PRIVATE MEDICAL INSURANCE AND SAVING: EVIDENCE FROM THE BRITISH HOUSEHOLD PANEL SURVEY*

by
Alessandra Guariglia and *Mariacristina Rossi*

Abstract

This paper investigates whether individuals in Britain save to self-insure against health risk. In particular, we use the British Household Panel Survey for the years 1996 to 1998 to test the hypothesis that those individuals who are not covered by private medical insurance, and are therefore more prone to health risk, tend to save more than those who are covered. Our findings, which are based on a wide range of econometric specifications, always reject this hypothesis, suggesting that health risk is not a factor which induces British individuals to save more.

Keywords: Precautionary saving, Private medical insurance.
JEL Classification: D12, D91, E21, H51.

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1. Introduction

The issue of precautionary saving, according to which people save to self-insure against uncertainty is controversial. Many studies have tested this hypothesis, using data from various countries, but while some of them found strong evidence in its favour (Carroll and Samwick, 1997, 1998; Kazarosian, 1997; Merrigan and Normandin, 1996 etc.), others found little evidence or no evidence at all (Guiso *et al.*, 1992; Lusardi, 1997 and 1998; Dynan, 1993 etc.). Most of these studies estimated equations of wealth, saving, consumption, or Euler equations, which included some measure of uncertainty. A test for the significance of the estimated coefficient associated with the uncertainty measure was then performed. A positive and significant coefficient was seen as evidence in favour of the precautionary saving hypothesis[1].

It is obvious that the adequacy of this type of test hinges on the appropriateness of the measure of uncertainty chosen. According to Browning and Lusardi (1996), this measure should be observable, exogenous and should vary significantly across the population. Most of the studies have proxied uncertainty with either the variability of household income (Carroll and Samwick, 1997, 1998; Lusardi, 1997, 1998; Banks *et al.*, 1999 etc.), or the

[1] Banks *et al.* (1999), Dardanoni (1991), Merrigan and Normandin (1996), and Miles (1997) tested the precautionary hypothesis for the UK using data from the Family Expenditure Survey, while Guariglia (2001) and Guariglia and Rossi (2001) used the British Household Panel Survey. All these studies found evidence in favour of the precautionary saving hypothesis.

variability of household expenditure (Dynan, 1993; Guariglia and Kim, 2001). These measures are however likely to be unreliable, as they contain various elements which can be directly controlled by households[2].

Our objective in this paper is to evaluate the extent to which individuals in Britain save to self-insure against a more specific type of risk: health risk. As the risk of becoming unemployed, the risk of becoming ill is likely to cause a potential expected downturn in the resources available to an individual[3]. A higher health risk should hence induce agents to save more for precautionary reasons. However, given the high variability of medical expenses, a more efficient solution would be for individuals to purchase medical insurance. If an individual is covered by insurance, the risk is in fact taken by the insurance company and the individual only has to face the fixed cost of the insurance premium[4]. One should therefore expect to find a lower level of saving among the insured, compared to the non-insured[5].

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[2] For an illustration of this point, see Carroll *et al.* (1999) who give the example of a "tenured college professor who, by choice, works only every other summer, and may [thus] have a much more variable annual income than a factory worker, but does not face the uncertainty of being laid off during a recession." (p.2).

[3] Although the National Health Service (NHS) is the dominant provider of health care in the UK, with provision that is generally free at source, a number of individuals prefer to use private health services for which they need to pay. This is due to the better availability of hospitals and senior doctors in the private sector (Propper *et al.*, 2001). More in general, it is due to the low quality characterising public health provision: for instance, long waiting lists are seen as a factor, which considerably lowers the quality of the NHS service (Belsley *et al.*, 1999). As documented in Propper (2000), the use of private health service in the UK has increased from 17.5% in 1991/92 to 23.4% in 1994/95. Similarly, private expenditure on health care has grown from 9% of total health care expenditure in 1979 to 15% in 1995.

[4] In the UK, private medical insurance is voluntary and does not remove the entitlement to NHS care. People can either purchase the insurance individually,

It must be noted, however, that the decision to purchase medical insurance is likely to be endogenous. As stated by Gruber and Yelowitz (1999): "The insurance status is in fact an outcome of the same choice process that determines saving decisions" (p. 1258). In particular, like the decision to save, the decision to purchase medical insurance depends on the perception that individuals have of risk[6]. One could therefore find that the insured agents have a higher rather than a lower level of saving, compared to the uninsured, simply because they are more risk averse.

We use the British Household Panel Survey (BHPS) for the years 1996-1998 to test the relationship between saving and health insurance. We initially use a simple Tobit model, which ignores the endogeneity problem described above. We then account for the panel dimension of our data set by presenting a random-effects Tobit specification. We consider the endogeneity

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or participate to a plan offered through their employer (see Belsley *et al.*, 1999). In this paper, we do not distinguish between the two cases.

[5] Levin (1995) and Starr-McCluer (1996) examined the relationship between the demand for private medical insurance and wealth accumulation using US micro data. The former study only focused on elderly households, and, by analysing the response of insurance holdings to changes in illiquid assets, found evidence of precautionary saving. On the other hand, the latter study found a positive association between insurance coverage and household wealth. Gruber and Yelowitz (1999) studied the effects of public health insurance on saving in the US, and found that Medicaid eligibility has a sizeable and significant negative effect on household wealth holdings. Also see Kotlikoff (1989), for a theoretical analysis of this point, and Hubbard *et al.* (1995) for a simulation model of precautionary saving in the presence of social security, and of uncertainty relative to both earnings and medical expenditure.

[6] In the case in which the insurance coverage is actually paid for by an employer, we cannot really talk of a decision to purchase medical insurance. In this case, the relevant decision can be seen as the decision to join a firm, which offers free private medical insurance.

problem by estimating the relationship between saving and medical insurance first with an Instrumental Variable (IV) Tobit approach, and then with a Full Model Maximum Likelihood approach, according to which the decisions to purchase medical insurance and to save are implemented simultaneously. In all our specifications, we find a positive association between insurance coverage and saving. This suggests that British individuals do not use precautionary saving as a device to protect themselves against health risk. A similar conclusion was reached by Starr-McCluer (1996) who used the 1989 cross-section of the US Survey of Consumer Finances. Our analysis improves on Starr-McCluer's (1996) in two ways. First, being based on a panel data set, it allows us to take into account unobserved heterogeneity. Second, we take into account the interdependencies between insurance coverage and saving decisions by using a Full Model Maximum Likelihood approach, which allows the error terms in the two relevant equations to be correlated.

The rest of the paper is laid out as follows. Section two illustrates our data set and presents some descriptive statistics. Section three illustrates our econometric model and our empirical results. Section four concludes.

2. Main features of the data and descriptive statistics

2.1 The data

The BHPS was designed as a survey of a nationally representative sample of 10,000 adult members of approximately 5,500 households who were interviewed in 1991. The same individuals, together with their co-residents were then followed and re-interviewed in successive waves. Eight waves are currently available, covering the years 1991 to 1998. The survey focuses, in particular, on household characteristics such as their

participation in the labour market, their income and wealth, their health, their education, and, more generally, their socio-economic status[7].

In each wave, individuals are asked the following question regarding their saving behaviour:

Do you save any amount of your income for example by putting something away now and then in a bank, building society, or Post Office account other than to meet regular bills? Please include share purchase schemes and Personal Equity Plan (PEP) schemes.

If an agent answers "yes" to the previous question[8], he/she is then asked:

About how much on average do you personally manage to save a month?

The information that is provided in these questions only refers to positive saving. Dissaving in the form of decumulation of financial assets is not considered, which makes the saving variable that we use in our analysis censored at zero[9].

In waves 6 to 8, individuals interviewed were also asked the following question regarding private medical insurance:

Are you covered by private medical insurance, whether in your own name or through another family member?

As we have mentioned earlier, one would expect people without this form of protection against illness risk to exhibit a higher saving rate. We have to be aware, however, that insurance coverage is likely to be endogenous. Those individuals without health insurance could in fact have chosen not to purchase the insurance

[7] For more details on the BHPS, see Taylor (1994) and Taylor (1999).

[8] In the remaining part of the paper, we will refer to those respondents who answered "yes" to the saving question as the savers.

[9] All the relevant income and saving variables are expressed in 1995 pounds The variables are deflated using the Retail Price Index.

as they are not risk averse. If this were the case, then these uninsured respondents could save less for precautionary reasons than the more risk averse insured individuals (Zeldes, 1989). We deal with this problem in two ways. First, we use an IV estimation technique, which instruments for the insurance coverage variable in the saving equation. Second, we simultaneously estimate the insurance coverage and the saving equations, allowing the two equations to be correlated via their error terms, which both contain the unobservable degree of risk aversion of the respondents. If agents with higher (lower) risk aversion are more (less) likely to be insured and to save more (less), then one should find a positive correlation between the error terms in the two equations.

2.2 Descriptive statistics

Table 1 presents descriptive statistics on saving behaviour and insurance coverage. In this Table and throughout the rest of the paper, we exclude those individuals who are younger than 25 or older than 65, and who are not in employment[10], as well as those who do not have valid data on saving and private medical insurance. We therefore have an unbalanced panel made up of 12,297 observations.

Column 1 shows that the percentage of savers in the overall sample is 50.31%. This percentage tends to be higher for individuals with no dependent children, aged either between 25 and 34 or between 45 and 54. It also increases with education and with income.

Column 2 reports the percentages of individuals covered by private medical insurance for various socio-demographic groups. 22.85% of the respondents in the entire sample are covered. The percentage of insured people tends to be higher for

[10] These sample restrictions can be justified by the fact that we want to avoid the effects of schooling, retirement, and unemployment on saving.

respondents with a college degree aged between 35 and 54, and tends to rise with income.

Columns 3 to 6 report the percentages of savers that can be found within the insured and uninsured groups, as well as the amounts saved by these savers. There is a higher percentage of savers among the insured, who also tend to save larger amounts. This pattern holds for the sample overall, as well as for the various socio-demographic groups reported in the Table. The percentage of savers among the insured is 60.91, whereas the corresponding percentage among the uninsured is 47.17. The insured savers tend to save on average £188.92, whereas the corresponding figure for the uninsured is £121.30. Both among the insured and the uninsured, the percentage of savers tends to be higher for the wealthier and the more educated individuals, who have no dependent children. The savers in these categories also tend to generally save higher amounts.

According to these descriptive statistics, there appears to be a positive association between medical insurance and saving, which would suggest that UK individuals do not tend to save to self-insure against health risk. Our objective in the next section is to provide more rigorous tests for this conclusion.

3. Econometric specification and estimation results

3.1. General specification

In our empirical specifications, we initially report Tobit regressions to analyse the determinants of individual saving decisions, and assess the extent to which insurance coverage affects these decisions. We use a Tobit estimation technique, because as mentioned in the previous section, the question that individuals are asked in the BHPS on their saving behaviour only allows for positive or 0 saving as a response. Saving could in principle take negative values, but these negative values are not observed due to

censoring. Using the subscript i to indicate the individual and the subscript t to indicate the wave, and denoting with S^*_{it} the respondent's true propensity to save, which is unobservable (latent), the following relationship will hold:

$$S^*_{it} = X_{it}'\beta + \gamma I_{it} + \nu_t + \varepsilon_{it},$$

where the observed saving variable S_{it} is such that:

$$S_{it} = S^*_{it} \quad \text{if } S^*_{it} > 0$$
$$S_{it} = 0 \quad \text{if } S^*_{it} \leq 0$$

(1)

I_{it} is a dummy variable that takes value 1 if individual i is covered by private medical insurance in wave t, and 0 otherwise. X_{it} includes a set of characteristics of individual i in wave t, which is assumed to affect saving. It includes a quadratic in age aimed at capturing the curvature of the saving function. Various demographic and educational variables, regional dummies, and a dummy indicating whether the individual has health related problems are also included. These variables are generally aimed at capturing differences in preferences.

X_{it} also includes the individual's subjectively evaluated financial situation, and expectations about next year's financial situation. The expectations variables are included to see whether respondents save to offset future expected declines in income, in accordance with the life-cycle model.

Finally, X_{it} includes a proxy for permanent income for each individual, given that there is evidence that saving varies across levels of permanent income, due to the non-homotheticity of preferences (Carroll and Samwick, 1997, 1998)[11]. We obtained permanent income by taking the fitted values from a random-effects regression of the individual's earnings on household characteristics, gender, age, age squared, education dummies,

[11] Permanent income can also be seen as a proxy for wealth.

occupational dummies, and interactions of the latter two groups of dummies with age and age squared (see Carroll *et al.*, 1999, and Kazarosian, 1997, for a similar approach).

The error term in Equation (1) is made up of two components: v_t, which represents a time-specific effect, and accounts for possible business cycle effects, and e_{it} which is an idiosyncratic error term. We take into account the v_t component of the error term, by including time dummies in all our specifications.

3.2. Tobit regressions

We initially estimate Equation (1) using a simple Tobit specification over the pooled sample. The results are reported in column 1 of Table 2. The positive and statistically significant coefficient on I_{it}, equal to 70.09, shows that there is a strong positive association between medical insurance and saving[12].

In accordance with the life cycle model, saving tends to be higher for respondents who expect their financial situation to deteriorate. It is also higher for those who consider their financial situation as good, or better than expected, and for those with higher permanent income. On the other hand, saving tends to be lower for males, for respondents who see their financial situation as bad or worse than expected, and who expect it to improve, as well as for individuals with health problems. Saving also tends to decline with the number of dependent children present in the household.

One problem with the results reported in column 1 of Table 2 is that they might be biased because they do not take into

[12] One might argue that this association embeds a wealth effect because it is generally the wealthier individuals who are more likely to purchase medical insurance and to save more (see Table 1). However, our regression contains other variables like permanent income and the financial situation as perceived by the respondent, which are more likely to capture the effect of wealth on saving.

account unobserved heterogeneity. This particular heterogeneity may be thought of, in general terms, as individual differences in some unobserved or unobservable attribute (like tastes), that might affect saving and might consequently cause an omitted variable bias in the pooled Tobit regression. In particular, as noted in Starr-McCluer (1996), there could be unmeasured differences in income between insured and uninsured individuals. Other things being equal, those workers whose employer provides them with medical insurance are in fact likely to get other non-wage incentives as well. The positive association between saving and medical insurance that was found in the pooled Tobit specification might therefore be a consequence of this effect. In column 2 of Table 2, we report the results obtained from the estimation of Equation (1) using a random-effects Tobit specification, which exploits the panel dimension of our data set to control for individual unobserved heterogeneity. This specification differs from the previous one mainly through the structure of its error term, which now takes the following form:

$$v_i + v_t + x_{it} \qquad (2)$$

v_i represents an unobservable individual-specific time-invariant effect, which we assume to be random and captures the unobserved individual heterogeneity; v_t represents a time-specific effect, and and x_{it} is an idiosyncratic error term.

Although the panel variance component r, which represents the proportion of the observed total variance of the error term accounted for by unobserved heterogeneity is precisely determined and equal to 0.396, the results of this random-effects Tobit specification are largely similar to those reported in column 1. This suggests that the latter estimates were not significantly biased. In particular, we can still observe a significant positive

association between insurance coverage and saving, as well as higher saving for those individuals expecting their financial situation to deteriorate.

However, there is still the possibility that the former result is biased due to endogeneity problems. This would be the case if, for instance, those risk-averse individuals who tend to save generally more, also tend to spend more time and effort to acquire insurance coverage. We take this possibility into account by estimating Equation (1) using an Instrumental Variable (IV) Tobit specification. We instrument I_{it}, using occupational dummies, a variable indicating the size of the individual's workplace, and dummies indicating whether the respondent has a personal pension and whether he/she works in the private sector. It is in fact well-known that larger firms who provide their employees with occupational pension schemes are also more likely to provide them with private medical insurance. Similarly, managers and administrators are more likely to be covered, compared for instance to craftspeople[13]. The estimates are obtained using the procedure illustrated in Newey (1987), and are reported in column 3 of Table 2. Once more, the coefficient on I_{it} is positive and precisely determined. It is bigger than in the previous regressions, suggesting that the positive association between insurance coverage and saving was not the product of the endogeneity bias. Contrary to the previous specifications, it now appears that married individuals are significantly less likely to save. Moreover, those individuals with a post-graduate education tend to save

[13] Company schemes for which the employer pays the subscription are particularly common among the managers group (ONS General Household Survey, 1995). Our data show that the highest proportion of insured people, 39.76%, can be found in the "Managers and administrators" category, whereas the lowest proportion, 10.62%, can be found in the "Others" occupational category.

more. The effects of most of the remaining variables on saving are similar to those previously reported.

3.3. Full Model Maximum Likelihood regression

An alternative and generally more efficient way to address the endogeneity of medical insurance coverage is to use a Full Model Maximum Likelihood technique (see Greene, 1991 and Maddala, 1983), which takes into account the interdependence between insurance coverage and saving decisions.

We consider a system composed of both the insurance coverage equation and the saving equation, where saving directly depends on insurance coverage. Denoting with I^*_{it} the unobservable (latent) variable indicating the underlying inclination of a person to possess private medical insurance, our problem can be represented by the following two sets of equations:

$$I^*_{it} = Z_{it}'\gamma + u_{it},$$

where the observed medical insurance dummy I_{it} is such that:

$$I_{it}=1 \quad \text{if } I_{it}^*>0$$
$$I_{it}=0 \quad \text{if } I_{it}^* \leq 0 \qquad (3)$$

and

$$S^*_{it} = X_{it}'\beta + \gamma I^*_{it} + e_{it} = X_{it}'\beta + \gamma (Z_{it}'\gamma + u_{it}) + e_{it} = W_{it}'\delta + h_{it},$$

where $h_{it} = \gamma u_{it} + e_{it}$ and the observed saving variable S_{it} is such that[14]:

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[14] Note that our equation for S_{it}^* contains the latent variable for insurance coverage, rather than the observed variable. Also note that to keep the notation simple, we did not include any time-specific component in the error terms of Equations (3) and (4). However, we included time dummies in both specifications.

$$S_{it} = S^*_{it} \quad \text{if } S^*_{it} > 0$$
$$S_{it} = 0 \quad \text{if } S^*_{it} \leq 0 \qquad (4)$$

The determinants of insurance coverage (contained in Z_{it}) are the same as the right hand side variables of the saving equation (contained in X_{it}), except for those variables related to the respondent's past and future expectations about his/her financial situation. The latter variables had been included in the saving equation to test for the presence of life-cycle behaviour. For the reasons outlined in the previous sub-section, Z_{it} also includes occupational dummies, a variable indicating the size of the individual's work place, and dummies indicating whether the respondent has an occupational pension, and whether he/she works in the private sector[15].

We assume that the error terms in the insurance coverage and saving equations (u_{it} and e_{it}) are jointly normally distributed with mean 0 and variance-covariance matrix S, where:

$$S = \begin{bmatrix} \sigma_e^2 & \sigma_{eu} \\ \sigma_{ue} & 1 \end{bmatrix}. \qquad (5)$$

The non-zero covariance between u_{it} and e_{it} allows the shocks to insurance coverage to be correlated with the shocks to saving[16]. This correlation reflects the risk aversion term, which is not observed by the econometrician, and is thus incorporated in the error terms of both equations. Allowing for a non-zero correlation between the two error terms prevents the coefficient

[15] In order for our model to be identified, it is important that the insurance coverage equation includes at least one variable that affects insurance coverage, but not saving (Greene, 1991).

[16] Note that the variance of u_{it} is normalised to 1.

on insurance coverage in the saving equation to wrongly subsume a risk aversion component, which would make it biased.

Due to the censoring, we can divide our sample into the following four categories:

Category 1: The individuals who save and are insured, such that:

$$S_{it}^* = W_{it}'\delta + h_{it} > 0 \text{ and } I_{it}^* = Z_{it}'\gamma + u_{it} > 0.$$

Category 2: The individuals who do not save and are insured, such that:

$$S_{it}^* = W_{it}'\delta + h_{it} \leq 0 \text{ and } I_{it}^* = Z_{it}'\gamma + u_{it} > 0.$$

Category 3: The individuals who save and are not insured, such that:

$$S_{it}^* = W_{it}'\delta + h_{it} > 0 \text{ and } I_{it}^* = Z_{it}'\gamma + u_{it} \leq 0.$$

Category 4: The individuals who do not save and are not insured, such that:

$$S_{it}^* = W_{it}'\delta + h_{it} \leq 0 \text{ and } I_{it}^* = Z_{it}'\gamma + u_{it} \leq 0.$$

Denoting with $f(.)$, $F(.)$, and $F2(.)$ the univariate normal density function, the univariate cumulative distribution, and the bivariate cumulative function, respectively; with σ_h^2, the variance of h_{it} and with σ_{hu}, the covariance between u_{it} and h_{it}, the probabilities associated with each of the four categories can be written as follows[17]:

$$\textbf{Pr(1)} = Pr(S_{it}^*)Pr(I_{it}^* > 0 \mid S_{it}^*) = f(h_{it}, \sigma_h) F\left(\frac{Z_{it}'\gamma + \frac{\sigma_{hu}}{\sigma_h^2} h_{it}}{\sqrt{1 - \frac{\sigma_{hu}^2}{\sigma_h^2}}} \right).$$

[17] The variance of h_{it} is given by $\sigma_h^2 = \sigma_e^2 + \gamma^2 + 2\gamma\sigma_{ue}$, while the covariance between h_{it} and u_{it} is given by $\sigma_{hu} = \sigma_{ue} + \gamma$.

Pr(2) $= Pr(S_{it}^* \leq 0) Pr(I_{it}^* > 0 \mid S_{it}^* \leq 0) = F2(-W_{it}'d/\sigma_h, Z_{it}'\gamma, -\rho)$.

Pr(3) $= Pr(S_{it}^*) Pr(I_{it}^* \leq 0 \mid S_{it}^*) = f(h_{it}, \sigma_h) F\left(\frac{-Z_{it}'\gamma - \frac{\sigma_{hu}}{\sigma_h^2} h_{it}}{\sqrt{1 - \frac{\sigma_{hu}^2}{\sigma_h^2}}} \right)$.

Pr(4) $= Pr(S_{it}^* \leq 0) Pr(I_{it}^* \leq 0 \mid S_{it}^* \leq 0) = F2(-W_{it}'d/\sigma_h, -Z_{it}'\gamma, \rho)$.

The log likelihood function for the estimation of the parameters γ; β, γ, σ_h, and σ_{hu} can be written as follows:

$$L = \sum_{\{category\ 1\}} \ln Pr(S_{it}^*, I_{it}^* > 0) + \sum_{\{category\ 2\}} \ln Pr(S_{it}^* \leq 0, I_{it}^* > 0) + \sum_{\{category\ 3\}} \ln Pr(S_{it}^*, I_{it}^* \leq 0) + \sum_{\{category\ 4\}} \ln Pr(S_{it}^* \leq 0, I_{it}^* \leq 0) \quad (6)$$

The results of the Full Model Maximum Likelihood estimation are reported in Table 3. Columns 1 and 2 present the results relative to the equation for insurance coverage. We can see that the probability of having coverage is higher for married individuals, who have A-levels and a higher permanent income, and who perceive their financial situation as good. It is also higher for individuals who work in large private companies, who also have occupational pensions. The coefficients associated with the occupational dummies are generally precisely determined and negative. This suggests that people employed in the categories

other than managers and administrators have lower probabilities of being covered[18].

Columns 3 and 4 show the results of the Full Model Maximum Likelihood saving regression. The coefficient on insurance is still positive and statistically significant. In terms of magnitude, it is now lower than in the IV Tobit case, but higher than in the pooled and random-effects Tobit cases. We can also see that s_{hu} is positive and statistically significant, indicating a strong correlation between the attitude to save and the attitude to purchase medical insurance. However, even taking into account the interdependencies between insurance coverage and saving decisions, we do not find a substitution effect between saving and insurance. This result is in line with the findings in Starr-McCluer (1996), and suggests that individuals in Britain do not save to self-insure against health risk.

4. Conclusions

In this paper we have explored how the saving decisions of British individuals respond to health risk. In particular, we have tested whether those individuals who are covered by private medical insurance, and who are consequently less exposed to health risk, show lower saving than the uninsured. Our results based on waves 6 to 8 of the BHPS have suggested that this hypothesis does not hold. Even by taking into account the possible endogeneity of insurance purchase, we found that insured respondents always have significantly higher saving than respondents without insurance. This finding is consistent with the results obtained by Starr-McCluer (1996) with regards to US households. Although there is evidence that British individuals save to self-insure against unemployment risk, and more in general income risk (Banks *et al.*, 1999; Guariglia, 2001 etc.), they do not

[18] "Managers and administrators" is the omitted category.

appear to use precautionary saving as a device to protect themselves against health risk. This might be due to the fact that, in spite of the numerous criticisms surrounding the quality of its services, the NHS is considered after all as a reliable institution.

References

Banks, J., Blundell, R. and A. Brugiavini, 1999. Risk pooling, precautionary saving and consumption growth. Working Paper No. W99/19, Institute for Fiscal Studies, Review of Economic Studies (forthcoming).

Belsley, T., Hall, J. and I. Preston, 1999. The demand for private health insurance: do waiting lists matter? Journal of Public Economics 72 (2), 155-81.

Browning, M. and Lusardi, A., 1996. Household saving: micro theories and micro facts. Journal of Economic Literature 34, 1797-1855.

Carroll, C., Dynan, K. and S. Krane, 1999. Unemployment risk and precautionary wealth: evidence from households' balance sheets. Federal Reserve Board Discussion Paper no. 1999-15.

Carroll, C. and Samwick, A., 1997. The nature of precautionary wealth. Journal of Monetary Economics 40, 41-71.

Carroll, C. and Samwick, A., 1998. How important is precautionary saving? Review of Economics and Statistics 80, 410-19.

Dardanoni, V., 1991. Precautionary savings under income uncertainty: a cross sectional analysis. Applied Economics 23, 153-60.

Dynan, K., 1993. How prudent are consumers? Journal of Political Economy 101 (6), 1104-13

Greene, W., 1991. Econometric Analysis, Macmillan Publishing Company, New York.

Gruber, J. and Yelowitz, A., 1999. Public health insurance and public saving. Journal of Political Economy 107 (6), 1249-74.

Guariglia, A., 2001. Saving behaviour and earnings uncertainty: evidence from the British Household Panel Survey. Journal of Population Economics, forthcoming.

Guariglia, A. and Kim, B-Y, 2001. The effects of consumption variability on saving: evidence from a panel of Muscovite households. mimeo, University of Kent at Canterbury.

Guariglia, A. and Rossi, M., 2001. Consumption, habit formation and precautionary saving: evidence from the British Household Panel Survey. Oxford Economic Papers (forthcoming).

Guiso, L., Jappelli, T. and D. Terlizzese, 1992. Earnings uncertainty and precautionary saving. Journal of Monetary Economics 30, 307-37

Hubbard, R., J. Skinner, and S. Zeldes, 1995. Precautionary saving and social insurance. Journal of Political Economy 103 (2), 360-99.

Kazarosian, M., 1997. Precautionary savings- A panel study. Review of Economics and Statistics 79 (2), 241-47.

Kotlikoff, L., 1989. Health expenditure and precautionary savings. In: Laurence J. Kotlikoff, What Determines Savings? MIT Press, Cambridge, MA.

Levin, L., 1995. Demand for health insurance and precautionary motives for saving among the elderly. Journal of Public Economics 57 (3), 337-67.

Lusardi, A., 1997. Precautionary saving and subjective earning variance. Economics Letters 57, 319-326

Lusardi, A., 1998. On the importance of the precautionary saving motive. American Economic Review Papers and Proceedings 88, 448-53.

Maddala, G., 1983. Limited-Dependent and Qualitative Variables in Econometrics. Cambridge, Cambridge University Press.

Merrigan, P. and Normandin, M., 1996. Precautionary saving motives: an assessment from UK time series of cross-sections. Economic Journal 106, 1193-1208.

Miles, D., 1997. A household level study of the determinants of income and consumption. Economic Journal 107, 1-25

Newey, W., 1987. Efficient estimation of limited dependent variable models with endogenous explanatory variables. Journal of Econometrics 36, 231-50.

Office for National Statistics, 1995. General Household Survey, London.

Propper, C., 2000. The demand for private health care in the UK. Journal of Health Economics 19, 855-76.

Propper, C., H. Rees, and K. Green, 2001. The demand for private medical insurance in the UK: a cohort analysis. Economic Journal 111, C180-C200.

Starr-McCluer, M., 1996. Health insurance and precautionary savings. The American Economic Review 86 (1), 285-95.

Taylor, A., 1994. Appendix: sample characteristics, attrition and weighting. In: Buck N, Gershuny J, Rose D, Scott J (Eds), Changing Households: The British Household Panel Survey 1990-1992. ESRC Research Center on Micro-Social Change, University of Essex

Taylor, M. (Ed), 1999. British Household Panel Survey User Manual Volume A: Introduction, Technical Reports, and Appendices. ESRC Research Center on Micro-Social Change, University of Essex

Zeldes, S., 1989. Optimal consumption with stochastic income: deviations from certainty equivalence. Quarterly Journal of Economics 104, 275-98

Table 1
Saving and private medical insurance coverage by individuals' demographic characteristics, age, education and income

	% who save (1)	% covered by insurance (2)	% of insured who save (3)	Non-zero average monthly saving of insured (£) (4)	% of uninsured who save (5)	Non-zero average monthly saving of uninsured (£) (6)

All						
	50.31	22.85	60.91	188.92	47.17	121.30
Demographic variables						
Married/Cohabiting	49.40	17.33	62.37	208.21	46.69	116.20
Not	50.63	24.77	60.55	184.07	47.36	123.23
married/cohabiting	54.14	22.43	64.99	208.05	51.00	127.87
No dependent	44.00	23.54	54.50	153.12	40.77	107.58
children						
One dependent child						
or more	52.10	21.34	62.81	186.80	49.16	123.61
	48.58	26.35	58.17	190.92	45.16	114.45
Age	52.53	26.34	64.66	199.67	48.19	120.94
25 – 34	49.06	22.50	61.92	187.08	45.32	141.97
35 – 44						
45 – 54						
55 – 65	61.31	27.52	73.27	364.09	56.77	180.29
	55.76	30.12	64.67	294.83	51.91	140.51
Education	53.18	24.56	61.12	164.02	50.59	131.46
More than college	51.43	23.27	65.01	151.85	47.31	114.39
College	45.86	19.26	48.90	60.34	45.38	62.86
Some college						
A levels						
Less than A levels	37.23	14.50	48.28	112.72	35.96	80.49
	45.16	14.76	55.73	110.68	43.33	93.07
Income	51.02	17.83	58.53	120.35	49.39	111.72
First quintile	55.67	25.37	60.76	171.33	53.94	131.25
Second quintile	62.50	41.82	68.23	264.82	58.37	188.07
Third quintile						
Fourth quintile						
Fifth quintile						

Source: BHPS, waves 6 to 8.

Table 2 Tobit estimates for saving

	Pooled Tobit (1)	Random-effects Tobit (2)	IV Tobit (3)
Medical Insurance	70.090	69.174	358.138
	(11.10)	(9.54)	(12.10)
Demographic variables			
Age	-3.006	-2.190	-3.289
	(-1.38)	(-0.84)	(-1.51)
Age^2	0.035	0.027	0.033
	(1.32)	(0.83)	(1.23)
Male	-40.232	-40.580	-21.651
	(-4.92)	(-4.09)	(-2.58)
Number of adults in household	1.634	3.546	1.198
	(0.55)	(1.03)	(0.40)
Number of dependent children in household	-22.747	-23.146	-24.004
	(-6.77)	(-5.65)	(-7.12)
Married/Cohabiting	-1.422	-2.304	-15.477
	(-0.21)	(-0.29)	(-2.23)
Education			
Post-graduate degree	27.821	43.240	66.900
	(1.53)	(1.92)	(3.60)
College degree	3.765	2.980	16.033
	(0.34)	(0.22)	(1.44)
Some college	3.148	5.551	11.355
	(0.43)	(0.61)	(1.52)
A levels	5.439	2.253	-2.144
	(0.63)	(0.21)	(-0.25)
Financial variables			
Financial situation expected to deteriorate	40.335	32.971	40.752
	(4.18)	(3.44)	(4.22)
Financial situation expected to improve	-17.974	-17.780	-22.303
	(-2.96)	(-2.88)	(-3.66)
Financial situation worse than expected	-19.782	-18.267	-24.061
	(-2.47)	(-2.29)	(-3.00)
Financial situation better than expected	34.467	37.695	26.732
	(5.52)	(6.02)	(4.25)
Financial situation: good	136.267	113.982	116.479
	(18.84)	(15.0)	(15.57)
Financial situation: bad	-128.882	-130.221	-120.532
	(-7.94)	(-7.85)	(-7.43)
Other variables			
Health problems	-36.570	-33.674	-36.602
	(-2.72)	(-2.42)	(-2.72)
Permanent income	0.149	0.152	0.059
	(9.32)	(8.12)	(3.20)
Sample size	12,997	12.997	12,997
Number of censored observations	6,459	6,459	6,459
Log likelihood function	-19,211.71	-18,696.78	-19,199.49

Notes: Asymptotic t-ratios are in parenthesis. Regional and time dummies were included in all specifications. "Less than A-levels" is the omitted educational category. In column 2, the fraction of total variance attributable to the unobserved random-effects (r) is equal to 0.396. The estimates in column 3 were obtained using the method illustrated in Newey

(1987). The instruments used are occupational dummies, size of the workplace, and dummies for whether the worker has an occupational pension, and for whether he/she works in the private sector. S*ource*: BHPS, waves 6 to 8.

Table 3
Full Model Maximum Likelihood estimates for insurance coverage and saving

	Insurance coverage (1)	*z-stats* (2)	Saving (3)	*z-stats* (4)
Medical Insurance	....	....	105.707	10.21
Demographic variables			-	-
Age	0.015	1.14	4.097	1.72
Age^2	-0.0001	-0.64	0.044	1.50
Male	-0.084	-1.33	-24.049	-2.64
Number of adults in household	-0.014	-0.93	2.592	0.80
Number of dependent children in household	0.007	0.42	-22.669	-6.21
Married/Cohabiting	0.149	4.37	-18.365	-2.38
Education				
Post-graduate degree	-0.200	-1.97	62.301	3.08
College degree	0.060	0.95	12.522	1.04
Some college	0.020	0.51	8.687	1.07
A levels	0.105	2.48	-3.759	-0.40
Financial variables				
Financial situation expected to deteriorate	...	...	38.687	4.02
Financial situation expected to improve	...	....	-19.037	-3.13
Financial situation worse than expected	...	...	-18.995	-2.38
Financial situation better than expected	...	...	33.990	5.45
Financial situation: good	0.215	6.53	113.341	13.74
Financial situation: bad	-0.103	-1.55	-118.487	-6.81
Occupation				
Professional occupations	-0.174	-3.41	...	...
Associate prof. & technical	-0.180	-3.31	...	...
Clerical & secretarial	-0.041	-0.59	...	...
Craft related	-0.376	-5.20	...	...
Personal & protective services	-0.116	-1.28	...	...
Sales	-0.142	-1.55	...	...
Plant & machine operators	-0.410	-5.36	...	...
Others	-0.246	-2.30	...	...
Other variables				
Health problems	0.003	0.05	-37.517	-2.58
Permanent income	0.0005	3.38	0.066	3.29
Size of the workplace	2.261	4.17	...	...
Has an occupational pension	0.459	16.33	...	...
Private sector	0.488	14.48	....	...
Sample size				
Number of censored observations	12,997	σ_η^2 (st.error)	2.650	(0.024)
Log likelihood function	6,459	$\sigma_{\eta u}$ (st.error)	0.333	(0.041)
	-25,410.01			

Notes: The saving equation is estimated jointly with the insurance coverage equation. Regional and time dummies were included in the specification. "Less than A-levels" is the omitted educational category. "Managers and administrators" is the omitted occupational category. s_h^2 represents the variance of the error

term in the saving equation after the insurance coverage equation has been substituted into it (see Equation 4 in the text). s_{hu} represents the covariance between the error term in the latter equation and that in the insurance coverage equation (see Equation 3 in the text). *Source*: BHPS, waves 6 to 8.