EXAMINING THE INTERACTION BETWEEN SAVING AND CONTRIBUTIONS TO PERSONAL PENSION PLANS. EVIDENCE FROM THE BHPS

Mariacristina Rossi

Examining the interaction between saving and contributions to Personal Pension Plans. Evidence from the BHPS

Mariacristina Rossi
University of Rome, Tor Vergata and CeRP*

Abstract
This paper analyses the effects of social security reforms on saving in Britain. Following the 1986 Social Security Act, the UK pension system has partially shifted from an unfunded basis towards a partially funded basis. Under the new pension scheme, individuals are given the option of contracting out of the earning related pension scheme into a personal pension plan comparable to the IRA pension plan existing in the US. Individuals are also given the possibility of making additional contributions to their pension plan. These contributions represent an attractive form of saving in that they receive a more generous tax treatment than other conventional forms of saving.

We use the BHPS dataset for the years 1991 to 2003 to investigate the interactions between voluntary additional contributions to personal pension plans (PPP) and saving in conventional forms. In particular, we test whether contributions to the PPP crowd out saving or constitute additional saving.

We estimate the determinants of the amount saved in conventional forms and for retirement purposes with different estimation strategies by allowing the two choices to be correlated. According to our findings, the introduction of private pension schemes has not exhibited a crowding out effect on private saving.

1 Introduction

The UK household saving rate has been stable at around 5% since the year 2000, after having reached its peak in 1992 (at 11%) and having then gradually declined until 1999[1]. The persistence of low saving rates has always worried economists, mainly because of the concern that households in their working age are possibly mistargeting the resources necessary to them during retirement. In order to avoid the consequences of this concern, government policies often aim at promoting retirement saving. The lack of resources during retirement, in fact, would entail a big burden either for the elderly left without vital resources or for society as a whole.

The rationale behind the introduction of a public pension system can be traced back to the paternalism principle (Diamond, 1977) according to which public provisions of pension income streams replace income flows during retirement. According to this view, public provision of retirement insurance appears superior from a social welfare point of view. However, as highlighted by Disney et al. (2000), a comprehensive state pension provision has become unaffordable given the demographic transitions characterising industrialised countries[2]. A shift away from a comprehensive state pension provision to a partially funded system allows households more freedom in their savings for retirement decisions. Individuals have, in fact, more discretionary power in determining their personal saving for old age. This freedom in saving choice

---

[1] See, also, Attanasio and Banks (1998).

[2] Social protection expenditures constitute a major part of public spending in all countries belonging to the European Union. Population ageing is a common factor among EU countries and it will impose an additional burden on European fiscal balances. Public pensions in most Western countries constitute a consistent fraction of GDP. For the 15 EU countries this amounted to 10.4 % in the year 2000, peaking at 14% for Austria and Italy. The only exceptions among the EU countries are the UK and Ireland, with a ratio of 4.6 percent and 5.5, respectively (OECD, 2003). This difference is hardly explained by different demographic structures of the countries. The composition of private and public pension provision, the structure of the pension benefits, and the age of retirement are the crucial factors in determining the discrepancy of the pension burden among countries.

spontaneously raises economists' worries on whether household saving is sufficient to keep households' consumption at its permanent level after retirement.

The UK system, in contrast to the average European pension system, allows employees to have a high degree of choice in determining how much to save for retirement. However, consumers' choice can be affected by such irrational attitudes as myopia, leaving the household prone to the risk of being left without vital resources for the future. Would this discretion in choosing how much to save for retirement leave consumers alone in facing the consequences of wrong retirement planning, and, if so, to what extent?

In Britain, the percentage of households who do not save any resource for future consumption in conventional forms has increased over the past decade. This could be due to the crowding out effect of the introduction of personal pension plans (PPP), whose return is higher than the market rate. The crucial issue in analysing the interaction between conventional saving and retirement saving in voluntary contributions to the PPP is whether contributions to the PPP crowd out saving or constitute additional saving. As a special tax treatment makes retirement saving returns more favourable than conventional saving, consumers face the income and substitution effect when choosing the optimal amount of savings. A higher interest rate increases the attitude toward saving due to a substitution effect, at the same time, having more resources available, due to a higher interest rate, makes saving less attractive due to the income effect.

If markets are not perfect and credit constraints bind, we expect that those consumers who are rationed in the credit market will be affected by liquidity constraints

in their pension and saving decisions. Pension asset is, in fact, illiquidable and therefore generates a non-disposable asset until retirement age (Gale 1998).

Substitution between pension wealth and other forms of assets has been tested several times. After the seminal work of Feldstein (1974) a great deal of empirical economic literature has tested the substitutability between household saving and pension wealth. According to Feldstein a large amount of the resources saved is displaced by the introduction of pension plans.

More recent empirical findings, albeit not unidirectional, acknowledge that a displacement effect is generated by the introduction of such pension plans. Even though new savings are generated, part of the contributions to pension plans can be attributed to a displacement of other forms of saving diverted towards pension plans. Dicks, Mireaux and King (1984) obtained a coefficient of displacement on saving due to pension of 0.15, while Hubbard (1986) obtained a coefficient of 0.4. Venti and Wise (1990) claim that the offsetting effect is almost non-existent. Gale and Scholtz (1994) found that the coefficient of substitution between IRAs and other assets rises with age, since the young face greater liquidity constraints. Samwick (1998) concludes that the coefficient of displacement found in the literature ranges between 0.2 and 0.5. In other words, an increase of one dollar in pension wealth reduces other assets by between 20 and 50 cents[3].

In the UK, with the exception of Guariglia and Markose (2000), no similar analysis has been performed. The authors claim that there is no evidence of a displacement effect on saving due to the introduction of personal pension plans. In fact, contributions to PPP are essentially made for retirement purposes, while saving in

---

[3] See also Lavi and Spivak (1999) for evidence on the pension offsetting effect on saving in Israel. The coefficient of offsetting found is between 0 to 0.5.

traditional forms is related to precautionary reasons. This paper departs from the analysis of Guariglia and Markose (2000) and extends it by considering the resources saved under different forms as the outcome of two jointly made decisions. The rest of the paper is organised as follows. Section 2 describes the characteristics of the UK pension system, while Section 3 describes the motivations behind saving in different forms and the saving patterns of the British. Section 4 describes the dataset used and Section 5 explains the results obtained through the empirical analysis. Finally Section 6 concludes the paper.

2   The UK Pension system

In 1986 the Social Security Act introduced relevant changes that have since affected retirement decisions. These reforms have peculiarly characterised the UK pension system, within the OECD countries, with the allowance of great freedom in choosing the private pension provider. The UK is facing a much softer pension burden than the other European countries, one of the reasons being that the UK has one of the most attenuated state pension systems among its European partners, which co-exists with a well-established private funded pension system. Moreover, since the beginning of the 1980's restrictive policies have been applied to state pension provisions to reduce the risk of a pension crisis in the near future (Blake, 2000).

The UK pension scheme is divided into three "tiers".

The first, a basic tier, contemplates a basic state flat rate. Benefits can be received at the age of 60 and 65, respectively for women and men. The earnings replacement ratio is about 12% for a single person, as a proportion of average earnings.

Couples receive a higher benefit, representing an earning replacement rate of about 20%[4].

Pensioners can benefit from a supplementary pension through the second tier of the UK pension programme. Secondary provision is compulsory for all employees whose earnings are above the lower earning limit.

Three options are available under the second tier programme.

1) the State Earning Related Pension System (SERPS), an earning related programme contemplating very favourable benefits at the beginning, based on the best 20 years of earnings. As described by Disney et al. (1999) about 17% of UK workers is still in SERPS (from April 2002 SERPS was replaced by the equivalent S2P, State Second Pension).

2) a company pension plan. This is either a defined benefit plan type or since 1986 a defined contribution plan type.

3) since 1986 individuals can opt out of SERPS or company pension plans to buy a Personal Pension Plan from a private insurer. Individuals can almost costlessly switch between regimes. Personal Pension Plans are therefore directly comparable to the Individual Retirement Account (IRAs plans) existing in the US (see Blake 1995).

The third tier of the pension system is given by discretionary individual additional payments to pension plans. Individuals can make additional contributions to a company pension plan (subjet to a limit, which depends on age and earning) or augment their plan through a separate insurer and they can make additional, tax relieved, contributions to Personal Pensions up to a certain fraction of their earnings

---

[4] An income-tested benefit -Income Support- is guaranteed to those people without adequate contributions. People with no other forms of income than basic flat pension are also entitled to Income Support.

(Disney 2000). Additional voluntary contributions to pension plans, along with saving in more conventional forms, represent the variables on which the paper focuses.

3   Understanding Saving

The usual model for dealing with the intertemporal allocation of money over time is the life-cycle model. The theory of life cycle consumption posits a smooth profile of consumption over time. In the presence of income patterns that increase until retirement and then decrease, the saving path should exhibit a hump-shaped profile during the individuals' lifetimes. In all of its forms, saving represents a way to transfer resources from periods when incomes are high to periods when incomes are low, relative to a person's average life-income. If current income is above permanent/lifetime income, people will accumulate assets in order to face future downturns in income (this is also known as saving for "a rainy day", Deaton 1992). The idea that saving is the way to keep consumption stable after income drops during retirement dates back at least to Modigliani and Brumberg (1954). Nowadays, compulsory pension contributions help fill the gap between working-life-income and retirement-income. However, given that the replacement rate of income in the UK is very low (even though there is no homogeneous pension treatment across Europe) pension streams could be insufficient to keep consumption at a stable level after retirement. Additional resources previously saved are necessary if households want to avoid a future drop in their retirement consumption levels.

Total savings can then be split into as many categories as the number of reasons for future income downturns. Traditional life cycle savings represent the amount of resources saved for retirement period purposes. Precautionary saving is needed to

transfer resources if negative events occur in the future. Saving could, also, be motivated by different reasons such as the education of children, bequests, etc[5].

The existence of insurance markets allows consumers to transfer resources if the bad event occurs under the payment of a premium. If all risks were covered by the existence of an insurance market we would expect no precautionary saving to exist any more. If perfect insurance markets existed and individuals were fully insured, resources would be consumed under the two different states in equal amounts. The degree of development of insurance markets could therefore influence the amount of resources saved due to precautionary reasons.

Table 1 illustrates the reasons according to which people save according to our sample[6]. In each wave, with the exception of the first one, respondents are asked:

"*What is the first reason to save?*" Respondents have to indicate the reason among the ones proposed in the BHPS questionnaire, as shown in Table 1[7].

It is worth noting that the majority of savers save for no specific reason (nearly 42% of all savers). Life cycle saving is not, therefore, a priority for people accumulating resources. The second saving motive is for holidays. These additional resources put aside, however, do not represent saving, strictly peaking, as they will be wiped out during the year. Therefore the actual saving rate of the British household is even lower than that declared if we consider a year, instead of a month, as the reference period to measure saving.

---

[5] See Samwick 1998. Precautionary saving is usually defined as the additional resources saved due to the variance of the shock affecting the uncertain income path (Deaton, 1992). This is positive if the third derivative of the utility function is positive. In our text, precautionary saving is considered as the response to uncertainty.

[6] One may argue that we should adopt a sceptical attitude to what people consider as the reasons for acting in a certain way. Individuals could just not be aware of the real reasons behind the act of accumulating resources, having to choose among some fixed categories of answers, which can, also, be interpreted subjectively.

Table 2 indicates the incidence of having a personal pension plan according to the principal motive for saving. Interestingly, among those who claim to save for life cycle purposes (old age) almost 30% have subscribed to a pension plan. This could be evidence of a higher prudence level, relative to future drops in income, exhibited by those individuals who consider saving for retirement purposes a priority. Thus, people who save for old age are also planning their retirement resources through alternative forms of saving.

3.1   Private Pension Plans

Pension reforms worldwide have been characterised by a common denominator: the attempt to move towards a system that relies more intensively on funded pensions. Underlying this process there is a common belief that stimulating pension asset accumulation enhances aggregate savings. In a low saving rate context, as in the UK, governments try to stimulate additional household saving so that households reduce their risk of facing retirement with insufficient resources[8]. In industrialised countries, the increase in the age of the population drives policy makers to promote higher saving rates so that comfortable living standards can be granted to individuals by additional saving previously accumulated for longer retirement periods.

In the US, the introduction of Individual Retirement Accounts (IRA) in 1974, was motivated by the need for encouraging personal saving for retirement (see Venti

---

[7] In wave one respondents are asked: "What is the reason for saving?" without specifying the first and second reason for saving. After wave one, respondents are asked the first and second reason to save.
[8] However, as stressed by Disney et al. (2000), average low aggregates of saving are not sufficient evidence to conclude that households are not saving enough for their future. Each household has, in fact, different saving optimal paths depending on its lifetime resources. Aggregate saving data are not, therefore, sufficient evidence to determine whether households have insufficient accumulated asset to face retirement.

and Wise, 1990 and Gravell, 1991). Contributions to IRA are not taxed and interest compounded is tax free. In order to assess whether IRA, or, similarly, private pension plans, do generate additional savings it must be determined whether IRA plans are financed by new savings, from existing savings or from savings that would have been put aside in any case (see also Attanasio and DeLeire, 1994). Do tax favoured pension plans generate net saving and, if they do, to what extent has the increase in saving taken place? A large body of economic literature has focused on the possible crowding out effect of the introduction of pension systems on private saving. It is well known that the effect of an increase in the interest rate on saving for net savers depends on the income and substitution effect. While the former acts to reduce saving, the latter acts in the opposite direction. The evidence reveals a mixed picture of the net saving effect due to the introduction of IRA.

One of the main impediments in determining whether the introduction of pension plans could generate additional saving is savers' heterogeneity. Due to different individuals' risk aversion, or, more generally, to widely different preferences among people, the effect of pension on personal saving could be driven by personal attitude towards saving in all its forms. If a positive effect on saving is observed after the introduction of personal pension plans, this could be due to a selection effect, households who save in conventional forms being more oriented towards saving in general. Controlling for individuals' hidden propensity to save, we can infer whether the introduction of personal pension plans causes a true displacement effect on personal saving.

4 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. Twelve waves are currently available, covering the years 1991 to 2003. The survey focuses, in particular, on household characteristics, such as participation in the labour market, income and wealth, health, education, and, more generally, on socio-economic status[9].

We used eleven of the waves of the British Household Panel Survey covering the years 1992- 2003[10].

We restricted our sample to those employees aged between 20 and 65. We excluded the self-employed from the sample as it could be misleading to consider the saving of this category as personal saving instead of saving that could be reinvested in their firm. Moreover, no measure of usual net earnings for this category was available[11]. After these restrictions, our sample consisted of 48521 person-year observations.

4.1 Descriptive statistics

The BHPS panel dataset collects some information on the financial decisions of British households. In particular, respondents are asked the following question: *"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?[12]"*

---

[9] For more details on the BHPS, see Taylor (1994) and Taylor (1996). Each wave cover two calendar years, e.g wave 12 is run from September 2002 to May 2003.
[10] We excluded the first wave from our analysis, as the variables of interest were included only from the second wave onwards.
[11] Employees represent the majority -around 87%- of the working group.
[12] For more information on the BHPS questionnaire, see http://www.iser.essex.ac.uk/bhps/doc/index.html.

Around 50% of households in Britain, during 1991-2003, acknowledge that they do not save any resource. Surprisingly a small fraction declares to save for retirement reasons, as described in Section 3. Given this picture, a perhaps paternalistic question naturally arises: do consumers save enough for their retirement? Half of the sample of British individuals exhibits no savings during the year; this could either be because they earn below their permanent income or because they have subscribed to other forms of saving through a private pension scheme. It is therefore crucial to correlate the two decisions on different forms of saving to understand if and how much consumers save for retirement purposes.

In each wave of the BHPS, with the exception of the first one, respondents are asked whether they have made additional contributions to their pension plans, conditional on having subscribed a pension plan. Respondents are asked: *"In the past year, that is since September 1st 1996 have you paid any contributions or premiums for a private personal pension, or had such contributions been paid on your behalf by the Department of Social Security (DSS)?"*. If they answer yes to that question, they are also asked whether they have made extra-contributions, in addition to those paid by the DSS to the pension plan[13].

Table 3 illustrates the fraction of individuals holding a private pension scheme and paying additional contributions to pension schemes, by sex, type of profession, age range, educational level, income level and whether or not his/her employer has an employee pension scheme[14].

---

[13] The question asked is: '*SinceSeptember 1st [of last year], over and above those contributions paid on yourbehalf* by the DSS, have you yourself made any extra contributions towards your personal pension?', 'How much was your last contribution?' and 'How long did it cover?'.

[14] Only respondents who have subscribed a personal pension fund can make extra contribution to it. We have not taken into account the possible selection of the sample in our estimates.

Overall, around 12% of the respondents in our sample made additional contributions to their pension plan. Male respondents have a higher propensity for contributing to personal pension plans than female respondents. The probability of having a personal pension plan is at its minimum in the 20-24 age range. At age 45-49 the fraction of respondents who save in forms of pension is at its peak (14% of the sample).

Employees belonging to private companies exhibit higher rates of personal pension plan participation. Respondents belonging to higher income classes exhibit a higher probability of saving in non conventional forms (5% against 18% for the first and fifth quintile, respectively).

5 Empirical Results

5.1 Determinants of pension contributions and amount saved

In our empirical specification, we initially estimate our model by using Tobit regressions. We use a Tobit estimation technique as our variable of interest, savings, is only observed for positive values. Using the subscript i to indicate individual and t to indicate time, the optimal amount of resources saved is determined as follows:

(1) $S^*_{it}=X_{it}'\beta+\gamma PC_{it}+\varepsilon_{it}$

S^* is the amount individuals would save each month, though it is not observed when negative. Saving (S) is observed when positive (S=S*) and it is observed equal to zero when S* takes negative values.

The set of regressors used, X, are:

age (*age)* and age squared (*age2)* of the individual,

number of children in the household to which the individual belongs (*nchild)*,

total monthly net income (*paynu),*

a set of dummy variables indicating whether the respondent's maximum level of education is college or higher and some college (*college or more, less than college*),

a dummy variable taking the value of one if the respondent is male (*male*), zero otherwise

a dummy variable taking the value of one if the respondent is married (*married*), zero otherwise,

a dummy variable taking the value of one if his/her financial situation is expected to improve, zero otherwise[15] (*Financial improvement expected*)

a dummy variable taking the value of one if s/he belongs to an employer's occupational pension plan, zero otherwise (*Occupational pension scheme*)

a dummy variable taking the value of one if the house of residence is owned (*House owned*).

a dummy variable taking the value of one if his/her overall health status is good (*healthok*), zero otherwise.

A variable capturing the variability over time of the individual's income was added to the regressors set (*var*)[16]. This variable was derived as the variance of the error component of the income process using all the waves of the BHPS. More specifically, we constructed the variable VAR_{it} according to the following procedure. We obtained the residuals from a random-effects regression of the respondent's usual net monthly earnings on his/her age, age squared, gender, regional dummies, educational dummies,

---

[15] The questionnaire contains a question on the subjective perception of the future financial situation (variable *fisitx*)

[16] We also tried to control for unemployment spells, but the percentage of those who are employed and experienced unemployment spells in the past was too small.

occupational dummies, and interactions of the last two groups of dummies with age. We then calculated the sample variance of these residuals in the four or more years before the year t, the year of the interview [17]. The rationale behind the introduction of the variance term relates to precautionary motives for saving. If the expected downturns in income are captured by financial status expectations and are responsible for the traditional saving for "a rainy day", an additional motive for saving arises if individual is risk averse. In fact, as shown in the closed form solution found by Caballero (1990), saving is enriched by an additional component, the variance of the disturbance to the income process, which enhances consumption growth if agents are prudent. Controlling for the precautionary motive for saving allows us to determine whether individuals exhibit a higher saving rate due to the presence of uncertainty. More importantly, we are also able to distinguish whether these motives directly enter both savings equations and what their incidences are in influencing saving in conventional forms or in personal pension fund forms.

Savings is also regressed on an additional regressor, PC, equal to the amount saved in a specific form: the resources put aside as an additional contribution to a personal pension plan.

One of the main problems arising when estimating such a model with this technique is that we do not consider the endogeneity of the variable PC. Given that the two saving decisions are correlated, if we did not take the correlation into account the coefficient of the dummy variable PC would not be consistent. The way we deal with the endogeneity issue is by jointly estimating the two equations by Maximum Likelihood[18] and allowing the two error terms to be correlated. If saving is mainly a

---

[17] See Guariglia for a similar approach (2001).
[18] See Maddala, 1983

response to future drops in income due to retirement, as Modigliani's original intuition suggests, those individuals who are not covered by a pension plan should exhibit a higher saving rate than those who are covered. In order to take into account the simultaneity of the decision processes and to determine whether individuals who save in pension forms and those who do not differ in their saving behaviour, we suppose that the amount of resources the agents put aside in pension plans enters the saving equation model both directly and indirectly via the errors correlation term. Denoting the (latent) propensity to save in ordinary forms and pensions with S* and PC*, respectively, and the observed corresponding variables with S and PC, we jointly estimate the following two equations:

(2) $S^*_{it} = X_{it}'\beta + \gamma PC^*_{it} + \varepsilon_{it}$ where S=S* if S*>0 , S=0 otherwise

(3) $PC_{it}^* = W_{it}'\varphi + v_{it}$ where PC=PC* if PC*>0, PC=0 otherwise

X_{it}, W_{it} are the sets of regressors referring to characteristics of individual *i* at time *t*, β and φ the parameter vectors; ε and v the two error terms.

The two error terms are distributed according to a bivariate normal distribution, with a correlation coefficient that we are going to estimate. The correlation of the two error terms allows us to take into account the individual propensity to save in any form. In equivalent terms, a positive coefficient γ, could be due to the fact that those individuals who save in conventional forms are, also, more likely to save in the form of pensions plans.

This specification allows us to detect the direct impact of pension contributions on saving which, if negative, measures the displacement effect on saving due to the introduction of the PPP[19].

The structure of the model in equation (2)[20] implies that the propensity to contribute to personal pension plans rather than the actual amount added into the plan has an impact on the decision on saving in conventional forms. One could argue that the result of the action, which is the observed counterpart (PC) of the latent variable (PC*), and not the sentiment towards an action should be used as an explanatory variable for saving. However, as highlighted in Maddala (1983), the correct specification of the econometric model should be based on a theoretical model according to which saving decisions are formulated. We argue that preferences for saving in pension and not the observed choice drive other saving decisions. For this reason, we use the latent propensity and not the action taken by the individual as the explanatory variable entering the saving equation.

Due to the censoring, we can divide our sample into the following four categories (we avoid the subscript i for easier notation):

Category 1: The individuals who save and contribute to a private pension plan, such that:

$$S^* = X'\beta + \gamma PC^* + \varepsilon = X^*_{it}{}'\delta + \eta_{it} > 0 \text{ and } PC^* = W'\varphi + \nu > 0.$$

[19] The structural model is considered, instead of a reduced form model, so that we are able to measure the direct impact of savings in pension form on other types of saving. In this way, we are able to detect whether the two forms of saving are considered substitutes or complements. For a similar approach, see Starr-McCluer (1996).

[20] Substituting the expression for PC into equation (2), we obtain: $X_{it}{}'\beta + \gamma PC^*_{it} + \varepsilon_{it} = X_{it}{}'\beta + \gamma (W_{it}{}'\varphi + \nu_{it}) + e_{it} = X^*_{it}{}'\delta + \eta_{it}$, where $\eta_{it} = \gamma_i \nu_t + \varepsilon_{it}$

Category 2: The individuals who do not save and do contribute to pension plans, such that:

$S^* = X'\beta + \gamma PC^* + \varepsilon = X^{*}_{it}{}'\delta + \eta_{it} < 0$ and $PC^* = W'\varphi + \nu > 0$.

Category 3: The individuals who save and do not contribute to a private pension plan, such that:

$S^* = X'\beta + \gamma PC^* + \varepsilon = X^{*}_{it}{}'\delta + \eta_{it} > 0$ and $PC^* = W'\varphi + \nu < 0$.

Category 4: The individuals who do not save and do not contribute to a private pension plan, such that:

$S^* = X'\beta + \gamma PC^* + \varepsilon = X^{*}_{it}{}'\delta + \eta_{it} < 0$ and $PC^* = W'\varphi + \nu < 0$.

Denoting with $\phi(.)$, $\phi 2(.)$, $\Phi(.)$, and $\Phi 2(.)$ the univariate and bivariate normal density function; and the univariate and bivariate cumulative distribution, respectively; with σ_η^2 and σ_ν^2, the variance of η_{it} and ν_{it}, with $\sigma_{\eta\nu}$, the covariance between η and ν, and with ρ the correlation coefficient between η_{it} and ν_{it}; the probabilities associated with each of the four categories can be written as follows:

$Pr(1) = Pr(S_{it}^* > 0, PC^*_{it} > 0) = \phi_2\,(\eta_{it}, \nu_{it}, \sigma_\eta, \sigma_\nu, \rho)$

$$Pr(2) = Pr(PC_{it}^*)Pr(S_{it}^* \leq 0 \mid PC_{it}^*) = \phi(\nu_{it}, \sigma_\nu)\,\Phi\left(\frac{-X^{*}_{it}{}'\delta - \frac{\sigma_{\eta\nu}}{\sigma_\nu^2}\nu_{it}}{\sqrt{1 - \frac{\sigma_{\eta\nu}^2}{\sigma_\nu^2}}}\right)$$

$$Pr(3) = Pr(S_{it}*)Pr(PC_{it}* \leq 0 \mid S_{it}*) = \phi(\eta_{it}, \sigma_\eta) \Phi \left(\frac{-W_{it}'\varphi - \frac{\sigma_{\eta v}}{\sigma_\eta^2}\eta_{it}}{\sqrt{1 - \frac{\sigma_{\eta v}^2}{\sigma_\eta^2}}} \right).$$

$$Pr(4) = Pr(S_{it}* \leq 0, PC_{it}* \leq 0) = \Phi_2(-X^*_{it}{}'\delta/\sigma_\eta, -W_{it}'\varphi/\sigma_v, \rho).$$

Both saving and pension contribution variables are censored at zero. The researcher observes only the positive values of saving, the negative values of the variables being censored at zero.

The two decisions on saving, in ordinary forms and pensions, are regressed on a set of demographic and socio-economic variables. The set of variables used are the same used to estimate the Tobit model.

The main difficulty which arises in the estimates of the structural model is the identification problem. More specifically, we have to find which variables are most likely to influence saving choices through the indirect impact on pension contribution decisions, without directly influencing saving decisions. Of the variables included the type of firm and job of the respondent have a direct impact on determining the contributions to PPP, but are less likely to have a direct impact on saving. The job related dummy variable we use is whether the job is in a *private firm/company*.

The reason behind the choice of the type of work variables is the following. Private company employees could show a different propensity for personal pension plans than civil servants, due to a minor stability. Moreover, employers often offer subscription to a private pension plan as a type of benefit for the employee. For this reason, we consider this dummy variable as directly entering the equation of additional voluntary contributions and only indirectly entering the equation of saving, via the parameter ρ.

5.2   Regressions Results

Table 4 and Table 5. illustrate the estimate results corresponding to the Tobit and Maximum Likelihood models, respectively. The sign and the magnitude of the regressors are very similar in both specifications. As already exposed, the Tobit model does not take into account the endogeneity of contributing to pension schemes, thus our preferred model is the one estimated through maximum likelihood, which jointly estimates the two saving outcomes. The maximum likelihood model being our preferred specification, our comments refer to the findings of the latter.

A more prosperous financial future stimulates higher current consumption levels and, therefore, a smaller amount of resources saved, as predicted by the LCPIH theory. This variable has a detrimental effect on pension contributions, by reducing them by 17£, while it does not significantly impact ordinary saving[21]. One explanation for this finding is that savings in ordinary forms respond more to transitory fluctuations than permanent ones. If respondents perceive a better financial situation in the future, this could be the result of a better permanent financial situation for the family, and therefore less need for accumulating asset for retirement.

A benefit pension scheme offered by the employer reduces the incentive to additionally contribute to retirement savings (variable *emplo_yes* in the first equation). The employer's pension scheme could therefore be considered as a substitute for a personal pension plan.

A good health status positively affects pension contributions. The perception of a good health status increases the willingness to save in both forms. This could be in contrast to the traditional role of saving namely saving for a "rainy day". According to

---

[21] Estimated coefficients such as the vector β in equation (2), therefore could be interpreted as the marginal effect conditional on having a positive saving.

the traditional life cycle predictions, respondents who perceive their health status as being good, should also exhibit a lower saving rate, compared to those individuals with worse future health expectations. If subjective perception of health condition is a good proxy for future health conditions, respondents with poor health should be more prone to the consequences of a future lack of resources, due to higher medical expenses, and therefore should save more than healthy respondents. One explanation for this finding could be related to life expectancy. Perception of own health status could proxy life expectancy; thus we would expect individuals who expect to live longer to save more than others.

The variance of income negatively affects only conventional savings in a significant way, suggesting that higher income variance decreases savings instead of enhancing them, as the precautionary motives for saving would suggest. Once different forms of saving are modelled jointly and considered as the outcome of a common process, precautionary motives to save do not represent a channel through which individuals accumulate additional saving.

Turning, finally, to the displacement effect on saving (measured by the coefficient γ) due to the existence of alternative forms of saving, we observe that pension contributions have an enhancing effect on saving in other forms, by increasing the latter by almost a pound. An additional pound invested in pensions would increase saving by up to a pound for the savers[22].

---

[22] The marginal effect of an additional pound of pension saving on saving in other forms is calculated by simulating the expected value of saving, conditional on having positive pensions and saving, by an increase of a pound of pension contributions. Given the specification of the model, we could estimate the total effect of a change of each regressor entering each equation. An increase of a pound in monthly income, for example, would increase saving both directly and indirectly through its impact on pension, via the parameter γ.

In other words, an additional pound put aside in a pension plan would have no detrimental effect on saving, but would actually increase it. The two products of saving are therefore complementary and not substitutes, as those respondents who save in pension forms also have higher savings.

The fact that saving decisions are correlated via their error terms is confirmed by the coefficient ρ, which is equal to 5%. Those individuals who are more inclined to conventional saving do also show a higher propensity for other forms of saving. After accounting for this effect, which could have been responsible for the enhancing effect of saving, we still find no detrimental effect on saving due to pension plans. The sign of the coefficient γ indicates that, in addition to a natural propensity for saving that differs among individuals (captured by the coefficient ρ), savings in pension plans does not substitute savings in conventional forms. The no displacement result given by the Tobit analysis, where pensions were treated as an exogenous variable, is thus confirmed.

From a policy standpoint it is important to provide the policy maker with estimates of the degree of substitutability of different forms of saving. In the presence of a displacement effect, total household saving could also be depressed by the introduction of such forms of pension schemes. The empirical evidence shows that not only is this effect not observed, but the existence of such plans seems to have an additional effect on conventional saving. However, if household savings are not affected in a negative way by these pension reforms, households with no pension coverage have no other conventional forms of saving either. Therefore, if a natural concern on the effect of pension reforms exists, this should not be related to the ability of creating saved resources, but, on the contrary, to the inability of targeting those households more prone to the risk of being left without resources after retirement.

6 Conclusions

This paper inspects saving behaviour in Britain by using the last twelve available waves of the BHPS panel dataset.

We focus on the determinants of saving in conventional forms and on the forms of pensions as two decisions taken simultaneously by the household. The aim of this analysis is to shed some light on the displacement effect on saving due to the introduction of the personal pension plans (PPP). As the two decisions have in common the specific individual's unobserved preference toward saving, the econometric specification adopted allows us to control for this effect. In estimating the direct impact of additional contributions on personal pension plans, we are able to detect whether there is a pure crowding out effect once we control for the hidden propensity to save in any form.

The evidence presented in this paper suggests that the contributions to personal pension plans have not offset other forms of saving. Our estimates, in fact, show a positive correlation between saving in conventional forms and saving in the form of contributions to personal pension plans. This suggests that the crowding out effect is not only non existent, but, more surprisingly that such forms of retirement saving enhance saving in other forms as well. This conclusion is supported both by the descriptive statistics and by the statistic empirical analysis described and performed in this paper. Controlling for individual characteristics, household's characteristics, and risk attitude we found that the effect of an additional pound contributed to personal pension plan stimulates saving in conventional forms. Individuals do not consider retirement saving as an alternative form of saving; they treat the two forms of saving as complements

instead of substitutes when deciding the amount of resources to put aside. These findings are in line with the previous literature focusing both on American households (among others, see Venti and Wise 1990) and on British households (see Guariglia and Markose 2000). One explanation of this empirical evidence is that individuals consider saving for retirement as distinct from other forms of saving, which might be motivated by more short-term needs.

Another consequence of these findings is that the observed decline in the saving rate cannot be attributed to any displacement effect of the alternative forms of saving. Without the existence of personal pension plans households' saving rates would have been even lower.

References

Attanasio O. and J. Banks, (1998), "Trends in Household Saving: a tale of two countries", *Institute for Fiscal Studies* (IFS), WP 98/15

Attanasio O. and T. De Leire, (1994), "IRAs and Household Saving Revisited: Some New Evidence", WP No. 4900, *NBER*.

Attanasio, O. and S. Rohwedder, (2003), "Pension Wealth and Household Saving: Evidence from Pension Reforms in the UK", *American Economic Review*, AER, (5), pp 1499-1521

Barrientos, A. (1998), "Supplementary Pension Coverage in Britain", *Fiscal Studies,* vol 19, n.4, pp.429-446.

Blake, D. (1995), *Pension Schemes and Pension funds in the United Kingdom*, Oxford, Clarendon.

Blake, D. (2000), "The United Kingdom: examining the switch from low-cost public pensions to high-cost private pensions", in M. Feldstein and H. Siebert (eds), *Coping with the Pension Crisis: Where Does Europe Stand?*, Chicago: University of Chicago Press.

Blundell, R. and Johnson, P. (1997) Pensions and retirement in the UK, *NBER* Working Paper #6154, Cambridge: Mass

Caballero, R. (1990), "Consumption Puzzles and Precautionary Savings" *Journal of Monetary Economics*, vol. 25, pp. 113-36.

Diamond, P. A.., (1977) "A Framework for Social Security Analysis", *Journal of Public Economics*, December, v. 8, iss. 3, pp. 275-98.

Dicks-Mireaux, L. and M. King (1984), "Pension Wealth and Household Savings: Tests of Robustness," *Journal of Public Economics*, 23, pp. 115-139.

Disney R. and C. Emmerson, (2002) "Choice of pension scheme and job mobility in Britain", *Institute for Fiscal Studies*, IFS 2002/09

Disney R., Emmerson C. and M. Wakefield (2000), "Pension reform and saving in Britain", *Institute for Fiscal Studies*.

Disney R., Palacios R. and Whitehouse E. (1999) "Individual Choice of Pension Arrangement as a Pension Reform Strategy", *Institute for Fiscal Studies*, IFS, WP99/18

Feldstein, M. S. (1974) "Social Security, Induced Retirement, and Aggregate Capital Accumulation", *Journal of Political Economy*, v. 82, iss. 5, pp. 905-26

Gale W. (1998), "The effects of Pensions on household wealth: a revaluation of theory and Evidence", *Journal of Political Economy*, vol 106, n 4 pp706-723

Gale, William G. and John K. Scholz (1994), "IRAs and Household Saving," *American Economic Review*.

Gravelle, J.G., (1991) "Do Individual Retirement Accounts Increase Savings?" *Journal of Economic Perspectives*, vol5, n.2, pp 133-148.

Guariglia, A., (2001). "Saving behaviour and earnings uncertainty: evidence from the British Household Panel Survey", *Journal of Population Economics,* 14 (4), 619-40.

Guariglia A. and S. Markose, (2000), "Voluntary Contributions to Personal Pension Plans: evidence from the British Household Panel Survey ", *Fiscal Studies*, vol.21, no.4, pp. 469-488.

Hall, R. (1978), "Stochastic implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence", *Journal of Political Economy*, 86, pp.971-987

Hubbard, R.G. (1986), "Pension Wealth and Individual Saving: Some New Evidence"; *Journal of Money, Credit, and Banking*, v. 18, iss. 2, pp. 167-78

Imrohoroglu, A., Imrohoroglu S. and Douglas H. Joines (1994), "The Effect of Tax-Favored Retirement Accounts on Capital Accumulation and Welfare," *Federal Reserve Bank of Minneapolis* Discussion Paper No. 92.

Lavi, Y. and A. Spivak, (1999), "The Impact of Pension Schemes on Saving in Israel", *Applied Economics*, v. 31, iss. 6, pp. 761-74

Maddala, G., (1983), *Limited-dependent and qualitative variables in econometrics.* Cambridge, Cambridge University Press

Modigliani, F. and Brumberg, R. (1954), "Utility Analysis and the Consumption Function: An Interpretation of the Cross-Section Data." In (ed. K. Kurihara) *Post-Keynesian Economics,* New Brunswick, NJ: Rutgers University Press pp.388-436, 1954.

OECD (2003): OECD Statistics Portal, Paris, France.

Office for National Statistics, London, UK. http://www.statistics.gov.uk, various years.

Samwick A.,(1998), "Discount Rate Heterogeneity and social security reform" *Journal of Development Economics*, vol. 57, 117-14

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

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

Taylor, M. (ed.), (1996), *British Household Panel Survey User Manual: Introduction, Technica Reports, and Appendices*, Colchester: ESRC Research Centre on Micro-Social Change, University of Essex.

Venti, S. F. and David A. Wise (1990), "Have IRAs Increased US Saving? Evidence from Consumer Expenditure Survey," *Quarterly Journal of Economics*, 105 (August), pp. 661-698.

Table 1. Motives for Saving. (%)

Motive to save	Percentage of respondents by category of saving motives Data pooled.
Holidays	20.92
Old age	8.65
Car	3.33
Children	3.76
House purchase	6.85
Home improvements	3.88
Hh bills	0.91
Special events	5.37
no spec reason	41.63
Other	4.70

Sample: waves 2-12 BHPS. Percentage calculated among those individuals who declare to have positive savings.

Table 2. Percentage of respondents covered by personal pension plan and amount saved each month by motive for saving.

Motives to save	Proportion of savers who contributed to personal pension plan (%)	Average amount saved each month by the savers (£)
Missing or wild	24	125
Refused	29	212
Don't know	23	140
Holidays	21	127
Old age	29	221
Car	21	153
Children	22	107
House purchase	23	94
Home improve	23	120
Hh bills	23	143
Special events	18	125
No spec reason	24	212
Other	19	140
Total	23	137

Sample: waves 2-12 BHPS.

Table 3. Extra-contributions to personal pension plans and savings in conventional forms by socio-economic and demographic characteristics.

Fraction of respondents making additional contributions to personal pension plans		Fraction of respondents with positive savings in conventional forms	
Male	0.154	Male	0.516
Female	0.094	Female	0.510
Age categories		Age categories	
20-24	0.056	20-24	0.476
25-29	0.124	25-29	0.522
30-34	0.136	30-34	0.524
35-39	0.130	35-39	0.494
40-44	0.136	40-44	0.506
45-49	0.144	45-49	0.522
50-54	0.137	50-54	0.542
55-59	0.126	55-59	0.535
60-65	0.094	60-65	0.513
Educational levels		Educational levels	
degree or more	0.124	degree or more	0.595
less than degree	0.131	less than degree	0.538
o level	0.116	o level	0.499
voc qualification	0.124	voc qualification	0.456
no qualification	0.108	no qualification	0.415
Type of employment		Type of employment	
private firm/company	0.141	private firm/company	0.503
Others	0.080	others	0.532
Employer has pens scheme	0.163	Employer has pens scheme	0.503
Individual income quintile		Individual income quintile	
Quintile 1 (Lowest)	0.051	Quintile 1 (Lowest)	0.397
Quintile 2	0.105	Quintile 2	0.458
Quintile 3	0.130	Quintile 3	0.507
Quintile 4	0.152	Quintile 4	0.553
Quintile 5	0.180	Quintile 5	0.643
		Additional contr. PPP	0.593
		No additional contr. to PPP	0.499
Total	0.123	Total	0.513

Source: BHPS, waves 2-12.

Table 4. Tobit Estimates

Dependent variable: Amount saved per month	Coefficients
Age at date of interview	-6.599 (3.88)***
Age^2	0.080 (3.84)***
Number of own children in household	-23.376 (8.13)***
Usual net pay per month	0.134 (25.82)***
Educational level: college or more	28.384 (3.89)***
Educational level: less than college	15.100 (2.77)***
Male	-34.663 (6.81)***
Married	13.447 (3.40)***
Occupational pension scheme	34.595 (6.63)***
Financial improvement expected	-17.399 (6.63)***
House owned	50.654 (7.86)***
Healthok	35.106 (6.10)***
$Var*10^{-6}$	-0.475 (2.52)**
Pension contributions	0.138 (2.68)***
Constant	-98.802 (3.12)***

Source: BHPS dataset waves 4 to 12. Observations: 32826

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Full Model Maximum Likelihood Estimates.

	Monthly Contributions to Personal Pension Plan	Amount saved each month
age at date of interview	35.098	-6.175
	(10.02)***	(3.40)***
Age^2	-0.375	0.078
	(9.00)***	(3.50)***
Number of children in the household	-40.955	-7.440
	(7.42)***	(2.39)**
Usual net pay per month	0.069	0.114
	(8.19)***	(21.33)***
Educational level: college or more	48.633	17.992
	(3.51)***	(2.34)**
Educational level: less than college	45.455	4.680
	(4.52)***	(0.80)
Male	50.698	-20.164
	(5.23)***	(3.73)***
Married	18.003	0.725
	(1.62)	(0.11)
Financial improvement expected	-16.656	-0.419
	(1.78)*	(0.08)
Occupational pension scheme	-136.286	9.037
	(12.63)***	(1.60)
House owned	67.237	4.668
	(5.36)***	(0.65)
Healthok	34.164	13.001
	(3.20)***	(2.08)**
Var*10^{-6}	0.180	-0.419
	(1.01)	(2.98)**
Private firm/company	0.061	
	(5.81)***	
γ		0.806
		(24.19)***
ρ	0.056	
	(3.59)***	

Source: BHPS dataset waves 4 to 12. Observations: 32826.
Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
a. Additional contribution to personal pension plan was derived from the following variables: *penadv* if the respondent has a personal pension (variable *ppp*==1) plan and started it after 1988 and made additional contributions to her plan; *penb4v* if the respondent has a personal pension plan and started it before 1988 (*penb4*=1).

Our papers can be downloaded at:

http://cerp.unito.it/publications

CeRP Working Paper Series

N° 1/00	Guido Menzio	Opting Out of Social Security over the Life Cycle
N° 2/00	Pier Marco Ferraresi Elsa Fornero	Social Security Transition in Italy: Costs, Distorsions and (some) Possible Correction
N° 3/00	Emanuele Baldacci Luca Inglese	Le caratteristiche socio economiche dei pensionati in Italia. Analisi della distribuzione dei redditi da pensione (only available in the Italian version)
N° 4/01	Peter Diamond	Towards an Optimal Social Security Design
N° 5/01	Vincenzo Andrietti	Occupational Pensions and Interfirm Job Mobility in the European Union. Evidence from the ECHP Survey
N° 6/01	Flavia Coda Moscarola	The Effects of Immigration Inflows on the Sustainability of the Italian Welfare State
N° 7/01	Margherita Borella	The Error Structure of Earnings: an Analysis on Italian Longitudinal Data
N° 8/01	Margherita Borella	Social Security Systems and the Distribution of Income: an Application to the Italian Case
N° 9/01	Hans Blommestein	Ageing, Pension Reform, and Financial Market Implications in the OECD Area
N° 10/01	Vincenzo Andrietti and Vincent Hildebrand	Pension Portability and Labour Mobility in the United States. New Evidence from the SIPP Data
N° 11/01	Mara Faccio and Ameziane Lasfer	Institutional Shareholders and Corporate Governance: The Case of UK Pension Funds
N° 12/01	Roberta Romano	Less is More: Making Shareholder Activism a Valuable Mechanism of Corporate Governance
N° 13/01	Michela Scatigna	Institutional Investors, Corporate Governance and Pension Funds
N° 14/01	Thomas H. Noe	Investor Activism and Financial Market Structure
N° 15/01	Estelle James	How Can China Solve ist Old Age Security Problem? The Interaction Between Pension, SOE and Financial Market Reform
N° 16/01	Estelle James and Xue Song	Annuities Markets Around the World: Money's Worth and Risk Intermediation
N° 17/02	Richard Disney and Sarah Smith	The Labour Supply Effect of the Abolition of the Earnings Rule for Older Workers in the United Kingdom
N° 18/02	Francesco Daveri	Labor Taxes and Unemployment: a Survey of the Aggregate Evidence
N° 19/02	Paolo Battocchio Francesco Menoncin	Optimal Portfolio Strategies with Stochastic Wage Income and Inflation: The Case of a Defined Contribution Pension Plan
N° 20/02	Mauro Mastrogiacomo	Dual Retirement in Italy and Expectations
N° 21/02	Olivia S. Mitchell David McCarthy	Annuities for an Ageing World