five-year cohort means. The coefficient on squared consumption growth is statistically significant at around 1, with and without controlling for cohorts in which we can compute the relative prudence at 2. This computed relative prudence is comparable to the results in the UK (Merrigan and Normandin 1996). However, it is very low compared to the results from Taipei, China (McKenzie 2006) and Turkey (Ceritoglu 2015). Remarkably, it can be seen that this magnitude of prudence in Thailand (= 2) lies in the reasonably approximated range of around 2–5 according to theory, as suggested by Hori and Shimizutani (2001); this prudence will ensure that precautionary savings count for around 20%–60% of total household savings (Skinner 1988; Carroll and Samwick 1998).

The low prudence among Thai households indicates a low intensity of precautionary saving motive, which is caused by a lower level of uncertainty in the Thai economy during the study period. Kimball (1990) and Leland (1968) asserted that households will increase their savings when future income is uncertain. Two main factors constitute the lower uncertainty level in Thailand. First, the structural development of the Thai economy from an agricultural economy to a manufacturing economy reduced the future risk and uncertain income of Thai households. The more security in the economy, the less income uncertainty there is, which leads to a less intense precautionary saving motive, and, subsequently, less saving overall (Abel 1985). Second, the government-assistance policy since the 1990s, which mainly targets reduction of the borrowing constraints among Thai households, such as village funds, makes people less sensitive to future uncertainty. Credit constraints have affected and stimulated the precautionary saving behaviors of households (Deaton 1992). However, according to the World Uncertainty Index (WUI), Thailand ranks in the middle of the scores in terms of economic, financial, and political risk among 143 countries (Ahir, Bloom, and Furceri 2018). Note that there may be an alternative explanation for ρ , where more uncertainty over income will lead to greater prudence, as ρ is a parameter of the utility function.

Table 2: WLS Pseudo-panel Regression

Variables	(1) WLS Pseudo- Panel (One-Year Cohort Means)	(2) WLS Pseudo- Panel (One-Year Cohort Means)	(3) WLS Pseudo- Panel (Five-Year Cohort Means)	(4) WLS Pseudo- Panel (Five-Year Cohort Means)
Sum of $(r-\delta)/(1+r)$	0.0789* (0.0437)	0.0791* (0.0460)	0.164 (0.273)	0.173 (0.273)
Squared Consumption Growth	1.194*** (0.175)	1.204*** (0.180)	1.032*** (0.113)	1.026*** (0.117)
Constant	0.124*** (0.0278)	0.112** (0.0544)	0.169 (0.226)	0.235 (0.232)
Computed Relative Prudence	2.388	2.408	2.064	2.052
Observations	239	239	143	143
R-squared	0.283	0.287	0.597	0.600
Birth year	No	Yes	No	Yes
Year	No	No	No	No

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In addition to exploring the overall degree of prudence in Thailand's economy, the data are disaggregated according to alternative demographic characteristics including: birth year cohorts, gender of heads of households, education levels, and living areas. By performing WLS estimation on the pseudo-panel with five-year cohort means, this study intended to find the demographic differences in the degree of prudence across these groups.

Table 3 presents the estimated results across cohorts in order to check the different levels of prudence across different generations of Thai people. The regression coefficient of relative prudence is statistically significant for all birth year cohorts. The computed relative prudence is estimated at 1.7 for the oldest cohorts (column (4)), and at 2.5 for the youngest cohort (column (1)).

There is a decreasing trend in the value of prudence, which is consistent with the findings of McKenzie (2002), in which younger cohorts have a higher degree of prudence than older ones. Also, Carroll and Samwick (1995) indicated that people aged below 50 will have precautionary saving, while Gourinchas and Parker (2002) indicated a high intensity of precautionary saving motive among the young generation. In the context of Thailand, the lower precautionary saving motive among old people could be explained by the government-assistance program in the 2000s that targeted securing an income for old people via implementation of the universal monthly allowance (Paweenawat and Vechbanyongratana 2015).

Table 3: WLS Pseudo-panel Regression
(classified by cohorts)

Variables	(1) Born 1966–1970	(2) Born 1961–1965	(3) Born 1956–1960	(4) Born 1956–1960
Sum of $(r-\delta)/(1+r)$	0.311 (0.577)	0.451 (0.514)	0.0582 (0.542)	0.0731 (0.550)
Squared Consumption Growth	1.262*** (0.207)	1.185*** (0.169)	1.036*** (0.148)	0.879*** (0.122)
Constant	0.245 (0.440)	0.000680 (0.376)	0.230 (0.410)	0.213 (0.426)
Computed Relative Prudence	2.524	2.370	2.072	1.758
Observations	35	36	36	36
R-squared	0.553	0.598	0.599	0.612
Birth year	No	No	No	No
Year	No	No	No	No

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4 provides evidence regarding the level of prudence according to gender. The computed relative prudence is estimated at 2.3 for women (column (2)), and at 2 for men (column (4)), with women showing a slightly higher prudence than men.

These results can be explained by following Kimball (1990) and Leland (1968), who asserted that women are more prudent than men, and the findings of Sunden and Surette (1998), who mentioned that women are more risk-averse than men. Furthermore, in Thailand, this also implicitly indicated high uncertainty concerning income level for women heads of households; this group may need the government to provide an assistance policy on security to lower the uncertainty they face in the economy.

Table 5 presents the estimated degree of prudence when the data are disaggregated into the three education levels, a finding that is consistent with most existing studies and which indicates that highly educated heads of households (those with secondary education and a university degree) will have more prudence than those with lower levels of education (those with primary education).

Table 4: WLS Pseudo-panel Regression
(classified by gender)

Variables	(1) Women	(2) Women	(3) Men	(4) Men
Sum of $(r-\delta)/(1+r)$	0.164 (0.263)	0.169 (0.260)	0.170 (0.276)	0.180 (0.276)
Squared Consumption Growth	1.173*** (0.0839)	1.179*** (0.0944)	1.006*** (0.116)	1.002*** (0.120)
Constant	0.418** (0.209)	0.494** (0.209)	0.170 (0.230)	0.234 (0.236)
Computed Relative Prudence	2.346	2.356	2.012	2.004
Observations	143	143	143	143
R-squared	0.625	0.629	0.598	0.601
Birth year	No	Yes	No	Yes
Year	No	No	No	No

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The computed relative prudence is around 2.5 and 2.8 for those with university and secondary education (column (6) and (4)), respectively, while it is only 1 for those with primary education (column (2)). McKenzie (2002) suggested that different levels of education for heads of households could represent an indicator signifying credit constraints on the ability to access the formal financial market. Attanasio (1995) mentioned the different saving behaviors across education groups and that savings will be high in more highly educated households, while Bernheim and Scholz (1993) indicate that noncollege degree households will have lower savings. In addition, the less educated group with a lower level of prudence indicates that they tend to have less knowledge or information about finance.

Table 5: WLS Pseudo-panel Regression
(classified by education levels)

Variables	(1) Primary	(2) Primary	(3) Secondary	(4) Secondary	(5) University	(6) University
Sum of $(r-\delta)/(1+r)$	0.168** (0.0820)	0.169* (0.0852)	0.0101 (0.0331)	0.00528 (0.0288)	0.120** (0.0592)	0.124** (0.0581)
Squared Consumption Growth	0.533*** (0.0211)	0.533*** (0.0224)	1.374*** (0.0506)	1.449*** (0.0473)	1.225*** (0.0549)	1.251*** (0.0550)
Constant	0.538***	0.537***	0.162***	0.148***	0.235***	0.197***
Computed Relative Prudence	1.066	1.066	2.748	2.898	2.45	2.502
Observations	47	47	48	48	48	48
R-squared	0.936	0.936	0.947	0.963	0.918	0.927
Birth year	No	Yes	No	Yes	No	Yes
Year	No	No	No	No	No	No

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results of regressions on urban and rural areas are presented in Table 6. The computed relative prudence for those who live in rural and urban areas are 1.6 and 2.8, respectively (columns (2) and (4)). This finding is contrary to Paxson (1992), indicating that most agricultural households living in rural areas will face very high future income uncertainty; thus, we expect a higher level of precautionary saving motive among this group. However, in Thailand, the future risk and uncertain future income that agricultural households faced in the 1970s and 1980s, as mentioned in Paxson (1992), were reduced by the government-assistance policy in the 1990s and 2000s. Several policies targeting agricultural households living in rural areas have been launched to help this group, such as crop insurance, the Bank of Agriculture, and Agricultural Cooperatives' (BAAC) credit accessibility, thereby inducing a decline in precautionary saving among these households.

Table 6: WLS Pseudo-panel Regression
(classified by living areas)

Variables	(1) Rural	(2) Rural	(3) Urban	(4) Urban
Sum of $(r-\delta)/(1+r)$	0.393 (0.250)	0.421* (0.244)	0.597** (0.262)	0.626** (0.262)
Squared Consumption Growth	0.850*** (0.108)	0.836*** (0.108)	1.374*** (0.0962)	1.404*** (0.104)
Constant	0.211	0.117	0.778***	0.814***
Computed Relative Prudence	1.7	1.672	2.748	2.808
Observations	143	143	143	143
R-squared	0.609	0.618	0.587	0.591
Birth year	No	Yes	No	Yes
Year	No	No	No	No

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5. CONCLUSIONS

This paper estimated the intensity of the precautionary saving motive in Thailand using constructed pseudo-panel data sets from the Thai Household Socioeconomic Survey (1992–2011). This paper applied a dynamic pseudo-panel approach in estimating the constructed pseudo-panel data sets during the 1990s and 2000s, in which Thai household saving was countercyclical to the economy and contrary to the prediction of permanent income theory. The estimated ρ has partially explained the countercyclical saving rate in Thailand. The computed relative prudence, representing the intensity of the precautionary saving motive of Thai households, is around 2, which shows a low prudence level among Thai households compared to other developing countries. However, its magnitude lies in the reasonably approximated range predicted by theory (Hori and Shimizutani 2006) and is similar to the results in the UK (Merrigan and Normandin 1996).

The low prudence is caused by a lower level of uncertainty in the Thai economy during the 1990s and 2000s. The structural development of the Thai economy and the government-assistance policy have mainly led to a less intense precautionary saving motive and less saving overall. The degree of prudence has been varied in accordance with alternative demographic characteristics. The younger cohorts, women, highly educated heads of households, and those who live in urban areas have a high degree of prudence, implicitly indicating high uncertainty concerning income level for these groups. The main finding indicated that some particular groups in the economy may need the government-assistance policy on security to lower the uncertainty they face in the economy. Furthermore, an urge for prudence to increase the intensity of the precautionary saving motive among Thai households may be necessity for the country.

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