Unemployment Risk and Buffer-stock Saving: An empirical investigation in Japan*

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Abstract

The purpose of this paper is to investigate, using micro data, the strength in Japan of the precautionary saving motive. While numerical simulations suggest the economic importance of precautionary saving, the empirical evidence is mixed. In this paper, we apply the buffer-stock saving model and focus on the effect of unemployment risk on wealth accumulation. We find that uncertainty has a positive and statistically significant effect on the wealth-to-income ratio, and that buffer-stock savings account for 6 or 15 percent of net financial assets. Housing loans and expenditures associated with children decrease this ratio.

JEL: D91, E21.

Key Words: buffer-stock saving, unemployment risk.

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1 Introduction

The purpose of this paper is to investigate, using micro data, the strength in Japan of the precautionary saving motive. The Japanese economy has been sluggish since the early 1990s, and one of the reasons for this is said to be consumer behavior. In past recessions, consumption remained fairly stable and supported the economy as a whole (the so-called "ratchet effect"). However, this has not been the case in the 1990s, as consumer sentiment has been depressed because of increasing uncertainty regarding the future. Higher risk of job loss and unemployment are suggested as causes of this uncertainty. In fact, the job loss rate of men in their twenties to fifties increased from 1.3 percent in 1992 to 1.7 percent in 1997 (Figure 1). Here we focus on the effect of unemployment risk on wealth accumulation.

***** Figure 1 around here *****

Over the past few decades, various studies have been devoted to precautionary saving. While there are many theoretical studies that identify a relationship between precautionary saving and wealth accumulation, empirical evidence is mixed. Some simulations suggest that it is of economic importance, while others find little or no relationship.

This paper contributes to the investigation of precautionary wealth accumulation by examining micro data in Japan. Several articles (e.g., Zhou 2003, Murata 2003) have studied precautionary saving in Japan using micro data, and this paper adds to that work by carefully selecting our uncertainty proxy and instrumental variables. First, we employ the job loss rate as a measure of risk. Previous studies have often proxied risk using either the variance of income or expenditure, which may simply reflect the preferences of households. Our measure of uncertainty, the job loss rate, presumably influences saving behavior only through uncertainty; thus, we believe that job loss rates are good proxies of uncertainty, as well as being exogenous variables. Second, we try to avoid relying on instrumental variables that may be correlated with unobservable determinants of saving behavior by making use of the prefecture of residence.

Our econometric model of precautionary wealth includes permanent income as an explanatory variable, which cannot be observed directly. This requires us to find instrumental variables to be excluded from the explanatory variables. Because most households do not seem to choose the prefecture of residence according to their saving habit, we pick up this variable as the excluded instrument.

We test a hypothesis implied by the buffer-stock saving model (Carroll et al. 2003) and find that the results support this hypothesis. Our empirical findings suggest that uncertainty is statistically significant and increases the wealth-to-income ratio, while the buffer-stock savings account for 6 or 15 percent of net financial wealth. These figures seem to be smaller than those found in some previous studies, but this may be because we focus only on job loss risk and not on income fluctuations.

This paper is organized as follows. Section 2 provides an overview of previous studies about precautionary saving. In Section 3 we present Carroll's buffer-stock saving model and our estimate equation. Section 4 explains the data sets. We show the estimation results in Section 5. Section 6 concludes.

2 Literature

Over the past few decades, a considerable number of studies have examined precautionary saving. This appears to be a key factor that explains some major stylized facts that include "consumption/income parallel", "consumption/income divergence", and patterns of wealth accumulation during a lifetime (Carroll 1997). In addition, many studies argue that uninsured shocks that cause precautionary saving determine the distribution of income, asset holdings, and consumption. However, the empirical evidence is mixed.

A permanent income hypothesis subsequent to Friedman's was formulated by Hall (1978), who presented the hypothesis of a random walk of consumption, but there was no notion of precautionary saving. After Leland (1968) first proved the existence of precautionary saving, Kimball (1990) introduced 'prudence' and demonstrated the relationship between the magnitude of precautionary saving and the characteristics of utility function. On the other hand, Aiyagari (1994) and Huggett and Ospina (2000) proved analytically that, under general equilibrium, setting idiosyncratic shocks increases aggregate capital stock regardless of the Leland condition.

Many studies, including Barsky et al. (1986), Zeldes (1989), Carroll (1997) and Abe and Yamada (2004) used numerical simulation to show the importance of precautionary saving, because it is difficult to examine analytically its property once a constant relative risk aversion (CRRA) instantaneous utility function, which is often used in macroeconomics, is assumed.

Empirical studies that seek evidence of precautionary saving may be divided into three types. The first type examines the aggregate saving function using aggregate time series data. Ogawa (1991), Doi (2001) and Niimi (2001) studied Japanese data and found an effect of precautionary saving.

The second type uses constant absolute risk aversion (CARA) utility functions, by which we can draw a linear estimate equation without approximation. Zhou (2003) verified the existence of precautionary saving by using Japanese household-level micro data and the method shown in Dardanoni (1991).

The third type employs CRRA utility functions and derives a linear estimate equation using Taylor approximation, by which the rate of risk aversion can be estimated. However, the results of this type of research are mixed. Attanasio and Weber (1995) used the first order Taylor series expansion and demonstrated that their Euler equation is in line with the patterns of consumption after controlling the characteristics of households and labor supply. On the other hand, Dynan (1993) estimated second order Taylor approximation and could not reject the null hypothesis that the rate of risk aversion equals zero(1). Dynan concluded that liquidity constraints could not explain this rejection and that her data provided no evidence for precautionary saving motives(2).

Consumer Expenditure Survey in U.S. is utilized in many studies including Dynan (1993)

(1)Hori and Shimizutani (2005) employ the method of Dynan (1993) to estimate the coefficient of prudence for Japanese households in the second half of the 1990s. Their estimated value is four, which is much higher than that in Dynan (1993).

(2)Parker (1999) also pointed out that the reason for rejection of the simple Euler equation is neither precautionary saving nor liquidity constraints, but near-rationality.

and Attanasio and Weber (1995), while Lusardi (1997) makes use of Italian Survey of Household Income and Wealth. As of Japan, Zhou (2003), Murata (2003), Abe and Yamada (2005, 2006) and Hori and Shimizutani (2006) use micro data. While Zhou (2003), Murata (2003) and Hori and Shimizutani (2006) rely on standard regression analysis, Abe and Yamada (2005, 2006) are based on the micro-founded structural estimation(3). The method in these papers differ each other, and the proxies of uncertainty also differ. Zhou (2003) employs the variance of income, Abe and Yamada (2005) and Hori and Shimizutani (2006) uses the variance of expenditure, and the uncertainty measure in Murata (2003) is subjective, an answer to a question regarding economic prospects. As discussed below, such variables could simply reflect differences in preferences of households and not necessarily be appropriate measure of uncertainty.

Turning now to the estimation equation. The puzzling results of estimating approximated Euler equations could be explained by simplified assumptions that excluded liquidity constraints, self-selection, or the specification of utility functions(4). Ludvigson and Paxson (2001) and Carroll (2001) demonstrated that the log-linearized Euler equation cannot be estimated consistently due to the approximation error of Taylor approximation. They argued that the estimates in Dynan (1993) may be down-biased. If log-linearized Euler equations cannot be estimated consistently, how can we detect the precautionary saving motive? A series of Carroll's studies provides one alternative. Carroll's hypothesis is known as the buffer-stock saving model. In this paper we examine this model using micro data from Japan.

3 Buffer-Stock Saving Model

Carroll (1997) and a series of his studies present a buffer-stock saving model based on the Deaton (1991) model. The consumer in the model solves the intertemporal optimization problem. The lifetime utility is time-separable, and the instantaneous utility is CRRA as usual. There is no

(3)They estimating the deep parameters in income process and preference to investigate the differences between the consumption and income inequalities by using the buffer stock saving model.

(4)Asano and Tachibanaki (1992,1994) achieved a result based on Nikkei Radar that showed that the relative risk aversion is not constant, but decreases with income.

explicit liquidity constraint. The only uncertainty exists in current labor income. The realized current labor income is a product of permanent income and a temporary shock. Permanent income tends to grow at a constant rate, but is subject to a multiplicative permanent shock, which follows the log-normal distribution. The temporary shock takes zero value with a positive probability, which represents catastrophic situations.

Cumulating permanent shocks in labor income means that permanent income grows with a stochastic trend. Considering the common fact that employees' income grows until they approach retirement, this saving model describes the behavior of the middle-aged who are not clearly apprehensive of retirement. Positive probability that a temporary shock is zero represents the existence of unemployment risk. We focus on this probability, which indicates the magnitude of unemployment risk.

In this model, impatient consumers have targets regarding the ratio between non-human capital and permanent income, X_t/Y_t^p. Since consumers are impatient and discount the future, they do not have much financial wealth. However, because the probability is positive, that incomes continue to be zero until death, and because the instantaneous utility of zero consumption is minus infinity, consumers set voluntary liquidity constraints and save for precautionary purposes. These two mixed effects force consumers to hold the wealth-to-income ratio at a constant level.

This wealth-to-income ratio is larger where the average growth rate of permanent income is lower and where variance of income is larger. In other words, this model predicts that the wealth-to-income ratio is larger as unemployment risk increases.[5].

One way to test the buffer-stock saving hypothesis is based on an estimation using household asset data (Carroll et al. 2003, Carroll and Samwick 1998). In this paper we test the hypothesis mentioned above that unemployment risks have a positive relationship to the wealth-to-

[5] As Carroll (1997) demonstrated, this hypothesis and numerical simulation can explain some stylized facts that the standard life cycle/permanent income hypothesis cannot explain. The facts include "consumption/income parallel", which emerges from aggregate data, "consumption/income divergence", and the patterns of wealth accumulation over a lifetime, which emerge from micro data.

permanent-income ratio[6]. The model ignores other important saving motives and differences in preferences or income process. To pick out the relationship between the wealth-to-income ratio and unemployment risks, we have to control for other explanatory variables that reflect other components that affect saving behavior. The estimated equation we use here is close to that of Lusardi (1997).

$$g\left(\frac{W_j}{Y_j^p}\right) = \beta_0 + \beta_1 Pr(u_j) + \beta_y \ln Y_j^p + C_j\beta_c + \varepsilon_j \tag{1}$$

where W_j is assets, Y_j^p is permanent income defined in the previous section and g is a non-decreasing function. Lusardi (1997) used a natural logarithm as g, Murata (2003) used identical transformation, while Carroll et al. (2003) used the inverse hyperbolic sine function[7]. $Pr(u_j)$ represents unemployment risks and C_j denotes other household characteristics. We use natural logarithm as base cases[8], and the results of cases where the inverse hyperbolic sine function is used as g are included in the Appendix.

4 Data

We use the 1997 wave of Nikkei Radar micro data on households. The sample households were chosen at random from the Tokyo metropolitan area in Japan (Tokyo, Saitama, Chiba, Kanagawa, and Ibaraki prefectures). The households were expected to answer the questionnaire in their homes. The number of effective respondents was 2721, and the response rate was 54.4 percent. The questionnaire included a large number of questions on the households' financial assets.

As Carroll (1997) pointed out, the buffer-stock saving model explains well the saving behavior of younger generations who do not yet care about retirement. In addition, the assumed process

(6) It is also true that a high-risk household may hold fewer assets than a lower-risk household if the high-risk household has recently experienced an unemployment.

(7) Watanabe (2005) used the logarithm of precautionary wealth as the dependent variable.

(8) If asset W_j is equal or less than zero, we cannot define the dependent variable. Such observations are, however, less than 7 percent of our sample.

of labor income is intended to describe that of employees. Considering these points, we restricted the sample so that both the household heads and spouses are younger than 55 years of age, and household heads are employees or public workers. The remaining sample size was 1559.

4.1 Uncertainty

The most appropriate empirical measure of uncertainty in the research into precautionary saving is not obvious. Many previous studies have proxied uncertainty with either variances of income (Dardanoni 1991, Zhou 2000, Carroll and Samwick 1998) or expenditure (Dynan 1993). However, it is possible that such variables simply reflect differences in preferences of households, so they may be poor proxies or endogenous variables. To avoid the endogeneity of these variance variables, instrumental variable methods can be used (Dynan 1993), but usual demographic or educational variables may not be excluded variables since they may influence saving behavior not only through uncertainty but also directly. It is important to find variables that represent uninsured shocks on grounds of measures to avoid risks and self-selection, while containing less noise and more information.

Lusardi (1998) and Carroll et al. (2003) employed the probability of job loss as a proxy of uncertainty. Lusardi (1997) used subjective data on variance of income normalized by permanent income, σ_j^2/Y_j^p, but also used unemployment rate as an instrument. Following these studies and considering the purpose of this paper, we adopt as a measure of uncertainty the probability of job loss. However, Nikkei Radar does not include data about job loss. We make use of other aggregate, not micro, data to construct the data on probability of job loss[9]. The following three variables are created to check robustness.

Job loss rate (a) *The Employment Status Survey* was conducted in 1997, and here we can obtain the numbers of those who left jobs, those who are not working continuously, those who did not change jobs, those who did change jobs, and those who are newly engaged in

[9] We can interpret these variables as consistent fitted values from regressions where job loss rates are regressed on group dummy variables. In other words, job loss rate variables are instrumented by these dummy variables.

jobs, by categories of gender, age, education, and marital status. In this survey, those who left jobs or who are not working continuously are considered as not working, while those who did not change jobs, changed jobs, or are newly engaged in jobs are assumed to be working. From these numbers we define the job loss rate. After subtracting home workers and students from those who left jobs[10], the job loss rate is defined as the ratio of those who left jobs, divided by the sum of those who left jobs, did not change jobs, and changed jobs, by the categories above. We list these job loss rates in Table A1 for reference.

Job loss rate (b) We can obtain from *The Employment Status Survey* the numbers of those who left jobs, are not working continuously, did not change jobs, changed jobs, and are newly engaged in jobs, by categories of gender, age, and firm size[11]. In this case we cannot exclude home workers and students, but we can define the job loss rate in the same way as above. Also, we cannot take into account the reasons for leaving jobs stated in the data.

Job loss-or-change rate We make this variable the ratio of those who left jobs and changed jobs, divided by the sum of those who left jobs, did not change jobs, and changed jobs, by categories of gender, age, and firm size.

We also calculate standard deviations of income for each category defined above in (a) and (b) to compare the results[12]. The income variance variables can be obtained from Nikkei Radar.

4.2 Other Variables

We estimate (1), in which we regress the wealth-to-income ratio on the probability of job losses and permanent income, while controlling for other characteristics of the household.

Wealth We use several kinds of data for wealth. First is gross financial assets, which include

[10] Since home workers include those who quit jobs just after marriage, we consider that it is not appropriate to count those people.
[11] Job loss rate (a) does not distinguish between private company and public workers, but job loss rate (b) does.
[12] We eliminated groups containing less than 10 observations.

bank deposits, postal savings, trust savings, bonds, stocks, investment trusts, other financial products, employee savings program, and workers' property accumulation savings. It excludes life insurance, public and private pensions, gold and real estate. Since the buffer-stock saving model assumes full liquid assets, financial assets are suited to the model.

Second is net financial assets, which consists of gross financial assets minus loans. It must be noted that net financial assets exclude housing loans. The Nikkei Radar has rich data about financial assets, but does not have data for the balance of housing loans. Housing loans may play an important role in the decision-making for savings, and therefore we introduce dummies on housing style as below. These two variables are part of a basic model in this paper.

Third is net financial assets including part of life insurances. In most empirical studies of Japanese households, life insurances are assumed as a financial asset. Thus, we estimate the surrender value of the insurance policy according to Iwamoto and Furuya (1995), and add them to gross financial assets. That is, we assume that the surrender value of the insurance policy equals the full maturity return of a single-premium endowment insurance plus half the value of maturity returns of other life insurances.

Permanent income We consider permanent income to be "normal" labor income, which is defined in Section 3 as Y^p. Although the Nikkei Radar contains data for pre-tax annual income of households, they are not just for "normal" labor income. Thus, we use these data as an endogenous explanatory variable and employ an instrumental variable (two stage least squared) method as discussed below. Since what we need is "normal" labor income of household, the instrument variables include the standard determinants of wage (e.g. Tachibanaki 1996), i.e., gender, age, age squared and dummies for college or university education, working for a private company, positions in the company, firm size, and the prefecture of residence of the household head. The wealth data are of household, thus a dummy variable that takes unity if the spouse is working is also added.

Other control variables As Carroll et al. (2003) pointed out, we cannot reject *a priori* that most variables used in the estimation of permanent income may have some independent influence on wealth other than their effect on the permanent income, such as effects through the growth rate of permanent income. Therefore, we include all variables used to estimate permanent income as C_j, except for dummies for the prefectures of residence. Other control variables include demographic factors (number of dependent parents and children, dummy for other resident relatives), dummies for housing style, and dummies for life-stage, as well as the variables used as the instruments for permanent income as mentioned above. Dummies for housing style consist of those for having a housing loan, planning to have a housing loan, and home ownership. Life-stages are classified in ten categories: single, married, first child is born, the first child enters primary school, the first child enters junior high school, the first child enters high school, the first child enters university, the first child leaves home, the last child leaves home.

4.3 Identification issues

As we have one endogenous explanatory variable (permanent income) in our model[(13)], we need at least one instrumental variable, which is exogenous and relevant, excluded in the second-stage regression to implement instrumental variable estimation. As mentioned previously, however, we cannot reject *a priori* that most variables used in the estimation equation of permanent income may have some independent influence on wealth. Following the spirit of Carroll et al. (2003), we choose the dummies for the prefecture of residence as the excluded variables[(14)]. Regarding exogeneity, the prefecture of residence is likely to be uncorrelated with preference parameters related to saving, because most households do not seem to choose to live in a particular prefecture according to their saving habit. As for relevance, the prefecture dummies

[(13)] The estimation method in this paper is different from that of Carroll et al. (2003), because we cannot estimate the job loss rate using micro data and do not instrument the variables regarding the job loss rate.

[(14)] Since the residents living in the Central Tokyo (the 23 Wards) are identified from those in the other area of Tokyo, we have five instrumental variables.

might be weak instruments[15], because the geographic coverage of our data is limited to the Tokyo metropolitan area. To check this point, we calculate the first-stage F-statistics in what follows. Because the F-statistics seem to be large, as noted below, we believe that the instruments are relevant. If the validity of the instruments is violated, the estimator will be biased and no longer reliable. We estimate other models with alternative excluded instrumental variables to check the validity and reassess our choice of the excluded instrumental variables.

5 Results

5.1 Baseline case

Sample statistics are shown in Table 1, and the correlation coefficients between the ratios of financial assets to permanent income and measures of job loss risk are shown in Table 2.

***** Table 1, Table 2 around here *****

Job loss rates (a) and (b) correlate positively with the ratios of the financial assets to permanent income, while the job loss-or-change rate correlates negatively with that. The correlations are rather weak.

Table 3 provides the results of a linear regression of net financial assets on the income variance or the job loss rate. For job loss rates (a) and (b), the corresponding estimated coefficients are positive but statistically insignificant. The estimated coefficients of the job loss-or-change rate are negative, as we may expect from the results shown in Table 2.

***** Table 3 around here *****

We next estimate simple regressions where the control variables include the usual demographic factors used in previous studies (e.g., Lusardi 1997). The results are shown in Table

[15] The sample in Carroll et al. (2003) covers the entire U.S.A.

4. The estimated coefficients for the job loss rates are positive and statistically significant only in the case of the standard deviation of income. Labor economists have suggested that having multiple workers in a household is one way to avoid income risk. Thus, it may be natural that these households have few financial assets. On the other hand, because working for a private company is more risky than being a public worker in terms of income risk, the coefficient of the dummy for working for a private company may well be positive. The corresponding coefficients have the expected signs but are not statistically significant. The results also suggest that the asset–income ratio depends on age and that dependent children reduce the stock of financial assets accumulated. The coefficients on the dummies for higher education are positive and significantly different from zero. This result supports that of Lawrence (1991). As Lawrence (1991) suggested, the time discount factor of such households is lower and they tend to put more weight on the future.

***** Table 4 around here *****

Table 5 presents the results for the cases where the dummies for housing style are added to the control variables. The effect of the housing style variables on the asset–income ratio is statistically significantly. Having a housing loan decreases financial assets, while home ownership increases financial assets. The net effect of home ownership with a housing loan is negative. Planning to have a housing loan has a positive effect on financial asset accumulation. This may reflect the fact that housing loans in Japan need down payments, as Hayashi et al. (1988) pointed out, or that housing loan payments are mandatory expenditure for households and force them to save less. Carroll et al.(2003) also find that homeowners have higher net worth than nonhomeowners relative to income.

***** Table 5 around here *****

Table 6 shows the results of the regression where we explicitly take into consideration other factors that may affect the asset–income ratio through the growth rate of permanent income or variance of temporary shock. F statistics of the first-stage regressions for the regional dummies are rather small, but the null hypothesis that the corresponding coefficients are all zero are statistically rejected. This suggests that our instrumental variables are not very week. Hansen's J statistics are somewhat large, p-values for which range around 0.07 and 0.08. These statistics may contest the validity of our instruments, thus we check the robustness below. Since in most cases below the J statistics are small enough, we employ these results as basic findings here.

All the coefficients of the job loss rates are statistically significantly and positive. These results could imply the significance of buffer-stock assets. The reason why such precautionary saving effects are not picked up in Tables 3, 4 and 5 may be missing variable bias, and it is likely that details of household characteristics, especially life stage, affect the asset–income ratio.

Our findings show that a one percent increase in the job loss rate increases W_j/Y_j^p by 3.2–6.3 percent. These figures probably indicate smaller precautionary effects than in Carroll et al. (2003), whose results show that their median household increases W_j/Y_j^p by 17 percent in response to a one percent increase in job loss rate. This may be because of the fact that the estimated standard deviations of their job loss rate, $Pr(\hat{u}_j)$ are larger than ours. On the other hand, the results in Table 6 seem consistent with those in Carroll and Samwick (1997). The magnitude of precautionary motives in Japan and the U.S.A. might not be so different.

How large are precautionary savings? We define buffer-stock savings as the decrease in savings when the job loss risk is zero. The bottom row in Table 6 suggests that buffer-stock savings account for 6.1 or 15.4 percent of net financial wealth. These figures are larger than those of Ogawa (1991), who found it to be less than one percent, but are consistent with Zhou (2003). Two recent studies suggest larger impacts on the precautionary motive than our results. The results shown in Murata (2003) imply that one-third or one-fourth of financial wealth can be attributed to uncertainty over future pensions. Abe and Yamada (2005) estimate the parameters of a utility function and show that about forty percent of savings by young consumers is because of the precautionary motive. The reason why our results suggest the relatively small impact of the precautionary motive is that only job loss risk is taken into account in our estimation. Murata (2003) focuses on the uncertainty regarding public pensions, while Abe and Yamada (2005) focus on the overall variance of income. It seems to be natural that precautionary savings for a particular risk are smaller than precautionary savings as a whole.

***** Table 6, Table 7, Table 8 around here *****

Tables 7 and 8 show the estimation results when we use gross and net financial assets respectively, including part of life insurance as a dependent variable. F statistics of the first-stage are not very different from those in Table 6, while J statistics seem to be small enough to confirm the validity of the instrumental variables. Some coefficients change value, and those for job loss risk become statistically insignificant but remain positive. We cannot say for certain why households buy life insurance plans, but it may mean that they do not think of life insurance as a buffer against unemployment, even if they can withdraw the money in the case of an emergency(16).

5.2 Robustness check

As noted above, we construct the job loss rate data from *The Employment Status Survey* and match them with the observations used in our sample. Because our job loss rate data might not reflect unanticipated job losses in some cases, we check the robustness of the baseline results by making use of subsamples for job loss rate (a). The results are shown in Table 9. In some cases F statistics for the excluded instruments are not sufficiently large, but J statistics are in most cases small enough.

***** Table 9 around here *****

(16)We suppose that there is little correlation between life insurance assets and the job loss rate, so including life insurance may weaken the statistical significance of the equation.

First, we remove the observations whose job loss rate equals zero, i.e., married males aged 20–24 with a 2-year college education, married males aged 20–24 with a 4-year university education and married males aged 50–54 with a 2-year college education. The zero job loss rate may not reflect the job loss risk adequately, because there seem to be very few 2-year college or 4-year university graduates in their early twenties who are in the labor force, and because most 2-year colleges are predominantly women's institutions in Japan. The results shown in Table 9, case (i) are quite similar to the baseline results, probably because of the small size of the shortened subsample.

Second, we drop off the observations for females either partly or entirely. The job loss rate (a) takes high values for females in their twenties or thirties. The high probabilities simply reflect that they are likely to leave the labor force when they marry or have a baby, not that they face a high risk of unanticipated job loss. Then we exclude the observations for females aged less than 30 in case (ii), those of females who are 2-year college graduates in case (iii), and those of females in case (iv). The results in Table 9 show that the estimated coefficients for the job loss rate are larger than the baseline results but statistically insignificantly in cases (iii) and (iv). These larger coefficients could indicate that the baseline results underestimate the magnitude of the precautionary motive.

Third, we drop off the observations for older people. In case (v), we exclude the subsample of those aged 50 or younger, and in case (vi), those aged 45 or younger. Because the theoretical model describes the behavior of the middle-aged who are not clearly apprehensive of retirement, the precautionary motive can be detected strongly in the sample of younger households. The results shown in Table 9, however, do not seem to be consistent with such predictions. The estimated coefficients for the job loss rate are not very different from the baseline case, while those for permanent income are smaller. These results suggest that the magnitude of the precautionary motive does not change with age but that the change in the relative volume of financial assets, in response to an increase in permanent income, becomes larger with age.

5.3 Sensitivity tests

The dummies for the prefectures of residence have been used as the excluded instrumental variables so far. We discussed earlier that the prefecture dummies may be valid instruments, and the F statistics of the first stage regressions and Hansen's J statistics may support their validity. This subsection considers the sensitivity of our results to the choice of instruments. Columns 2 and 3 of Table 10 report the results when firm-size dummies or position dummies are instrumental variables that are excluded from the second-stage regression as control variables and prefecture dummies are included as control variables, following Carroll et al. (2003). When excluding firm-size dummies, the estimated coefficient for the job loss rate is slightly larger than for the baseline case, and the coefficient for permanent income increases substantially. Because the F statistic is sufficiently large and Hansen's J statistic is small, this result supports the validity of the firm-size dummies as the instruments. It is true that households can choose the size of firm, but at the same time firms also decide whom to hire. This may be the reason of the validity of the firm-size dummies. On the other hand, the coefficients for the job loss rate and permanent income do not seem to change significantly when excluding the position dummies, but the J statistic is rather large. This may be because positions in the company have a direct effect on preference parameters related to saving, and thus the position dummies are invalid instrumental variables.

Comparing these results with the baseline results, the firm-size dummies may be better instruments than the prefecture dummies in our model. If the firm-size dummies are preferable instruments, the effect of permanent income on wealth relative to permanent income is larger than that detected in the baseline case. In either case, however, the magnitude of the precautionary saving is estimated to be 6 or 7 percent of total wealth, which is smaller than found in the previous studies in Japan (Abe and Yamada 2005, Murata 2003).

***** Table 10 around here *****

The standard error of income has been used as an explanatory variable just to compare the results, because the observed income variations simply reflect differences in preferences of households, as discussed in the data section. Here, as one of the sensitivity tests, we include the standard error of income as well as the job loss rate as explanatory variables, which also tests the combined effects of job loss risk and earning uncertainty. The results are shown in Table 11. The values of F statistics and Hansen's J statistics are not so different from those in Table 6, which seems to support the validity of the instrument variables. The coefficients of the two variables that represent income risks are estimated positive, and in some cases, statistically significantly. We have also calculated the buffer-stock savings, which account for about thirty percent of the net financial wealth. These results seem to be consistent with those in Table 6, and suggest still smaller effects of income risk shown in Abe and Yamada (2005).

***** Table 11 around here *****

6 Conclusion

This paper investigates the strength of precautionary saving motives using micro data provided by Nikkei Radar. In this paper, we carefully choose our uncertainty proxy and instrumental variables. First, we employ as a measure of uncertainty the data on job loss rates. Previous studies have often proxied uncertainty using the variance of either income or expenditure. Such variables may simply reflect preferences of households, making them endogenous. Our measure of uncertainty, job loss rate, influences saving behavior only through uncertainty, which seems to be supported by our empirical evidence. In this respect, we believe that job loss rates are good proxies of uncertainty as well as exogenous variables. Second, we try to avoid using instrumental variables that may be correlated with unobservable determinants of saving behavior, making use of the prefecture of residence that presumably is uncorrelated with preference parameters related to saving.

Our empirical results suggest that uncertainty increases the wealth-to-income ratio and that buffer-stock savings account for 6 or 15 percent of net financial wealth. These figures seem to be smaller than those found in some previous studies, but one explanation for this is that we focus only on job loss risk, not on the risk associated with income fluctuations.

There are a few Japanese studies regarding precautionary saving that utilize micro data. Our research is one such study, but it has several problems. The Nikkei Radar covers only the Tokyo metropolitan area, and this area is unique in many aspects. We obtain results for the buffer-stock saving model, but we cannot make a general conclusion regarding Japan. Because we do not have micro data for job history, the data for the job loss rate, which previous studies considered a better proxy for uncertainty, are taken from survey data, not micro data. Also, the income and asset data of Nikkei Radar are not measured in real values but in categorized values. Although the categories are small, the data may contain measurement error. On the other hand, the rich information that Nikkei Radar has about portfolios is not adequately used. These problems will be addressed in the future.

As Carroll and Kimball (2000) and Huggett and Ospina (2000) found, precautionary saving is now considered to have a strong relationship with liquidity constraints. Our future task is to undertake empirical studies in Japan on liquidity constraints and their effect on precautionary savings.

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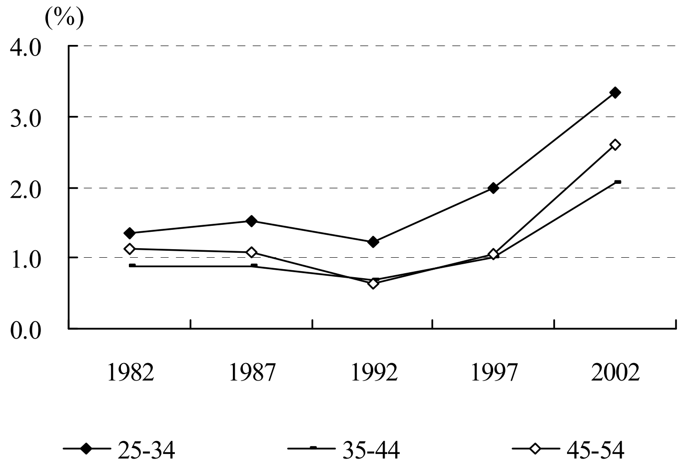
Figure 1: Job loss rate, Males, 1982-2002



(note) The job loss rates are defined as the ratios of those who left jobs to those who had jobs one year before, based on *Employment Status Survey*, various years.

Table 1: Sample statistics

	average	sd	max	min
Gross financial assets	66.229	93.167	1000	1
Net financial assets	62.073	97.176	1000	-665
Net financial assets incl. LI	87.496	115.013	1050	-665
Household income	76.718	40.955	400	5
Net financial assets / Y^p	0.823	1.169	17.617	-7.949
Gross financial assets / Y^p	0.880	1.114	17.617	0.010
Net financial assets incl. LI / Y^p	1.172	1.378	17.617	-7.949
S.D. of income	30.891	12.995	79.630	0
Job-loss rate (a)	1.408	2.016	20.186	0
Job-loss rate (b)	2.216	3.356	15.215	0.106
Job-loss-or-change rate	5.608	5.410	25.918	0.530
Male dummy	0.897	0.304	1	0
Age	39.327	8.584	54	23
Number of parents	0.101	0.370	3	0
Number of children	1.186	1.085	9	0
Live with other relatives	0.073	0.260	1	0
Double income	0.374	0.484	1	0
Private company	0.878	0.327	1	0
University	0.628	0.484	1	0
Have a housing loan	0.383	0.486	1	0
Plan a housing loan	0.284	0.451	1	0
Own House	0.676	0.468	1	0
Firm size dummy				
under 10	0.060	0.238	1	0
10 - 49	0.145	0.352	1	0
50 - 199	0.153	0.360	1	0
200 - 999	0.203	0.403	1	0
1000 - 4999	0.193	0.395	1	0
over 5000	0.245	0.431	1	0
Position dummy				
Untitled employee	0.433	0.496	1	0
Subsection chief	0.250	0.433	1	0
Manager	0.237	0.425	1	0
Executive officer	0.034	0.181	1	0
Chief executive	0.017	0.131	1	0
Temporary worker	0.003	0.059	1	0
Others	0.024	0.154	1	0
Life stage dummy				
Single	0.191	0.394	1	0
Married	0.117	0.321	1	0
Have first child	0.157	0.364	1	0
First child enters primary school	0.149	0.356	1	0
First child enters junior high	0.089	0.286	1	0
First child enters high school	0.082	0.274	1	0
First child enters unversity	0.084	0.277	1	0
First child have own life	0.085	0.278	1	0
Last child have own life	0.032	0.176	1	0
Have grandchild	0.014	0.117	1	0

Table 2: Correlation

	Job-loss rate (a)	Job-loss rate (b)	Job-loss-or-change rate
Gross financial asset	0.029	0.031	-0.005
Net financial asset	0.021	0.023	-0.011
Net financial asset (2)	0.002	0.010	-0.019

Table 3: Estimation Results, Single Regression

Net financial assets	S.D. of income			Job-loss rate (a)			Job-loss rate (b)			Job-loss-or-change rate		
	coef.	S.E.		coef.	S.E.		coef.	S.E.		coef.	S.E.	
Job-loss rate	0.010	0.002	***	0.014	0.016		0.008	0.009		-0.006	0.006	
constant	-1.002	0.084	***	-0.710	0.040	***	-0.708	0.039	***	-0.656	0.046	***
Sample size	1374			1377			1377			1377		
Adj R^2	0.0108			-0.0002			-0.0002			0.0001		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is OLS.

Table 4: Estimation Results, demographics only

Net financial assets	S.D. of income			Job-loss rate (a)			Job-loss rate (b)			Job-loss-or-change rate		
	coef.	S.E.		coef.	S.E.		coef.	S.E.		coef.	S.E.	
Job-loss rate	0.007	0.004	*	0.021	0.019		0.028	0.025		0.000	0.013	
Permanent income	0.536	0.192	***	0.556	0.187	***	0.578	0.189	***	0.589	0.190	***
Male dummy	0.401	0.132	***	0.310	0.163	*	0.160	0.257		0.410	0.195	**
Age	0.133	0.045	***	0.131	0.044	***	0.142	0.047	***	0.123	0.047	***
Age^2	-0.002	0.001	***	-0.001	0.001	***	-0.002	0.001	***	-0.001	0.001	**
Number of parents	0.053	0.080		0.053	0.080		0.050	0.080		0.053	0.080	
Number of children	-0.150	0.034	***	-0.146	0.034	***	-0.152	0.034	***	-0.150	0.034	***
Live with other relatives	0.255	0.134	*	0.237	0.134	*	0.245	0.133	*	0.249	0.133	*
Double-income	-0.188	0.071	***	-0.181	0.070	**	-0.198	0.071	***	-0.190	0.072	***
Private company	0.125	0.096		0.132	0.096		0.087	0.101		0.138	0.105	
University	0.196	0.081	**	0.194	0.079	**	0.183	0.079	**	0.178	0.079	**
Constant	-6.249	0.985	***	-6.195	0.988	***	-6.317	0.999	***	-6.215	1.035	***
Have a housing loan	No			No			No			No		
Plan a housing loan	No			No			No			No		
Own house	No			No			No			No		
Firm size	No			No			No			No		
Position	No			No			No			No		
Life stage	No			No			No			No		
Sample size	1374			1377			1377			1377		
F-value of 1st stage	19.15		***	20.45		***	20.07		***	19.92		***
Hansen's J statistic	20.000			21.098			23.574	*		23.013	*	
(p-value)	(0.172)			(0.134)			(0.073)			(0.082)		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies, firm size dummies and position dummies. The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

<u>Table 5: Estimation Results, including Housing variables</u>

Net financial assets	S.D. of income			Job-loss rate (a)			Job-loss rate (b)			Job-loss-or-change rate		
	coef.	S.E.		coef.	S.E.		coef.	S.E.		coef.	S.E.	
Job-loss rate	0.008	0.004	**	0.010	0.020		0.025	0.024		0.000	0.013	
Permanent income	0.604	0.200	***	0.627	0.194	***	0.645	0.196	***	0.664	0.195	***
Male dummy	0.396	0.130	***	0.350	0.162	**	0.183	0.247		0.401	0.190	**
Age	0.167	0.045	***	0.161	0.044	***	0.173	0.046	***	0.156	0.046	***
Age^2	-0.002	0.001	***	-0.002	0.001	***	-0.002	0.001	***	-0.002	0.001	***
Number of parents	0.044	0.073		0.046	0.073		0.043	0.073		0.046	0.073	
Number of children	-0.135	0.034	***	-0.133	0.034	***	-0.137	0.034	***	-0.135	0.034	***
Live with other relatives	0.111	0.133		0.097	0.133		0.102	0.131		0.103	0.132	
Double-income	-0.152	0.069	**	-0.148	0.068	**	-0.160	0.069	**	-0.154	0.069	**
Private company	0.140	0.092		0.148	0.092		0.107	0.098		0.151	0.101	
University	0.151	0.080	*	0.144	0.078	*	0.138	0.078	*	0.132	0.078	*
Constant	-7.307	0.978	***	-7.215	0.982	***	-7.342	0.993	***	-7.281	1.025	***
Have a housing loan	-0.520	0.091	***	-0.513	0.090	***	-0.514	0.090	***	-0.523	0.090	***
Plan a housing loan	0.228	0.082	***	0.233	0.081	***	0.234	0.081	***	0.227	0.081	***
Own house	0.312	0.085	***	0.311	0.085	***	0.307	0.085	***	0.313	0.085	***
Firm size	No			No			No			No		
Position	No			No			No			No		
Life stage	No			No			No			No		
Sample size	1374			1377			1377			1377		
F-value of 1st stage	17.61		***	18.79		***	18.48		***	18.55		***
Hansen's J statistic	21.574			23.018		*	25.167			25.024		
(p-value)	(0.119)			(0.084)			(0.048)			(0.050)		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies, firm size dummies and position dummies. The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

Table 6: Estimation Results, Basic Results

Net financial assets	S.D. of income			Job-loss rate (a)			Job-loss rate (b)			Job-loss-or-change rate		
	coef.	S.E.		coef.	S.E.		coef.	S.E.		coef.	S.E.	
Job-loss rate	0.010	0.005	**	0.047	0.022	**	0.063	0.025	**	0.032	0.018	**
Permanent income	0.287	0.856		0.380	0.855		0.327	0.848		0.297	0.850	
Male dummy	0.511	0.161	***	0.320	0.174	*	-0.060	0.279		0.126	0.292	
Age	0.186	0.081	**	0.178	0.078	**	0.211	0.081	**	0.211	0.088	**
Age^2	-0.002	0.001	**	-0.002	0.001	**	-0.002	0.001	**	-0.002	0.001	**
Number of parents	0.081	0.077		0.079	0.077		0.077	0.076		0.080	0.076	
Number of children	-0.158	0.046	***	-0.160	0.046	***	-0.167	0.046	***	-0.164	0.046	***
Live with other relatives	0.142	0.138		0.140	0.137		0.142	0.136		0.147	0.136	
Double-income	-0.107	0.111		-0.110	0.114		-0.124	0.112		-0.115	0.111	
Private company	0.132	0.123		0.145	0.121		0.047	0.127		0.031	0.148	
University	0.166	0.149		0.172	0.148		0.161	0.149		0.172	0.150	
Constant	-7.153	1.910	***	-7.207	1.976	***	-7.290	1.942	***	-7.505	1.856	***
Have a housing loan	-0.512	0.142	***	-0.512	0.141	***	-0.502	0.141	***	-0.502	0.142	***
Plan a housing loan	0.244	0.108	**	0.249	0.106	**	0.254	0.107	**	0.257	0.108	**
Own house	0.377	0.090	***	0.377	0.090	***	0.364	0.091	***	0.376	0.091	***
Firm size	*F*=	4.50		*F*=	3.60		*F*=	5.42		*F*=	5.31	
Position	*F*=	10.64		*F*=	12.43	**	*F*=	13.07	**	*F*=	13.12	**
Life stage	*F*=	26.63	***	*F*=	29.76	***	*F*=	28.31	***	*F*=	27.45	***
Sample size	1353			1355			1355			1355		
F-value of 1st stage	3.31		***	3.28		***	3.32		***	3.35		***
Hansen's J statistic	8.697 *			8.259 *			8.152 *			8.178 *		
(p-value)	(0.069)			(0.083)			(0.086)			(0.085)		
Ratio of Buffer-stock Wealth	0.254			0.061			0.116			0.154		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies. The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

Table 7: Estimation Results, Gross Financial Assets

Gross financial assets	S.D. of income			Job-loss rate (a)			Job-loss rate (b)			Job-loss-or-change rate		
	coef.	S.E.		coef.	S.E.		coef.	S.E.		coef.	S.E.	
Job-loss rate	0.007	0.005		0.035	0.023		0.057	0.025	**	0.025	0.018	
Permanent income	0.441	0.901		0.535	0.906		0.500	0.896		0.483	0.894	
Male dummy	0.615	0.157	***	0.483	0.177	***	0.116	0.281		0.332	0.296	
Age	0.186	0.080	**	0.179	0.078	**	0.207	0.081	**	0.202	0.088	**
Age^2	-0.002	0.001	**	-0.002	0.001	**	-0.002	0.001	**	-0.002	0.001	**
Number of parents	0.091	0.074		0.090	0.074		0.088	0.073		0.091	0.073	
Number of children	-0.156	0.043	***	-0.159	0.043	***	-0.165	0.043	***	-0.163	0.043	***
Live with other relatives	0.162	0.135		0.161	0.135		0.162	0.133		0.166	0.134	
Double-income	-0.125	0.111		-0.131	0.115		-0.145	0.113		-0.136	0.111	
Private company	0.196	0.128		0.206	0.126		0.119	0.131		0.119	0.152	
University	0.178	0.160		0.178	0.160		0.168	0.161		0.177	0.162	
Constant	-7.953	1.979	***	-8.059	2.073	***	-8.142	2.027	***	-8.290	1.924	***
Have a housing loan	-0.524	0.142	***	-0.525	0.141	***	-0.518	0.140	***	-0.520	0.141	***
Plan a housing loan	0.265	0.106	**	0.269	0.104	**	0.273	0.104	***	0.273	0.105	**
Own house	0.409	0.087	***	0.405	0.088	***	0.394	0.088	***	0.404	0.088	***
Firm size	*F*=	5.30		*F*=	4.74		*F*=	6.60		*F*=	5.89	
Position	*F*=	13.94	**	*F*=	15.88	**	*F*=	16.49	**	*F*=	16.44	**
Life stage	*F*=	17.34	**	*F*=	19.83	**	*F*=	19.11	**	*F*=	18.20	**
Sample size	1442			1444			1444			1444		
F-value of 1st stage	2.92		**	2.87		***	2.92		***	2.96		***
Hansen's J statistic	5.993			5.621			5.530			5.653		
(p-value)	(0.200)			(0.229)			(0.237)			(0.227)		
Ratio of Buffer-stock Wealth	0.218			0.076			0.134			0.149		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies. The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

Table 8: Estimation Results, Net financial assets (2)

Net financial assets (2)	S.D. of income			Job-loss rate (a)			Job-loss rate (b)			Job-loss-or-change rate		
	coef.	S.E.		coef.	S.E.		coef.	S.E.		coef.	S.E.	
Job-loss rate	0.009	0.005	**	0.024	0.020		0.034	0.026		0.016	0.019	
Permanent income	-0.165	0.916		-0.105	0.921		-0.156	0.915		-0.200	0.916	
Male dummy	0.552	0.168	***	0.427	0.173	**	0.215	0.295		0.327	0.316	
Age	0.218	0.082	***	0.208	0.079	***	0.228	0.084	***	0.228	0.092	**
Age^2	-0.002	0.001	***	-0.002	0.001	**	-0.002	0.001	**	-0.002	0.001	**
Number of parents	0.059	0.082		0.058	0.082		0.057	0.082		0.058	0.082	
Number of children	-0.132	0.047	***	-0.133	0.047	***	-0.137	0.047	***	-0.135	0.047	***
Live with other relatives	0.076	0.144		0.077	0.143		0.077	0.143		0.078	0.144	
Double-income	-0.072	0.119		-0.070	0.122		-0.075	0.121		-0.067	0.119	
Private company	0.091	0.130		0.102	0.128		0.047	0.135		0.041	0.160	
University	0.240	0.161		0.243	0.160		0.242	0.162		0.252	0.164	
Constant	-5.840	2.090	***	-5.753	2.176	***	-5.754	2.142	***	-5.784	2.031	***
Have a housing loan	-0.309	0.150	**	-0.308	0.149	**	-0.300	0.150	**	-0.296	0.151	*
Plan a housing loan	0.309	0.113	***	0.310	0.110	***	0.315	0.111	***	0.319	0.113	***
Own house	0.274	0.091	***	0.278	0.091	***	0.272	0.092	***	0.279	0.092	***
Firm size	*F*=	6.77		*F*=	5.76		*F*=	6.55		*F*=	5.49	
Position	*F*=	8.49		*F*=	9.69		*F*=	10.00		*F*=	9.93	
Life stage	*F*=	26.49	***	*F*=	30.17	***	*F*=	28.46	***	*F*=	28.06	***
Sample size	1382			1384			1384			1384		
F-value of 1st stage	3.16		***	3.11		***	3.15		***	3.19		***
Hansen's J statistic	6.252			5.998			5.753			5.797		
(p-value)	(0.181)			(0.199)			(0.218)			(0.215)		
Ratio of Buffer-stock Wealth	0.411			0.248			0.275			0.286		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies. The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

Table 9: Estimation Results, Limited sample

Net financial assets	(i)			(ii)			(iii)			(iv)		
	coef.	S.E.		coef.	S.E.		coef.	S.E.		coef.	S.E.	
Job-loss rate	0.046	0.022	**	0.051	0.024	**	0.095	0.067		0.073	0.089	
Permanent income	0.392	0.868		1.412	1.047		0.962	0.830		1.287	1.087	
Male dummy	0.324	0.173	*	0.353	0.218		0.226	0.238				
Age	0.178	0.078	**	0.123	0.090		0.150	0.074	**	0.135	0.084	
Age^2	-0.002	0.001	**	-0.001	0.001		-0.002	0.001	*	-0.001	0.001	
Number of parents	0.078	0.077		0.099	0.078		0.088	0.076		0.090	0.084	
Number of children	-0.160	0.046	***	-0.172	0.048	***	-0.171	0.047	***	-0.172	0.048	***
Live with other relatives	0.140	0.137		0.124	0.171		0.159	0.153		0.065	0.188	
Double-income	-0.109	0.115		-0.223	0.131	*	-0.174	0.107		-0.216	0.129	*
Private company	0.161	0.123		0.206	0.128		0.190	0.122		0.162	0.125	
University	0.177	0.152		0.025	0.171		0.088	0.139		0.054	0.166	
Constant	-7.277	2.041	***	-9.593	2.379	***	-8.687	2.035	***	-9.067	2.662	***
Have a housing loan	-0.506	0.142	***	-0.655	0.162	***	-0.578	0.138	***	-0.629	0.172	***
Plan a housing loan	0.254	0.107	**	0.175	0.122		0.204	0.108	*	0.177	0.129	
Own house	0.378	0.090	***	0.337	0.097	***	0.350	0.093	***	0.335	0.095	***
Firm size	*F*=	3.52		*F*=	3.18		*F*=	3.15		*F*=	4.38	
Position	*F*=	11.99	*	*F*=	12.61	**	*F*=	12.30	*	*F*=	11.30	*
Life stage	*F*=	28.18	***	*F*=	24.99	***	*F*=	31.26	***	*F*=	24.05	***
Sample size	1348			1276			1305			1204		
F-value of 1st stage	3.17		***	2.19		*	3.50		***	2.01		**
Hansen's J statistic	7.740			7.093			6.520			7.973	*	
(p-value)	(0.102)			(0.131)			(0.164)			(0.094)		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies. The job-loss risk variable is represented by job-loss rate (a). Case (i) excludes such observations that have zero job-loss rates. Case (ii) excludes those of females aged less than 30. Case (iii) excludes those of females who are 2-year college graduates. Case (iv) includes only male observations.
The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

Table 9: Estimation Results, Limited sample

Net financial assets	(v)			(vi)		
	coef.	S.E.		coef.	S.E.	
Job-loss rate	0.046	0.022	**	0.041	0.024	*
Permanent income	0.057	0.948		0.004	1.237	
Male dummy	0.354	0.189	*	0.414	0.187	**
Age	0.198	0.106	*	0.205	0.156	
Age^2	-0.002	0.001		-0.002	0.002	
Number of parents	0.071	0.081		0.046	0.118	
Number of children	-0.134	0.048	***	-0.113	0.062	*
Live with other relatives	0.159	0.144		0.157	0.153	
Double-income	-0.083	0.131		-0.037	0.204	
Private company	0.044	0.129		0.040	0.143	
University	0.290	0.153	*	0.340	0.187	*
Constant	-6.493	1.966	***	-6.563	2.463	***
Have a housing loan	-0.471	0.143	***	-0.461	0.224	**
Plan a housing loan	0.240	0.102	**	0.232	0.132	*
Own house	0.340	0.091	***	0.320	0.108	***
Firm size	*F*=	3.17		*F*=	2.25	
Position	*F*=	7.29		*F*=	4.74	
Life stage	*F*=	28.51	***	*F*=	19.37	***
Sample size	1213			941		
F-value of 1st stage	2.88		**	1.92		*
Hansen's J statistic	5.028			5.198		
(p-value)	(0.284)			(0.268)		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies. The job-loss risk variable is represented by job-loss rate (a). Case (v) includes only those of aged less than 50. Case (vi) includes only those of aged less than 45.
The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

Table 10: Estimation Results: Alternative excluded IV

Net financial assets	Firm size			Position		
	coef.	S.E.		coef.	S.E.	
Job-loss rate	0.054	0.022	**	0.044	0.021	**
Permanent income	1.263	0.296	***	0.446	0.242	*
Male dummy	0.410	0.163	**	0.345	0.164	**
Age	0.120	0.050	**	0.150	0.049	***
Age^2	-0.001	0.001	**	-0.001	0.001	**
Number of parents	0.076	0.073		0.061	0.073	
Number of children	-0.171	0.048	***	-0.161	0.046	***
Live with other relatives	0.141	0.136		0.122	0.136	
Double-income	-0.208	0.073	***	-0.104	0.074	
Private company	0.217	0.101	**	0.144	0.095	
University	0.046	0.083		0.147	0.082	
Constant	-9.249	1.208	***	-6.833	1.054	***
Have a housing loan	-0.640	0.097	***	-0.534	0.091	***
Plan a housing loan	0.180	0.081	**	0.245	0.082	***
Own house	0.376	0.087	***	0.400	0.088	***
Region	*F*=	9.08		*F*=	8.13	
Firm size	No			*F*=	6.31	
Position	*F*=	15.25	**	No		
Life stage	*F*=	32.37	***	*F*=	39.52	***
Sample size	1355			1355		
F-value of 1st stage	25.65		***	31.16		***
Hansen's J statistic	2.618			11.527	**	
(p-value)	(0.623)			(0.042)		
Buffer-stock wealth	0.069			0.057		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies. The job-loss risk variable is represented by job-loss rate (a). Case (v) includes only those of aged less than 45.
The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

Table 11: Estimation Results, Net financial assets

Net financial assets	Job-loss rate (a)			Job-loss rate (b)			Job-loss-or-change rate		
	coef.	S.E.		coef.	S.E.		coef.	S.E.	
Job-loss rate	0.044	0.022	**	0.057	0.027	**	0.029	0.018	
Income variance	0.009	0.005	**	0.007	0.005		0.008	0.005	*
Permanent income	0.339	0.858		0.295	0.852		0.264	0.853	
Male dummy	0.363	0.168	**	0.010	0.278		0.182	0.281	
Age	0.190	0.080	**	0.217	0.081	***	0.218	0.088	**
Age^2	-0.002	0.001	**	-0.002	0.001	**	-0.002	0.001	**
Number of parents	0.083	0.077		0.081	0.076		0.083	0.076	
Number of children	-0.157	0.046	***	-0.162	0.046	***	-0.160	0.046	***
Live with other relatives	0.139	0.137		0.142	0.136		0.146	0.137	
Double-income	-0.112	0.111		-0.122	0.111		-0.116	0.109	
Private company	0.129	0.122		0.044	0.124		0.027	0.145	
University	0.174	0.146		0.164	0.148		0.174	0.149	
Constant	-7.364	1.934	***	-7.381	1.916	***	-7.606	1.844	***
Have a housing loan	-0.513	0.141	***	-0.505	0.141	***	-0.504	0.142	***
Plan a housing loan	0.245	0.108	**	0.249	0.108	**	0.252	0.109	**
Own house	0.374	0.089	***	0.366	0.090	***	0.375	0.090	***
Firm size	*F*=	4.35		*F*=	6.12		*F*=	6.03	
Position	*F*=	10.80	*	*F*=	11.57	*	*F*=	11.44	*
Life stage	*F*=	29.26	***	*F*=	27.60	***	*F*=	27.04	***
Sample size	1353			1353			1353		
F-value of 1st stage	3.27		***	3.30		***	3.33		***
Hansen's J statistic	8.425	*		8.401	*		8.382	*	
(p-value)	0.077			0.078			0.079		
Ratio of Buffer-stock Wealth	0.291			0.289			0.340		

Note: The dependent variable is log of ratio of net financial assets to permanent income. The estimation method is IV, where the excluded instruments are the regional dummies. The numbers of dummies are 5 for firm size, 6 for position, 9 for life stage, respectively.

Table A1. Job loss rate (a)

Age	Education	Male		Female	
		Married	Single	Married	Single
20-24	Junior high school	1.613	8.040	40.000	16.418
	High School	1.075	4.399	38.788	7.557
	2-year college	0.000	3.876	47.761	5.289
	4-year University	0.000	5.098	30.000	4.651
25-29	Junior high school	2.128	7.018	25.490	12.963
	High School	0.800	3.304	26.953	7.389
	2-year college	2.174	2.821	29.945	6.375
	4-year University	0.528	2.214	26.119	5.764
30-34	Junior high school	1.840	6.796	14.815	8.108
	High School	0.935	3.075	13.885	5.753
	2-year college	0.394	2.632	1.493	20.186
	4-year University	0.455	2.268	12.571	4.082
35-39	Junior high school	1.875	2.222	7.692	7.407
	High School	0.675	2.804	6.439	4.329
	2-year college	0.803	1.408	5.743	2.721
	4-year University	0.260	1.859	3.535	2.899
40-44	Junior high school	1.173	4.478	4.803	5.882
	High School	0.661	2.899	4.572	3.965
	2-year college	0.474	2.857	4.008	3.093
	4-year University	0.412	1.807	3.070	0.000
45-49	Junior high school	0.799	3.865	4.538	5.128
	High School	0.799	3.478	4.456	3.509
	2-year college	0.435	4.000	3.712	4.396
	4-year University	0.485	2.609	3.175	2.381
50-54	Junior high school	0.951	3.822	4.420	5.844
	High School	0.948	2.198	5.223	4.286
	2-year college	0.000	7.692	5.357	3.509
	4-year University	0.559	3.448	1.835	3.571