How Prudent are Households in Turkey? [a]

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Abstract

This paper estimates households' degree of prudence, which is the intensity of the precautionary motive for saving, by developing a pseudo-panel data set using nine consecutive waves of the TURKSTAT Household Budget Surveys from 2003 to 2011. In this approach, the variance of the growth of consumption is considered as a suitable proxy variable for risk and uncertainty that prevail in the economy. The econometric results reveal that the coefficient of relative prudence is significant and also households are more prudent in Turkey than households from advanced economies. More risk-averse individuals are more likely to search for employment in the public sector instead of becoming entrepreneurs. As a result, the empirical analysis provides direct evidence in favour of the precautionary saving hypothesis, which proposes that households postpone consumption and raise their saving ratio to safeguard themselves against risk and uncertainty.

JEL Classification: C23, D11 and D12

Key words: *prudence, risk-aversion, cohort, pseudo-panel*

[a] I would like to thank Richard Cornes, Alessandra Guariglia and Çağaçan Değer for their valuable comments and suggestions.

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I. Introduction

This paper estimates households' degree of prudence with a pseudo-panel data for the Turkish economy. The empirical importance of precautionary saving in the economy depends on households' degree of prudence. More prudent households are expected to accumulate greater amounts of financial wealth in order to safeguard themselves against risk and uncertainty. This approach establishes a direct link between consumer theory and the precautionary saving hypothesis. However, empirical literature on prudence is limited to high quality, but a few studies especially for developing economies (Dynan, 1993; Merrigan and Normandin, 1996; Banks *et al.*, 2001 and McKenzie, 2004 and 2006).

The precautionary motive for saving is consistent with the theory of inter-temporal allocation of consumption, but it is removed from the theory through specific assumptions. Specifically, the perfect foresight and certainty equivalence assumptions that generate the Theory of Life-Cycle Saving and the Permanent Income Theory eliminate the presence of uncertainty. However, understanding household consumption and saving behaviour becomes more difficult when uncertainty and its implications are neglected. Although the discussion on the precautionary saving extends back to Keynes (1936), theoretical development of the implications of uncertainty on saving decisions owes much to the contributions of Leland (1968), Sandmo (1970) and Dreze and Modigliani (1972). The precautionary saving hypothesis is considered as one of the plausible explanations for the empirical failure of the strict version of the Permanent Income Theory (Browning and Lusardi, 1996; Attanasio and Weber, 2010). Recent empirical research analyses the empirical importance of the precautionary saving in the analysis of household consumption and saving decisions (Carroll, 2001; Guariglia and Rossi, 2002; Carroll *et al.*, 2003, Guariglia and Kim, 2003; Benito, 2006 and Ceritoğlu, 2013a).

Dynan (1993) estimated households' degree of prudence with a CRRA type utility function using a panel data set from the Consumer Expenditure Survey (CEX) for the U.S. economy. However, the estimated regression coefficients of relative prudence were too small, which was inconsistent with widely accepted beliefs about risk-aversion and also cast significant doubt on the precautionary saving hypothesis. However, Merrigan and Normandin (1996) estimated households' degree of prudence by

using a time series of cross-sectional surveys from the Family Expenditure Survey (FES) for the U.K. economy. Their predictions of the coefficient of relative prudence and the coefficient of relative risk-aversion were within the boundaries of traditionally accepted values for theoretical models. Thus, their empirical findings represent strong support of the precautionary saving hypothesis. In addition to that, McKenzie (2006) performed econometric estimations to reveal households' degree of prudence using a pseudo-panel data set from the Personal Income Distribution Surveys (PIDS) for the Taiwanese economy. He found evidence for a strong precautionary motive for saving, since households' degree of prudence emerged as significantly higher than former estimates for advanced economies. Moreover, younger cohorts' higher degree of prudence compared to older generations is attributed to their greater participation in industries with high income risk.

In the literature, the plausible values of the coefficient of relative risk aversion range between one and four, which makes the range of two to five as the set of potential values that the coefficient of relative prudence can assume to be compatible with the common presumptions (Carroll, 2001). However, previous empirical research indicated that the coefficient of relative risk aversion is lower than this range in advanced economics, whereas it is significantly higher in developing economies. Recently, there is an intense discussion about correct measurement of the coefficient of relative risk aversion and households' degree of prudence using appropriate econometric methods (Ludvigson and Paxson, 2001; Attanasio and Low, 2004 and Alan *et al.*, 2009). In this respect, this empirical paper attempts to provide estimates of the coefficient of relative risk aversion and households' degree of prudence in Turkey.

Although, prudence is a theoretically important and empirically interesting issue, empirical research for developing economies is very limited for various reasons. One of the main difficulties is the lack of micro-economic data sets with a panel dimension for developing economies. To the best of my knowledge, this topic has not been investigated for the Turkish economy previously. Households' perceptions of risk and uncertainty from a sizeable developing economy, which is accompanied with a young and growing population, might be significantly different than household behaviour in advanced economies. Empirical research requires the analysis of household budget surveys in a panel-data set

format. Therefore, I develop a pseudo-panel data set by forming birth year cohorts from the Turkish Statistical Institute (TURKSTAT) Household Budget Surveys from 2003 to 2011 following Deaton (1985) and Verbeek (2008). The analysis of household consumption and saving behaviour with a pseudo-panel date set based on cohort values from the TURKSTAT Household Budget Surveys is one of the positive aspects of this paper, since a genuine panel data set on household income, consumption and wealth is not readily available for the Turkish economy.

The outline of this paper is as follows: Section II presents the theoretical background. Section III performs a descriptive analysis of the TURKSTAT Household Budget Surveys and then, presents the econometric results. Section III also includes robustness checks. Finally, Section IV concludes the paper with a brief discussion on empirical findings.

II. Theoretical Background

Kimball (1990) explores the similarities and contrasts between risk aversion and prudence. Although, the degree of risk aversion and the degree of prudence are directly related to each other, it is not correct to accept them as the same. In particular, the theory of prudence is developed upon the foundation of Pratt (1964) from the theory of risk-aversion. Risk aversion is controlled by the degree of the concavity of the utility function, while prudence is controlled by the degree of the convexity of the marginal utility function. Therefore, we need to use a convex marginal utility function to present this discussion in a formal manner.

Moreover, if absolute prudence is decreasing uniformly, then absolute risk aversion must also be decreasing uniformly. Decreasing absolute risk aversion is a widely accepted view in the economic literature. Decreasing absolute prudence basically states that the sensitivity of consumption to future income uncertainty declines as the level of wealth increases. The direct relationship of absolute risk aversion and absolute prudence is considered as a theoretical argument in favour of the precautionary saving hypothesis (Gollier, 2001).

The representative individual is assumed to be a rational and risk-averse human being, who aims to maximise utility (1), which is only derived from consumption with respect to the budget constraint.

$$\max_{C_{i,t+j}} \mathrm{E}_t\left[\sum_{j}^{T-t}(1+\delta)^{-j}U\left(C_{i,t+j}\right)\right] \tag{1}$$

Here, *E* represents the expectation conditional on information at time *t*, while *T* represents the time of death. C_{it} is consumption, Y_{it} is labour income and A_{it} is the amount of wealth in period *t*. δ is the subjective time preference rate, which is assumed constant over time and across individuals. Moreover, *r* is the real interest rate, which is constant over time, but might vary across individuals. The evolution of wealth over time is presented in equation (2).

$$\mathrm{A}_{i,t+j+1} = (1+r_i)\mathrm{A}_{i,t+j} + \mathrm{Y}_{i,t+j} - C_{i,t+j} \tag{2}$$

The initial amount of wealth, which is denoted by A_{it}, is given, whereas the amount of wealth at the end of life-time, which is denoted by A_{T+1}, is assumed to be zero. Moreover, the utility function is assumed to be additive over time and separable across goods and services. It is a concave function, meaning the utility from consumption rises at a decreasing rate. Finally, the third derivative of the utility function is positive to allow for the existence of the precautionary motive for saving (Leland, 1968).

$$U(C) = \sum_{t=1}^{T} u(C_{it}) \qquad U'(C) > 0 \text{ and } U''(C) < 0 \qquad U'''(C) > 0$$

The solution of the optimisation problem of the representative individual is the first-order condition, which is known as the Euler equation (3). The first-order condition states that future labour income uncertainty will lead to greater amounts of saving provided that the assumptions concerning the utility function hold.

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

The presence of future labour income uncertainty indicates that the expected marginal utility of future consumption is greater than the marginal utility of current consumption. Intuitively, this condition implies that future consumption becomes more valuable compared to current consumption for the representative individual under the presence of future labour income uncertainty. Hence, the representative individual will allocate more resources to the future periods by decreasing the amount consumption and increasing the saving level in the current period.

The substitution of the second-order Taylor series approximation of $U'\left(C_{i,t+1}\right)$ into the first-order condition (4) results in the following formal expression.

$$\mathrm{E}_t\left[\frac{C_{i,t+1}-C_{it}}{C_{it}}\right]=\frac{1}{\gamma}\left(\frac{r_i-\delta}{1+r_i}\right)+\frac{\varphi}{2}\mathrm{E}_t\left[\left(\frac{C_{i,t+1}-C_{it}}{C_{it}}\right)^2\right] \tag{4}$$

In equation (4), γ is the coefficient of relative risk aversion and φ is the coefficient of relative prudence as defined in Kimball (1990). Hence, the coefficient of relative risk aversion and the coefficient of relative prudence are directly related to each other. The coefficient of relative risk aversion determines the degree of the convexity of the marginal utility function, while the coefficient of relative prudence determines the intensity of the precautionary motive for saving.

The representative individual is assumed to be risk-averse, which creates the intention to smooth consumption across periods with respect to the life-time resources. In a similar fashion, the representative individual must be prudent to engage in precautionary saving. Consumer theory accepts the idea that individuals will be more willing to participate in risky investments as they become more prosperous in life. Parallel to that idea, wealthy individuals will be less vulnerable towards risk and uncertainty. In other words, their accumulated savings, either in the form of housing wealth and/or financial wealth, act a source of safety and protection for individuals against unforeseen negative situations such as a spell of unemployment and out of pocket health expenditures.

$$\gamma = -C_{it}\frac{U''(C_{i,t+1})}{U'(C_{i,t+1})} \qquad \varphi = -C_{it}\frac{U'''(C_{i,t+1})}{U''(C_{i,t+1})}$$

The features of the utility function have crucial importance to analyse household consumption and saving behaviour under risk and uncertainty. The selected utility function must incorporate the presence of risk and uncertainty with household behaviour to complete the formal derivation of the precautionary saving hypothesis. There are two types of utility functions that satisfy the underlying assumptions, which are required to allow for the presence of the precautionary motive for saving. The first choice is the Constant Relative Risk Aversion (CRRA) type of utility function, while the only alternative is the Constant Absolute Risk Aversion (CARA) type of utility function, respectively.

$$U(C) = \frac{C^{1-\rho}}{1-\rho} \qquad U(C) = -\frac{\exp(-\theta C)}{\theta}$$

The CRRA type of utility function is the most popular choice in the literature of the consumer theory. If the CRRA type of utility function is selected, then ρ becomes the coefficient of relative risk aversion and (ρ + *1*) becomes the coefficient of relative prudence. It is thought that the plausible

values of the coefficient of relative risk aversion range between one and four, which makes the range of two to five as the set of potential values that the coefficient of relative prudence can assume to be compatible with the common presumptions in the literature (Carroll, 2001). If the CRRA type of utility function is selected for the empirical analysis, then the first-order condition will become equation (5). The coefficient of relative prudence ($\rho + 1$) is situated in front of the variance term in the right-hand side of this equation, which is composed of only the growth of consumption.[1]

$$\Delta C_{i,t+1} = \alpha_i + \frac{1}{\rho}\left(\frac{r_i - \delta}{1 + r_i}\right) + \frac{(\rho+1)}{2}\left[\left(\Delta C_{i,t+1}\right)^2\right] \qquad (5)$$

III. Empirical Analysis

III.1 – The TURKSTAT Household Budget Surveys

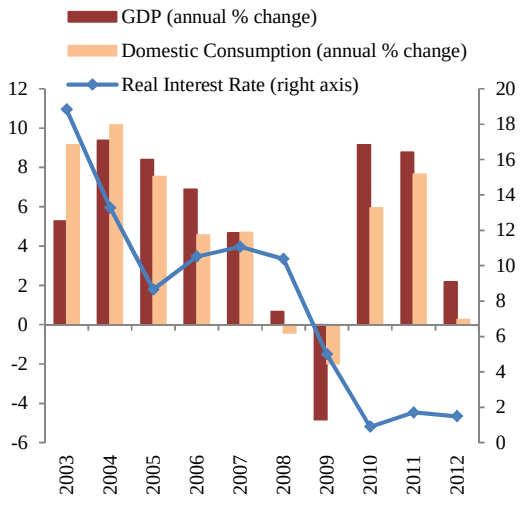
The TURKSTAT Household Budget Surveys are repeated cross-sectional surveys, which do not have a panel dimension. They provide data on household disposable income and consumption expenditures from 2003 to 2011 with respect to urban and rural regions.[2] They also provide extensive information about age structure, labour force participation preferences and education levels of family members. Unfortunately, the surveys do not include information about households' geographical locations, except for the 2003 survey, which also has a significantly higher number of observations.[3]

At this point, it is necessary to mention that the Turkish economy experienced significant changes between 2003 and 2011. Especially, households suffered from the negative consequences of

[1] Previously, Guariglia and Rossi (2002) and Benito (2006) used the Euler equations to test the empirical importance of precautionary saving.
[2] Consumption expenditures are available only at the household level and as monthly figures in the TURKSTAT Household Budget Surveys. Monthly consumption expenditures are multiplied by twelve to reach an annual estimate of household consumption expenditures under the assumption that household consumption follows a steady pattern throughout the year.
[3] TURKSTAT collects individual and household disposable income figures for the twelve months period prior to the survey month, but not for the calendar year due to the design of the survey questionnaires. For instance, if a household participates in the Household Budget Survey in September 2008, then annual household disposable income will refer to the twelve months period between September 2007 and September 2008. However, the monthly inflation rates are quite high and there are significant differences in the inflation rates of geographical regions in Turkey. TURKSTAT includes a regional and monthly inflation variable in the Household Budget Surveys since 2003. Household disposable income and household consumption are inflated to the year-end (December) prices of the corresponding survey year by multiplying with this inflation index. Annual household disposable income and household consumption expenditures are divided by year-end consumer price indices for each survey year and all economic variables including household saving figures are analysed in 2003 TL prices.

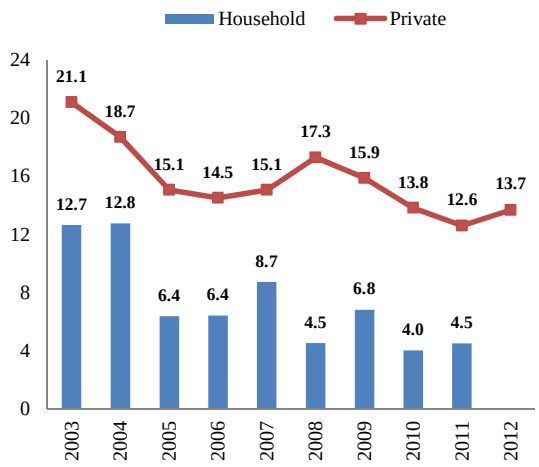
the global economic crisis, which might have affected their consumption and saving behaviour through various channels. The average annual growth rate of Gross Domestic Product (GDP) was 6.4 percent between 2003 and 2011, but it decreased by 4.8 percent in 2009 annually (Figure 1). The annual unemployment rate increased from 10.8 percent in 2004 to 14 percent in 2009 at the height of the global economic crisis, but it fell to 9.8 percent in 2011. Real interest rates declined sharply between 2003 and 2012 (Figure 1). As a result, private and household saving ratios had a downward trend throughout the period of analysis (Figure 2).

Figure 1 – Main Macroeconomic Variables



Source: TURKSTAT, Treasury, CBRT

Figure 2 – Saving Ratios (%)



Source: Ministry of Development, TURKSTAT Household Budget Surveys, Author's calculations

Moreover, the significant rise in GDP per capita presented households with new opportunities. According to World Bank (WB) figures GDP per capita based on Purchasing Power Parity (PPP) at current international prices increased from $8,919 in 2003 to $18,348 in 20012. Arslan and Ceritoğlu (2013) showed that household expenditures on high quality durable goods increased parallel to the rise in their income in the period of analysis. This empirical finding implies that household consumption patterns might have changed during this period. Therefore, household expenditures on durable goods are excluded from total household expenditures. Durable goods, which are often considered as part of

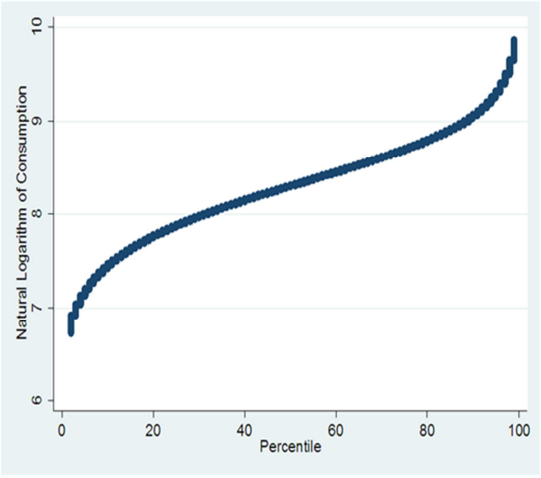
household saving, are home appliances, medical equipment, consumer electronics, new and second-hand automobile purchases and jewellery and watches for personal consumption (Ceritoğlu, 2013a).

There are repeated cross-sectional surveys about household consumption expenditures and income distribution, which are available for researchers instead of proper panel data sets in many developing countries. These repeated cross-sectional surveys enable researchers to acquire knowledge about family types, income distribution and household consumption patterns such as the share of durable goods in total consumption expenditures. However, these surveys are not sufficient for a coherent and satisfactory analysis of household consumption and saving behaviour on their own. Therefore, the creation of a pseudo-panel data set is required, which will be based on the birth years of the household heads using the mean values of main economic variables.

According to the new OECD equivalency scales, adults are weighted by 1, while children who are 14 and older and children younger than 14 years of age are weighted by 0.5 and 0.3, respectively. In this manner, demographic features such as family size, the number of adults and children in the family can be controlled for in the empirical analysis. Moreover, this approach allows us to consider intra-household resource allocation in the empirical analysis.

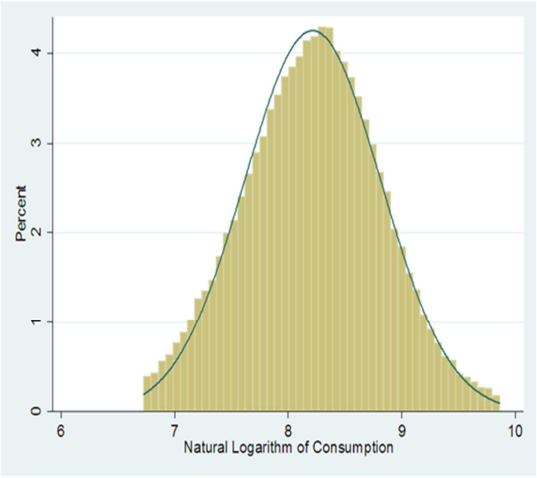
Figure 3 – The Distribution of Consumption

(*Panel a*)



Source: TURKSTAT Household Budget Surveys

(*Panel b*)



Source: TURKSTAT Household Budget Surveys

Previous empirical research shows that demographic factors such as family size might be important, which could influence the estimation of households' degree of prudence (Deaton, 1997 and Attanasio *et al.*, 1999). McKenzie (2006) asserts that decreasing household size will lead to the underestimation of the degree of prudence, whereas increasing will result in the overestimation of the degree of prudence. McKenzie (2006) shows that if household size is not taken into consideration, then younger cohorts' consumption growth is observed faster than its true level in Taiwan. However, it is not possible to analyse family size directly, since the empirical analysis is carried with a pseudo-panel data set, which is formed by taking averages of birth cohorts. Therefore, household consumption is divided by OECD equivalency scales, which are already available in the TURKSTAT Household Budget Surveys, to reach individual consumption values (Figure 3).

Table 1 – Cell Sizes of Cohorts with respect to the Birth Year Interval of the Household Head

	2003	2004	2005	2006	2007	2008	2009	2010	2011	*Average*
1930-1935	1,188	400	320	290	248	274	309	281	235	393.9
1935-1940	1,453	406	392	358	312	345	385	371	358	486.7
1940-1945	1,641	501	501	464	489	493	510	525	469	621.4
1945-1950	2,115	668	671	581	622	594	683	583	654	796.8
1950-1955	2,909	1,003	901	901	920	798	874	873	731	1,101.1
1955-1960	3,071	1,081	1,101	1,016	1,026	986	1,000	1,001	1,054	1,259.6
1960-1965	3,825	1,209	1,207	1,226	1,154	1,131	1,189	1,289	1,200	1,492.2
1965-1970	3,346	1,176	1,134	1,158	1,083	1,075	1,244	1,242	1,205	1,407.0
1970-1975	2,800	973	993	1,118	1,092	1,166	1,290	1,262	1,291	1,331.7
1975-1980	1,384	514	695	780	832	841	1,035	1,050	1,127	917.6
1980-1985	176	80	148	252	370	410	601	725	837	399.9

Source: TURKSTAT Household Budget Surveys

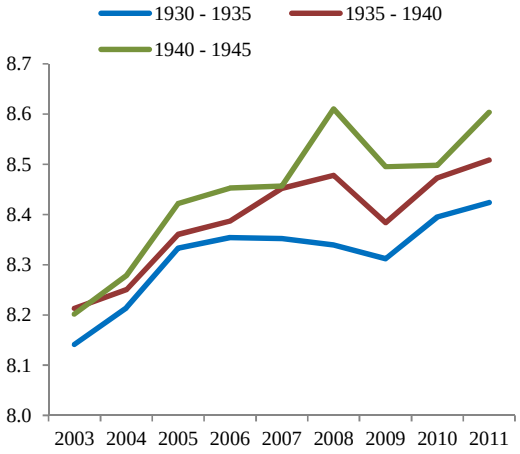
The sample set is separated into cohorts using household heads' birth years as the choice criteria (Table A1).[4] The total number of individual observations using cohort values is 91,870 as a sum of surveys from 2003 till 2011. Household units, which are composed of individuals, who are living together, and families, whose household head is an unpaid family workers are excluded from

[4] According to the classification of the TURKSTAT Household Budget Surveys, a family member who plays a greater role than the rest of the members in at least one important issue is selected as the household head. Bringing income into the family is not the main criteria in the selection of the household head. The household head may be male or female though over 90% of them are actually male. The household head does not have to be the highest income earner in the family, but he/she is responsible for managing household income and consumption expenditures. Household head characteristics have a strong influence over household saving preferences.

the pooled sample. Moreover, the lowest and the highest 1% quintiles of individual consumption are trimmed out to remove potential outliers from the sample set (Figure 3, Panel a). As a result, the distribution of individual consumption from the restricted sample resembles to normal distribution (Figure 3, Panel b). The final sample set is restricted to families, whose household head is between the ages of 20 and 73 in 2003. It can be seen that sufficient number of observations are available for each cohort (Table 1).

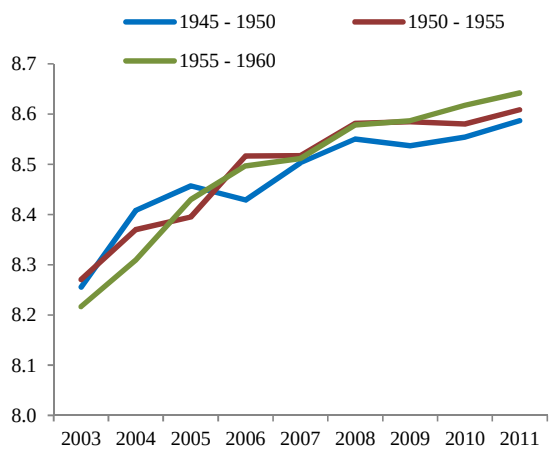
Figure 4 – Consumption Profiles with respect to Cohorts
(*Natural Logarithm of 2003 TL prices*)

(*Panel a*)



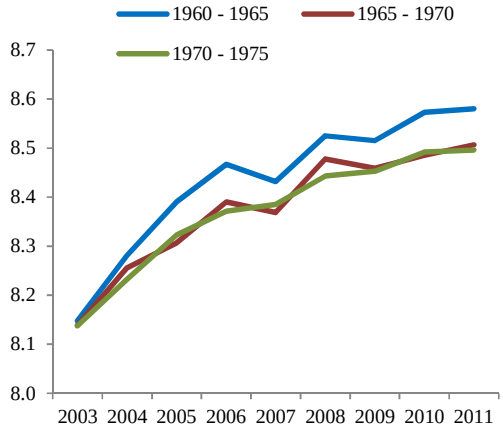
Source: TURKSTAT Household Budget Surveys

(*Panel b*)



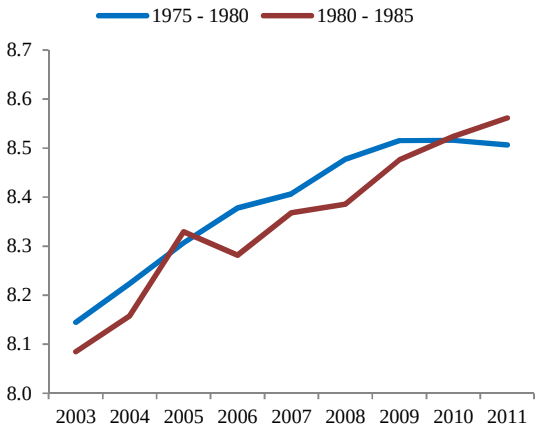
Source: TURKSTAT Household Budget Surveys

(*Panel c*)



Source: TURKSTAT Household Budget Surveys

(*Panel d*)



Source: TURKSTAT Household Budget Surveys

First, each cohort's consumption is calculated by taking the weighted averages of consumption expenditures of all families, who belong to a particular cohort based on the birth year interval of the household head (Table 1). Then, natural logarithms of each cohort's consumption figures are taken for all survey years. Although there are differences between cohorts, their consumption profiles are in general concave over the period of analysis (Figure 4). Especially, consumption profiles of cohorts that are composed of households, whose heads are middle-aged, appear relatively smooth (Figure 4, Panel b and Panel c). Moreover, cohorts that are composed of households, whose heads were born in the five year intervals from 1940-1945 to 1960-1965, have higher consumption levels than older cohorts, who are in retirement period and younger cohorts, who are at the beginning of their working lives. However, the youngest cohort, who is comprised of households, whose heads were born during the 1980-1985 time period enjoys the highest consumption growth rate.

III.2 – Econometric Results

In a seminal paper, Deaton (1985) suggests the use of cohorts from a time series of repeated cross-sectional surveys, when a genuine panel data set is not available. Cohorts can be constructed by focusing on a distinct and static feature, which is observed for all individuals or households such as the birth year of the household head (Browning, Deaton and Irish, 1985 and Verbeek, 2008). McKenzie (2004) discusses asymptotic properties of Ordinary Least Squares (OLS) and Instrumental Variables (IV) estimators and recommends the application of OLS estimation for a pseudo-panel data set; when the cross-section dimension (n) is large, but the time dimension (t) is short in a microeconomic data set. In fact, using cohort values in estimations is identical to an IV approach, where group averages are used as instruments for individual observations.

In this case, the cross-section dimension of the TURKSTAT Household Budget Surveys is large, but the number of cohorts is assumed to be fixed. Thus, average cohort size is significantly large as presented in Table 1, which is required for consistent estimation of parameters of interest (Verbeek,

2008). Households' degree of prudence is estimated with a CRRA type utility function as shown in equation (6). The natural logarithm of each cohort's consumption is first-differenced with respect to the past year, which is then regressed on the square of itself.

$$\Delta \ln \bar{c}_{h,t+1} = \alpha_i + \frac{1}{\phi}\left(\frac{r_{t+1} - \delta}{1 + r_{t+1}}\right) + \left(\frac{\rho + 1}{2}\right) \mathrm{E}_t\left[\left(\Delta \ln \bar{c}_{h,t+1}\right)^2\right] + \nu_{t+1} \qquad (6)$$

The variance of the growth of consumption is considered as the most suitable proxy variable to capture risk and uncertainty. Several empirical studies used the variance of the growth of income as a proxy variable for future labour income uncertainty (Carroll, 1992 and 1994).[5] However, Dynan (1993) asserts that household consumption will change only in response to unforeseen income changes such as an unexpected spell of unemployment rather than the variance of the growth of income.[6] Therefore, I prefer a theoretical approach to reveal the empirical importance of precautionary saving by searching for households' degree of prudence, which is the intensity of the precautionary motive for saving in this paper.

First of all, equation (6) is estimated using OLS regressions following McKenzie (2004 and 2006).[7] The econometric results show that the regression coefficient of relative prudence is statistically significant at 1% confidence level. The oldest and the youngest cohorts are excluded from the final regression in the last row, since their cohorts sizes vary considerably during the period of analysis, which might affect the estimations results. The estimated range of the coefficient of relative prudence ($\rho + 1$) is approximately between 8.9 and 10.2 (Table 2). Moreover, households' degree of prudence is significantly higher than previous estimates for households from advanced economies (Dynan, 1993;

[5] Households tend to underreport their disposable income in household budget surveys. This is especially the case for poor households that do not have social security coverage. They might deliberately hide their labour income in order to benefit from public health care services free of charge. However, household consumption expenditures are measured more accurately due to careful questionnaire design and frequent visits by surveyors. As a result, the variance of the growth of income is considered as a more reliable economic variable than the variance of the growth of income.

[6] Moreover, Carroll et al. (2003, p. 586) point out that ''*… a tenured college professor who, by choice, teaches or consults every other summer may have more variable annual income than a factory worker, but does not face the uncertainty of being laid off during a recession.*''

[7] All econometric estimations include time (*year*) dummy variables to control for macroeconomic changes, which might have affected household consumption patterns.

Merrigan and Normandin, 1996), but its estimated values are closer to the findings of McKenzie (2006) for the Taiwanese households.[8] As a result, the econometric results provide direct evidence in favour of the precautionary saving hypothesis.

The annualised and weighted nominal interest rates that emerge from the Treasury auctions are deflated by annual consumer price inflation rate expectations from the Central Bank of the Republic of Turkey (CBRT) Survey of Expectations (Figure 1). The real interest rate (r) is assumed to be variable over time, but the same for all cohorts. Moreover, the subjective time discount rate (δ) is assumed at 5 percent level and constant throughout the period of analysis. The real interest rate, which is discounted by the individuals' subjective time discount rate, has a statistically significant and positive, but small regression coefficient in all estimations. This finding contradicts with previous empirical research on the Turkish economy with time-series data (Ceritoğlu, 2013b).[9]

Table 2 – OLS Regressions on Full Sample (1)

	CRRA		*CARA*			Number of obs.
	($\rho + 1$)	R-squared	(θ)	*Implied Relative Prudence*	R-squared	
All cohorts	10.22 *	0.67	0.00209 *	9.51	0.59	88
	(0.76)		(0.00027)			
(*excluding 1980-1985*)	9.63 *	0.70	0.00188 *	8.30	0.62	80
	(0.85)		(0.00024)			
(*excluding 1930-1935 and 1980-1985*)	8.94 *	0.69	0.00173 *	7.65	0.62	72
	(0.79)		(0.00022)			

*, **, *** Significant at 1%, 5% and 10% confidence levels, respectively

Robust standard errors are in parenthesis.

(1) Estimations also include time dummy variables.

The CARA type utility function is the only alternative to the CRRA type utility function in the literature. Previously, McKenzie (2006) and Terada-Hagiwara (2012) employed the CARA type utility function to check the robustness of their econometric results. For this reason, households' degree of

[8] McKenzie (2006) analysed the Personal Income Distribution Surveys (PIDS) for the Taiwanese economy from 1976 to 1996, which provides a sufficiently large time dimension to estimate each cohort's degree of prudence. However, the TURSKAT Household Budget Surveys are only available from 2003 to 2011 at the moment (Figure 4). Therefore, it is not possible to estimate equations (6) and (7) for each cohort separately and predict households' degree of prudence at the cohort level.

[9] I re-estimated equation (6) without the time-varying real interest rate. However, the removal of the real interest rate does not influence the estimated values of the degree of prudence. The degree of prudence remains the same whether the real interest rate is included or not in the regressions.

prudence is also estimated with a CARA type utility function and the same pseudo-panel data set from the TURSKAT Household Budget Surveys with equation (7). As before cohort consumption is first-differenced with respect to the previous year, which is then regressed on the square of itself. However, natural logarithms of cohort consumption values are not taken, when the CARA type utility function is selected.

$$\Delta\overline{C}_{h,t+1} = \beta_h + \left(\frac{\theta}{2}\right)\mathrm{E}_t\left[\left(\Delta\overline{C}_{h,t+1}\right)^2\right] + \upsilon_{h,t+1} \tag{7}$$

The coefficient of absolute prudence is a constant, which allows determining the intensity of the precautionary motive for saving (McKenzie, 2006). If the coefficient of absolute prudence assumes a positive value, then the growth of consumption will be higher. The coefficient of absolute prudence is associated with the variance of the growth of consumption, which should reflect the level of risk and uncertainty in the economy. Thus, household saving will be higher in this situation. The regression coefficient of absolute prudence is positive and statistically significant at 1% confidence level (Table 2). The implied coefficient of relative prudence is between 7.7 and 9.5 approximately, which is close to, but smaller than the estimates from the OLS regressions.[10] Thus, the econometric results confirm the previous findings and provide additional support in favour of the precautionary saving hypothesis.

Furthermore, equation (6) is estimated using IV regressions, where the lagged values of the variance of consumption from *t-2* to *t-4* are used as instruments to eliminate the possibility of serial correlation between the explanatory variables and the error terms. However, this approach reduces the number of observations and also the precision of the estimation significantly, since only the fourth lag of the dependent variable has some degree of explanatory power. The regression coefficient of relative prudence is not statistically significant at conventional confidence levels, if all cohorts are included in the estimation. In this case, the regression coefficient of relative prudence is significant only at 10%

[10] The implied coefficient of relative prudence is calculated by multiplying the estimated regression coefficients of absolute prudence with mean consumption level of cohorts that are in the sample.

confidence level, when the oldest and the youngest cohorts are excluded from the estimation. The coefficient of relative prudence is predicted as 9.9 approximately, which is close to prior estimates from the OLS regressions (Table 3).

Table 3 – IV Regressions on Full Sample (1)

	CRRA		Number of obs.
	(ρ + *1*)	R-squared	
All cohorts	11.28	0.42	44
	(3.97)		
(*excluding 1980-1985*)	8.24	0.49	40
	(3.22)		
(*excluding 1930-1935 and 1980-1985*)	9.92 ***	0.48	36
	(3.00)		

*, **, *** Significant at 1%, 5% and 10% confidence levels, respectively

Standard errors are in parenthesis.

(1) The lagged values of the variance of consumption from *t-2* to *t-4* are used as instruments. Estimations also include time dummy variables.

III.3 – Robustness Checks

The self-section of more risk-averse individuals is an interesting topic, which requires further attention within the context of this study. More risk-averse individuals are more likely to choose safe occupations such as public employment, since the probability of becoming unemployed is almost zero for civil servants in Turkey. Moreover, public sector retirees generally have higher pensions and health care services provided for civil servants have significantly higher quality and lower costs compared to the facilities for wage and salary earners from private sector. Fuchs-Schündeln and Schündeln (2005) and Fuchs-Schündeln (2008) analysed the relationship between precautionary savings and the self-selection of more risk-averse individuals using the German reunification as a natural experiment. They concluded that if risk-aversion is not controlled for, then this situation might create a sample selection bias, which could lead to the systematic underestimation of the empirical importance of precautionary savings. Therefore, public sector workers are omitted from the sample set at this point and households'

degree of prudence is estimated for this restricted sample, which includes only members of private sector.

The total number of individual observations is 79,671 as a sum of surveys from 2003 till 2011 for the restricted sample. The regression coefficient of relative prudence is statistically significant at 1% confidence level according to the econometric results. If the youngest and the oldest cohorts are excluded from the sample, then the coefficient of relative prudence ($\rho + 1$) is estimated approximately as 9.4 for this restricted sample (Table 4). This prediction is higher than the initial estimate of 8.9 for the unrestricted sample, which is presented in the last row of Table 2.

Table 4 – Robustness Checks (1)

	CRRA				Number of obs.
	Private Sector Members		*Self-Employed Individuals and Employees*		
	($\rho + 1$)	R-squared	($\rho + 1$)	R-squared	
All cohorts	9.07 *	0.70	10.01 *	0.67	88
	(0.60)		(0.70)		
(*excluding 1980-1985*)	10.09 *	0.77	9.54 *	0.69	80
	(0.64)		(0.94)		
(*excluding 1930-1935 and 1980-1985*)	9.42 *	0.77	8.84 *	0.68	72
	(0.56)		(0.92)		

*, **, *** Significant at 1%, 5% and 10% confidence levels, respectively

Robust standard errors are in parenthesis.

(1) Estimations also include time dummy variables.

Entrepreneurs might play a similar role in the economy, since their degree of risk-aversion might be lower than the rest of the economic agents, but they also face a more volatile income stream, which might force them to raise their saving level for precautionary reasons. In order to shed light on this issue, employers are omitted from the sample set and households' degree of prudence is estimated for this restricted sample. However, self-employed individuals are kept in the restricted sample set, since not only their income level is significantly lower, but also the variance of their income is smaller than employers.

The total number of individual observations is 87,108 as a sum of surveys from 2003 till 2011 for this restricted sample. The regression coefficient of relative prudence is statistically significant at 1% confidence level according to the econometric results. If the youngest and the oldest cohorts are excluded from the sample, then the coefficient of relative prudence ($\rho + 1$) is estimated approximately as 8.84 for this particular restricted sample (Table 4). This prediction is slightly smaller than the initial estimate of 8.94 for the unrestricted sample, which is presented in the last row of Table 2. This finding suggests the precautionary motive for saving must be more effective on employers compared to self-employed individuals. It is also markedly smaller than the estimate of 9.42 for the restricted sample, which excludes public sector employees, which is shown in the last row of Table 4.[11]

The short time span of the available TURKSTAT Household Budget Surveys limits the scope of empirical analysis. I think it will be interesting and useful to analyse the changes in household consumption and saving behaviour in time as more waves are published. Moreover, it is reasonable to expect households' degree of prudence vary between cohorts. Young generations might be less risk averse compared to past generations, since they live in a more prosperous and stable economy with a better social security system. Young generations have more positive experiences in life, which might aspire them confidence such as European Union (EU) full membership candidacy.

One could also argue that if households are becoming less prudent, then this might help to explain the recent fall in household saving ratios in Turkey following Terada-Hagiwara (2012). In order to shed some light on this issue, I estimated equation (6) for selected cohort groups to raise the number of observations in the regressions (Table 5). Unfortunately, the number of observations is not sufficient to estimate equation (6) for each cohort separately.

I selected cohorts with respect to their labour force status and age groups. The first cohort group is formed by combining families, whose household head was born in the five year intervals from 1930-1935 to 1945-1950 and between the ages of 53 and 73 as of 2003. This is the oldest cohort group and mainly composed of retirees. The second cohort group is from families, whose household head was born in the five year intervals from 1950-1955 to 1965-1970 and between the ages of 33 and

[11] However, the number of observations is not sufficient to estimate households' degree of prudence for public sector employees and entrepreneurs separately, since cell sizes for each year would be too small to reach reliable values for cohorts.

53 in 2003. The third cohort group is from families, whose household head was born in the five year intervals from 1970-1975 to 1980-1985 and between the ages of 20 and 33 in 2003 according to the sample restrictions. The econometric results show that the regression coefficient of relative prudence is statistically significant at 1% confidence level in all estimations. The coefficient of relative prudence ($\rho + 1$) is estimated as 9.23 for the oldest cohorts. The coefficient of relative prudence is estimated as 12 for the second cohort group, whose members are mature individuals, who are expected to be at the peak of their careers. Moreover, it is estimated as 10.92 for third cohort group, whose members are young and at the beginning of their working lives (Table 5).

Table 5 – OLS Regressions for Selected Cohorts (1)

Cohorts	*CRRA*		Number of obs.
	($\rho + 1$)	R-squared	
(from 1930-1935 to 1945-1950)	9.23 *	0.77	32
	(1.04)		
(from 1950-1955 to 1965-1970)	12.00 *	0.95	32
	(0.73)		
(from 1970-1975 to 1980-1985)	10.92 *	0.77	24
	(1.31)		

*, **, *** Significant at 1%, 5% and 10% confidence levels, respectively

Standard errors are in parenthesis.

(1) Estimations also include time dummy variables.

IV. Conclusion

This paper predicts households' degree of prudence, which is the intensity of the precautionary motive for saving. For this purpose, a pseudo-panel data set is developed using nine consecutive waves of the TURKSTAT Household Budget Surveys from 2003 to 2011. The final sample set is composed of households, whose heads were born in the five year intervals between 1930-1935 and 1980-1985. Both CRRA and CARA type utility functions are analysed and OLS and IV regressions are employed to estimate the coefficient of relative prudence. The regression coefficients of relative prudence and absolute prudence are significant for the whole sample and sub-samples, which excludes

the youngest and the oldest cohorts. In addition, the regression coefficient of relative prudence is found significant in the IV estimation, when the youngest and the oldest cohorts are excluded from the sample set. Moreover, the econometric results reveal that households are more prudent in Turkey than households from advanced economies. As a result, the empirical analysis provides direct evidence in favour of the precautionary saving hypothesis, which proposes that households postpone consumption and raise their saving ratio to safeguard themselves against risk and uncertainty.

In this approach, the variance of the growth of consumption is considered as the most suitable proxy variable for risk and uncertainty that prevail in the economy. Consumption will change only in response to unexpected income changes such as an unforeseen spell of unemployment rather than the variance of the growth of income. Moreover, the variance of the growth of consumption is considered as a more reliable economic variable, since households tend to underreport their disposable income in microeconomic data sets, whereas household consumption expenditures are measured more accurately due to careful questionnaire design and frequent visits by surveyors. Therefore, I prefer a theoretical approach to reveal the empirical importance of precautionary saving by searching for households' degree of prudence.

The self-section of more risk-averse individuals into safe jobs and the role of entrepreneurs is also analysed in this study. Households' degree of prudence is estimated using OLS regressions for two separate restricted samples, which put aside public sector workers and employers, respectively. The regression coefficient of relative prudence is significant and higher for the restricted sample, which excludes public sector workers. However, the regression coefficient of relative prudence is significant, but smaller for the restricted sample, which excludes employers. Hence, we can conclude that more risk-averse individuals are more likely to search for employment in the public sector instead of becoming entrepreneurs.

Appendix – Descriptive Statistics

Table A1 – Descriptive Statistics

	Number of obs.	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Cohorts born between 1930 - 1935					
Household Income (*2003 prices, TL*)	3,545	8,208.95	6,558.96	5.27	87,130.23
Family Size		3.05	2.19	1	23
Age of the Household Head		73.58	3.05	69	81
Female Household Head		22.45 %			
Home-Ownership		90.10 %			
University Graduate Household Head		1.89 %			
Cohorts born between 1935 - 1940					
Household Income (*2003 prices, TL*)	4,380	9,490.25	9,888.38	288.14	396,553.50
Family Size		3.23	2.22	1	26
Age of the Household Head		68.81	3.21	64	76
Female Household Head		19.52 %			
Home-Ownership		89.04 %			
University Graduate Household Head		2.85 %			
Cohorts born between 1940 - 1945					
Household Income (*2003 prices, TL*)	5,593	10,338.40	9,421.84	0.00	257,806.10
Family Size		3.39	2.20	1	20
Age of the Household Head		64.17	3.15	59	71
Female Household Head		17.45 %			
Home-Ownership		88.58 %			
University Graduate Household Head		4.27 %			
Cohorts born between 1945 - 1950					
Household Income (*2003 prices, TL*)	7,171	11,407.07	9,162.00	0.00	195,235.30
Family Size		3.64	2.15	1	22
Age of the Household Head		59.06	3.19	54	66
Female Household Head		13.50 %			
Home-Ownership		85.61 %			
University Graduate Household Head		6.04 %			
Cohorts born between 1950 - 1955					
Household Income (*2003 prices, TL*)	9,910	12,675.05	11,633.67	4.48	360,512.00
Family Size		3.99	2.11	1	23
Age of the Household Head		54.06	3.08	49	61
Female Household Head		10.52 %			
Home-Ownership		82.04 %			
University Graduate Household Head		7.18 %			

Table A1 – Descriptive Statistics (cont'd)

Cohorts born between 1955 - 1960					
Household Income (*2003 prices, TL*)	11,336	13,045.67	11,186.65	0.00	305,597.40
Family Size		4.21	1.94	1	19
Age of the Household Head		49.30	3.15	44	56
Female Household Head		9.11 %			
Home-Ownership		76.30 %			
University Graduate Household Head		7.69 %			
Cohorts born between 1960 - 1965					
Household Income (*2003 prices, TL*)	13,430	12,686.77	11,654.98	4.48	365,240.10
Family Size		4.51	1.77	1	19
Age of the Household Head		44.26	3.17	39	51
Female Household Head		7.74 %			
Home-Ownership		68.09 %			
University Graduate Household Head		6.74 %			
Cohorts born between 1965 - 1970					
Household Income (*2003 prices, TL*)	12,663	11,464.93	9,783.07	0.00	212,566.60
Family Size		4.56	1.61	1	17
Age of the Household Head		39.47	3.17	34	46
Female Household Head		7.38 %			
Home-Ownership		59.59 %			
University Graduate Household Head		8.00 %			
Cohorts born between 1970 - 1975					
Household Income (*2003 prices, TL*)	11,985	10,883.90	9,433.94	4.48	167,731.50
Family Size		4.33	1.57	1	30
Age of the Household Head		34.70	3.12	29	41
Female Household Head		6.34 %			
Home-Ownership		48.44 %			
University Graduate Household Head		8.66 %			
Cohorts born between 1975 - 1980					
Household Income (*2003 prices, TL*)	8,258	10,562.26	9,683.36	5.27	257,398.70
Family Size		3.82	1.54	1	22
Age of the Household Head		30.39	2.94	24	36
Female Household Head		5.92 %			
Home-Ownership		38.64 %			
University Graduate Household Head		10.29 %			
Cohorts born between 1980 - 1985					
Household Income (*2003 prices, TL*)	3,599	9,817.16	7,000.91	0.00	105,579.50
Family Size		3.42	1.52	1	20
Age of the Household Head		27.13	2.38	20	31
Female Household Head		8.31 %			
Home-Ownership		30.56 %			
University Graduate Household Head		10.59 %			

Source: TURKSTAT Household Budget Surveys

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