THE REFORM OF THE ITALIAN PENSION SYSTEM, AND ITS EFFECT ON SAVING BEHAVIOUR

by

Massimo Baldini,
Carlo Mazzaferro, and Paolo Onofri

Prometeia, and
University of Bologna
Joint Research Group on Pensions for

The Fourth International Forum of the Collaborating Projects
On Ageing Issues
Tokyo, February 18-21, 2002

1. THE ITALIAN PENSION SYSTEM AND ITS REFORMS[1]

1.1 The origins: the old generous system

During the first half of the XX century, the Italian pension system was a *public funded* system, to which employers, workers, and the state contributed with not so much different contributions. Dramatically hit by the very high inflation rate during and immediately after World War II, it was changed into an *unfunded public pay-as-you-go* system (pay-go), which was fully constructed during the years between 1957 and 1968. They were years of high rate of economic and demographic growth, which brought about a very generous pension system.

The main features of the system built during those years are the following:

- Pensions were determined by the earnings related formula: $p = c.T.w$, where c is the so-called internal return coefficient, T is the number of years of contribution (T could not exceed 40), and w is the reference wage. For employees of the private sector, c was 0.02, and w the average wage of the last five years of work, expressed in terms of the final year prices. The age for the old age pension was 55 for women, and 60 for men.
- "Seniority pensions" were introduced, allowing early retirement for private employees, once they had reached 35 years of contribution to the pension system, independently of the age. The benefit was computed exactly in the same way as indicated above, without any consideration of the difference in the life expectancy at the different ages of the early retirees.
- Public employees had a privileged position. For several categories of civil servants, the coefficient c was higher than 0.02. For all public employees, the reference wage was the wage of the final year of work. Every civil servant had the right to retire when he reached 20 years of seniority; in the case of a woman with two children the minimum seniority to early retirement was 14 years, six months, and one day. Again, early retirement pensions were not actuarially fair.
- In between 1957 and 1965 the public unfunded pension system was extended to all the self-employed. Artisans, shop keepers, farmers, professionals had to contribute to their new pay-go funds, but at the beginning they were allowed to get the benefit as soon as they reached the age

[1] We thank Robert Clark, the September meeting discussant, for his remarks, Fabio Bagliano, Elsa Fornero, Francesco Giavazzi and Francesco Regonati for discussions on several chapters. Of course, this text does not involve their responsibility.

of 65, under the condition that they had contributed at least for a year. The original pension formula related the benefit to the amount of contribution. In 1990, a new rule was enacted for self-employed, which granted pension benefits proportional to the average earnings over the last 10 years of work with an accrual rate of 2%. Having not modified the level of contributions accordingly (12% of gross income for self-employees instead of 27,4% of the gross salary for the employees, at that time), this modification caused a huge growth of future pension net liabilities. Currently, a large share of retired self-employees still receive a benefit which is integrated by the state in order to reach the national minimum level of the benefit. One should not forget that self-employment represents 30 per cent of overall employment, in Italy.

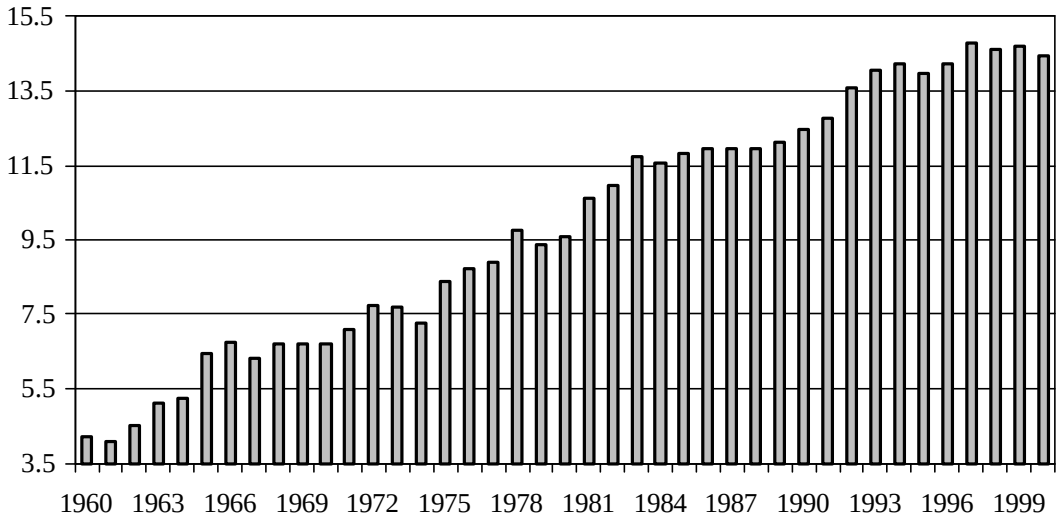
- From 1971 to 1992, pensions were indexed both to price increases, and to the average real wage growth.
- The system allowed a uniform substitution rate, but an internal return on contribution variable in the opposite direction with the degree of seniority, with the rate of growth of wage during the working life, and with the age of retirement.

The system built in those years produced a rapid increase of pension expenditure till the first half of the nineties. Such an increase of expenditure was also supported by a large diffusion of inability pensions, as substitutes of the lacking unemployment insurance for workers of a mature age. *Fig.1.1* describes the historical dynamics of the expenditure in the past 40 years. The higher line in *Fig. 1.2* below shows how expenditure would have grown, in the next 50 years, without any of the reforms enacted during the last decade.

1.2 The first step of the reform: 1992

In 1984 the rules for inability pensions were restricted to the physical inability to work instead of the more general inability to produce income. The long process of reduction of the number of inability pensions started seventeen years ago is still underway, and it is a component of the slowdown of the growth of pension expenditure. However, it was only in September 1992 that, under the pressure of a deep currency and financial crisis, an effective process of reform started. The first Amato government introduced some important new principles in the system.

Fig. 1.1 Pension expenditure in % of Gdp



- The determination of the benefits should stick more to insurance principles through a stronger relationship with the amount of contributions paid during the working life. The reference wage was not to be any longer the wage of the last five years of work, but the average of the last 10 years, to be extended, in the future, to the whole working life. The formula for the computation of the first pension benefit for an individual who entered the labour market after 1992 can be expressed as follows:

$$p = 0{,}02\, L\, W_0 \left[\sum_{i=1}^{L} \frac{(1+w)^{i-1}\,(1+0{,}01(L))}{L} \right]$$

where W_0 is the entry wage; *w* is the average growth of workers' wages and L is the seniority at retirement.

- Current and future generations cannot any longer afford sharing technical progress with retirees; hence the benefits were not any longer indexed to real wages. Moreover, the portion of pension higher than three times the official minimum benefit level is not any longer fully adjusted to consumer price changes.
- The privileges of the civil servants started to be dismantled: a very slow process of convergence toward the system for private employees was enacted. The seniority required to a civil servant to retire early was increased.

- The age for old age pension had to be progressively increased to reach 60 years for women, and 65 for men (this target has been reached in 2000). Moreover, the minimum number of years of contribution required in order to receive the benefit was increased from 15 to 20 years.
- Occupational funds and individual funds should complement the pay-go system, in order to face demographic transition. The legislation required was enacted, but the fiscal incentives were not enough to let those funds start.

The strongest impact of these measures was to be exerted by the abolition of the indexation of benefits to real wage growth. As a whole, *our working assumption is that these measures helped workers to realise that the generosity on which they had built their life cycle wealth expectations was not any longer sustainable*. It has been shown that households, whose breadwinner was a civil servant, felt the strongest effect.

1.3 The second step: 1995-97. The notional defined contribution system

Three years later, in 1995, the Dini government enacted a radical reform of the system of computation of the benefit, based on true insurance principles, applied within a pay-go system. The Prodi government in 1997 further integrated the reform. The new notional defined contribution system is a pay-go system that mimics capitalisation. The amount of contribution paid to the pay-go system during the whole working life is going to be capitalised at the rate of growth of nominal Gdp (actually, a five years moving average of Gdp growth). Such an amount of capitalised contributions is the basis for the computation of the benefit by means of a discount rate that is a proxy of the expected long rate of growth of real Gdp (1.5 per cent, in real terms because the benefit is indexed to prices).

The worker can choose the age of old age pension, once he/she is 57 years old, and is not yet 65. At 65 the retirement is compulsory. The computation of the benefit takes into account the average life expectancy (men and women) at the age the worker chooses to retire. When the new system fully works at regime, the return in terms of benefit to the contributions is the same for every worker, independently of the age of retirement, of the life time wage profile, and of the seniority at the moment of retirement. No difference between men and women age for pension will survive.

Under the new system, the benefit is approximately determined by the following simplified formula:

$$p = a_j \, w_0 \left[\sum_{t=0}^{T-1} (1+y_n)^{T-t-1} (1+g)^t \right] g(y_r, \boldsymbol{w}, s); \text{ with } \frac{\partial g}{\partial y_r} > 0; \frac{\partial g}{\partial \boldsymbol{w}}, \frac{\partial g}{\partial s} < 0 ,$$

where a_j is the contribution rate equal to 33% and 20% respectively for employee and self employed, w_0 is the entry wage of an employee of T years of seniority, y_n is the average rate of growth of nominal Gdp (the capitalisation rate) during the last T years, g is the average rate of growth of the nominal wage during the same T years, and $g(.)$ is the value of a coefficient, which depends on the constant discount rate $y_r = 0.015$ (the expected long run real growth rate of Gdp), on the weighted average of the life expectancy of men and women ($\boldsymbol{w}$), and on the probability to have a survivor, combined with his/her life expectancy, s.

The notional defined contribution system introduces actuarial fairness within a pay-go system; the degree of redistribution and solidarity enacted trough the pension system is reduced, though not cancelled. The system reduced distortion in labour market decisions especially with regards to the choice of retirement age. Moreover, it reduces, in a sense, the perverse solidarity of the current system, where workers with less dynamic careers and lower wages finance benefits of the workers with higher and more dynamic wages. A real jungle of various privileges will be cleared: more favourable treatment both of civil servants (with special reference to military forces), and self-employees with respect to private employees will disappear. With the new system, true solidarity is going to be mainly a question of the general taxation.

If there is not any relevant long run change in income distribution between profits and wages, the new system tends to balance revenues and payments in a structural way. Given the anticipated real growth of Gdp used as a discount rate to compute the benefit, the higher the actual rate of growth, the higher the revenues, and the benefits.

Parametric reforms in 1992 and 1995 reduced the expectations for future level of pension benefits and the change in the indexation mechanism reduced the dynamic of pension benefit after retirement. The first effect can be seen by comparing the replacement rate, defined as the ratio between the first pension benefit and the last wage. In table 1 we report the replacement rate at different age of retirement for a representative individual whose seniority at retirement is equal to 37 years. We notice that both the 1992 and the 1995 reform reduced the replacement rate. With the notional defined contribution formula the replacement rate increases with the retirement age as the formula considers explicitly the average life expectation at retirement. The parameters of the

defined contribution scheme are fixed such to reach the same replacement rate that of 1992 for a 62 years old employee. The reduction of the replacement rate is stronger for self employed after 1995 because of the lower level of the contribution rate used to the computation of the pension benefit, which for this category is fixed at 20%.

Table 1.1: Replacement rate between pension benefit and last wage at different retirement ages. Each number represents the percentage of the first gross pension with respect to the last gross wage of a representative individual who retires with seniority equals to 37 years.

Retirement age	Earnings related scheme before 1991		Earnings related scheme after 1992 (Amato reform)		Contribution related scheme after 1995 (Dini reform)	
	Employee	Self employed	Employee	Self employed	Employee	Self employed
58	71,2	67,8	61,9	61,9	54,4	33,0
60	71,2	67,8	61,9	61,9	57,8	35,0
62	71,2	67,8	61,9	61,9	61,7	37,4
65	71,2	67,8	61,9	61,9	68,7	41,6

To fulfil the equilibrium conditions of the system, the coefficients used to compute the benefit will be changed every ten years to take into account changes in life expectancy. If life expectancy increases, the substitution rate between wage and benefit will be reduced, but the worker might choose to work longer to compensate such a reduction.

1.4 The transition period

The new system will not fully work before 25-30 years, since now; therefore the reform has dealt with the many details of the long transition process. It has created three different cohorts: the young employees, the middle seniority employees, and the mature seniority employees. The new system applies fully to the new entrants since the beginning of 1996. For the employees that at the end of 1995 had seniority, in terms of years of contribution, of not more than 17 years, the new system applies only for the remaining part of their working life. Their benefit will be the result of two parts; the first one determined according to the old computation rules, and the second one according to the new rules. Finally, for employees with seniority equal or higher than 18 years in 1995 the rules for the computation of the pension benefit remain the same as pre-1995.

Early retirement benefits are completely abolished when the new system works at regime. In the mean time, for workers already at work in 1995, early retirement is progressively restricted to those who are 57 years old and have a seniority of 35 years; these conditions will apply in 2004. On that date, the pension rules for both civil servants, and private employees will be exactly the same. In other words, early retirement benefit, computed without actuarial fairness, is still allowed for employees that currently have middle, and mature seniority, when they meet the above restricted conditions.

The effective contribution rate of self-employed is progressively increased to 19 per cent in 2013, compared with the current and constant 32.7 per cent for employees.

Fig. 1.2 describes the behaviour of pension expenditure expected for the next 50 years before the reforms of 1992-97, and after those reforms. During the first two decades of the century, the reduction in the expenditure dynamics is mainly due to the abolition of the indexation to real wage growth (the strongest effect), to the lengthening of the working life, and to the restrictions in the early retirement pensions. When the notional contribution system is fully working, around 2030, the ratio of average pension to average wage declines (see *Table 1.1*), bringing back the ratio of pension expenditure to Gdp to the current level.

Table 1.1: Number of benefits, average benefit, output per employees, and number of employees

	2000	2020	2030	2050
Avg. Benefit/output per employee	0.158	0.16	0.142	0.11
# benefits/employees	0.90	0.97	1.12	1.22

Source: Italian Ministry of Economy and Finances
 # The number of pensions is currently 1.2/1.3 times the number of retirees; the change is the result of the increase of the number of retirees.

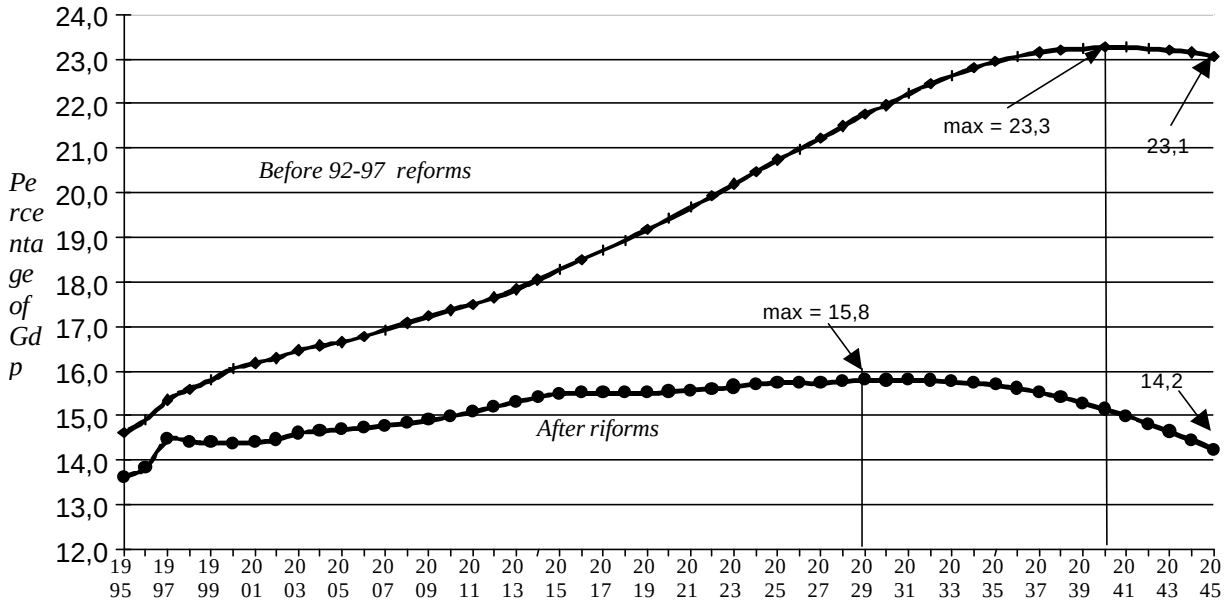
1.5 The questions still open

Nonetheless, as we already mentioned, there is still the prospect of almost two-percentage points growth during the next two decades. Two questions are still open. The first, how to prevent an already high share of pension expenditure to Gdp from further increasing in the next two decades. In other words, how to accelerate the full application of the new regime. Actually, the question is not a technical one; it has a deep political value because it implies to ask current

generations, the same generations that are paying for the reduction of the public debt (i.e. for the promises of the past), to work longer, and to save more in order to pay also for their future. Social and political cohesion will become a very delicate topic in the near future.

The second question is how to support the development of a funded pillar to compensate the reduction in the expected ratio of public pension to wage, especially for the current young workers. As the companion paper[3] shows, according to the current legislation employers and workers can set up closed (occupational) pension funds. Banks and other financial institutions can build open funds. Both open and closed pension funds are based on defined contribution formula. Contributions are tax deductible and derive mainly from a severance pay fund, which is already available. Nonetheless, the development of pension funds has been slow during the 1990s, probably because of the still high replacement ratio offered to old workers, rather than because of limited tax incentives. Actually, this question too, has its social and political counterpart: which is the socially acceptable overall replacement ratio of pension to wages? Once this target is accepted it is easier to state which weight should be given to the funded part, and how to ask current generations to pay for the cost of the opting out of the pay-go, necessary to release the resources to feed the funded pillar.

Fig. 1.2 - Pension expenditures in terms of Gdp (*)



(*) Source: Ministry of Tresaury, 1998.

[3] P. Bosi and M.C. Guerra, *The Role of Tax Incentives in Voluntary Pension Plans in Italy: Any Lesson for Other Countries?,* Prometeia, February, 2002

The technical analysis of this process requires also to have an idea about how the change in the relative share of private and public social security wealth is going to influence households saving.

The aim of this research project is to evaluate the impact of the reforms already enacted on the propensity to save both on the general macro level and on the microeconomic behaviour of the Italian households. We are going to focus on the effects on saving because it is our opinion that every kind of reform that may change the pay-go system and/or stimulate the development of a private funded system will exert a positive effect on the sustainability of the pension claims in the future if it increases the propensity to save, the capital accumulation, and the potential growth of the system.

2. THE MACROECONOMIC EFFECTS OF THE REFORMS

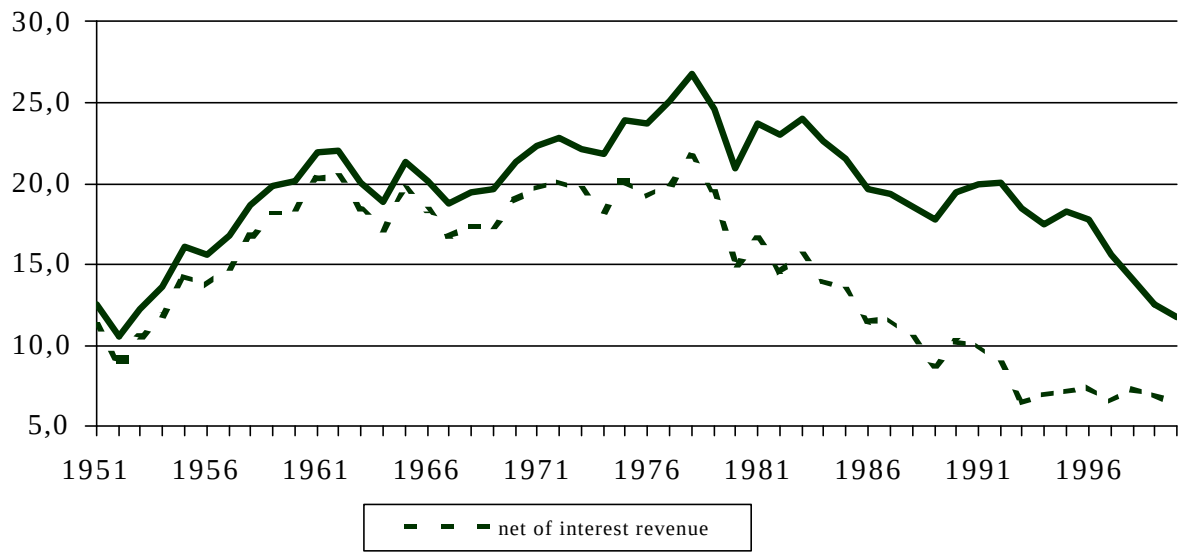
The ageing of the population and its decline influence the investment rate, the growth rate of the economy, the demand for financial assets, and its composition. Given the rate of capital obsolescence, the *decline* in both population and labour forces releases resources for consumption through a net decumulation of the required capital. *Ageing*, on its turn, implies a stronger conflict on resources available for consumption: higher average propensity to consume hence a reduction in the net demand for financial assets, with a possible reduction in the average preference for risky assets. A positive effect on saving might be exerted by a transitory implication of ageing: relatively larger and larger mature generations of workers facing smaller and smaller generations of young workers.

It is not easy to state whether the required reduction in saving implied by the declining size of the population, and by the possible change in the rate of technological obsolescence of the capital stock, will be of the same order of magnitude of the reduction in saving implied by ageing. We should not forget that successive generations are not only different in size; they may differ also in their attitude toward saving, as a consequence of the so-called cohort effect. Moreover, as we have already mentioned, different generations, and different groups of employees have been hit by the reforms to a different extent. In what follows, we concentrate on the analysis of the Italian households' behaviour during the past decade with respect to saving, financial assets accumulation, and its composition in order to try to detect how strong has been the influence of the reforms of the pension system on their behaviour. In so doing, we hope to be able also to state whether, for the Italian economy, ageing, as such, might imply a reduction in the average propensity to save, and to what extent.

2.1 Changes in the propensity to save: the macroeconomic view

From a general macroeconomic point of view, the household propensity to save out of disposable income has been declining since the second half of the 1970's (see *Fig. 2.1*). This long run trend has been interpreted as the result of two factors. Firstly, a general change in the attitude of Italian households toward saving, fed also by a growing social safety net for household income, has been underway for all the period. Secondly, on this long run effect, several episodes of inflation surprises exerted negative effects on financial wealth, which might have influenced saving decisions. The latter factor has been very much disputed in the past. To take it into account, household disposable income was computed *à la* Hicks; moreover, possible Ricardian effects in the perception of the "true" value of the household wealth, given the large share of public debt in their portfolio, were explored. The estimations of both the Hicksian, and Ricardian effects revealed quite low coefficients to correct the current computation of household disposable income. Identification of those effects was difficult, given the possible effects exerted by changes in disposable income distribution, due to the high degree of concentration of wealth ownership, and of the resulting yields.

Fig. 2.1 Household saving as a percentage of disposable income (See footnote 5)



If we restrict our analysis to the last decade, some of the phenomena that influenced household wealth in the previous decades reversed: inflation almost disappeared, public debt started declining, the social safety net stopped widening, and, finally, private financial wealth earned large capital gains. Nonetheless, propensity to saving continued declining. Only if we include capital gains in household disposable income, propensity to save increases in the second half of the

nineties[4]. However, if we simply compute household disposable income net of interest revenues, the trend stops declining since 1993[5].

As we have just noticed, too many other macroeconomic factors have been at work to be able to detect the impact of the pension reforms at the very aggregate level. On the one side, the consolidation of the government budget: between 1992 and 1997 the general government deficit was reduced from 10.7% of Gdp to 2.7%. The currency crisis of the summer 1992 was the signal that current and future taxes plus reduction of public expenditures were going to reduce the forward looking part of the life cycle wealth of Italian households. Which might have exerted an expansionary effect on the propensity to save. On the other side, the supply of financial assets changed dramatically: the liberalisation of the capital markets, the reduction of the supply of government bonds, the bubbles in the equity markets, and the privatisation of state-owned firms are other factors that may have influenced the behaviour of saving. We need to deepen the details of the microeconomic behaviour of the Italian households[6]. Let us start with the age profile of saving.

2.2 The age profile of the propensity to save

Most empirical results show a very slow decline of the propensity to save with age, in Italy (Ando et al. 1995). The usual remark is that, up to now, the old generous Italian pension system has guaranteed a high substitution rate between wage and pension benefit, and the computation of the saving rate does not take into account the decumulation of individual social security wealth as the pension annuities are paid (Jappelli and Modigliani 1998). This explanation is usually added to the presence of a bequest motive, to precautionary saving, and the uncertainty about the length of life.

As a first stage, we neglect the effect of the individual social security wealth, and we use the data of the Bank of Italy's Survey of Household Income and Wealth (SHIW). They refer to five surveys on income and wealth of the Italian households. The surveys we are going to use refer to the following years: 1989, 1991, 1993, 1995, and 1998. Data for the survey of the year 2000 are not yet available. The first four surveys refer to about 8000 households; the last one to slightly more than 7000[7].

---

[4] See Zollino (2001)

[5] Actually, the propensity to saving shown in *Fig. 2.1* is (1-*c*), where $c = (Yd - C)/Yd$; *C* is households consumption (NIA), and *Yd* is households disposable income. *Yd* computed net of interest revenues (*Ir*) implies $c^* = [(Yd - Ir) - C)/(Yd - Ir)$.
Interest payments were the 12.9 per cent of household disposable income in 1993; in 2000 they were 5.8 per cent. The two times series are Prometeia elaborations on different sets of NIAs.

[6] The current state of the analysis of the behaviour of the Italian propensity to save can be found in Zollino (2001).

[7] Brandolini and Cannari (1994) describe the main features of the survey.

In general terms, the age profile of a behavioural variable of a sample of population depends not only on a pure age effect, but also on possible cohort effects, and on the possible presence of time period effects. The cohort effect is the result of the fact that different generations behave in systematically different ways at the same age. The time period effect results in a systematically different behaviour at all current ages; in other words, it shifts either up or downward the age profile, without changing its shape. If *a* is the age, *t* is the calendar time, and *c* the year of birth of a given cohort, $a = t - c$. The collinearity among these three effects does not allow their separate identification.

As a consequence, in order to get an estimation of the age profile we need to use an identification restriction on the coefficients both of simple cross-section regressions, and of panel cross-section regressions. The shape of two of the three effects can be estimated only as conditional to an exogenous shape of the third one. To give an example, moving from a survey at time *k* to the following one at time *k+1,* if we observe an equal percentage increase in the average value of a given variable for each age and cohort, it might be the result either of a trend effect, or of a combination of a positive age effect, and of a cohort effect favourable to the younger generations.

Here we are going to use two different sets of restrictions. In the first one, the variability of the data is assumed to be fully imputable to a combination of age and time period effects; in the second, we restrict to zero the possible time period effects, in order to get an estimation of the cohort effects.

In order to isolate the age effect, we have also derived a pseudo panel from the original 39833 household observations of the pooling of the five surveys. The pseudo panel describes the time evolution of the average behaviour of homogenous groups of households. These homogenous groups are defined by the year of birth of the "breadwinner"[8]. Given the limited number of surveys available, we divided the sample into 12 cohorts: the first cohort includes all the households, whose "breadwinner" was born during the period 1910-1914, the twelfth cohort those born between 1965 and 1969. The limited temporal extension of the sample produces little overlap between different cohorts over time, which is very important to estimate the cohort effects; choosing cohorts defined on less than five years would however reduce the probability of detecting significant systematic differences across successive cohorts. For each cohort we have computed the average values of the economic variables describing their behaviour; the values have been expressed in terms of 1998 prices, using the consumer price index.

[8] The surveys of the Bank of Italy identify the "breadwinner" as the person mainly responsible for the economic conditions of the household. Not being a permanent condition of the single individual, this is likely to induce some instability in the results.

Coming to the main variable under investigation, the propensity to save, we should remind that it could be computed according to two different procedures. The first, as a ratio of the difference between disposable income and consumption to the disposable income (or with an approximation of this measure given by the difference between the log of income and the log of consumption); the second, as the ratio of the change in the total wealth to the disposable income. Should we assume a constant propensity to invest saving in newly built houses, it would be plausible to expect consistency between the behaviour of the propensity to save and the behaviour of the ratio of total financial wealth to disposable income. It goes without saying that, on an empirical ground, the two definitions do not coincide, because of measurement errors, of inter generational *inter vivos* transfers, and more important, because of changes in the values of the real and financial assets, which do not show up as part of disposable income. In what follows, we stick to the first definition and, unless otherwise indicated, define the saving rate as the ratio of household saving (net of durables' services and capital gains) to disposable income.

An estimate of the various effects involved can in principle be obtained, without significant differences, with regressions either on the individual micro data or on the pseudo-panel of their cohort averages. The analysis of this section has been carried out both on the individual micro-data, and on the pseudo-panel. The main text describes results obtained from individual data: pseudo-panel results are presented in Appendix III. The following tables report the estimation results, from the individual micro-data, under the two alternative identification restrictions: firstly, without time effects, and then without cohort dummies. The omitted dummies refer to the first cohort and to the first available year, 1989. The regression method is ordinary least squares, with observations weighted by the sample weights provided in the survey[9]. Standard errors have been computed with the White correction for heteroskedasticity.

Table 2.1 shows the coefficients estimated from regressions on the individual micro-data, carried out both with and without a set of demographic controls, which may influence the evolution of permanent income and therefore of personal saving over the life-cycle.

The pseudo-panel regression (see *Table A3.1*, Appendix III), does not supply a precise estimate of the age and cohort effects. Even if not significantly different from zero, however, the coefficients provide the same information of the coefficients estimated on the micro-data: the age coefficients define a hump-shaped profile of personal saving, while the cohort coefficients decline from older to younger generations.

[9] Age, education level, profession and sex refer to the head of the household. Age is expressed in terms of deviations from 50. Omitted dummies refer to households living in Northern Italy, headed by a woman with first compulsory level of education.

As for the time effects, both sets of regressions provide consistent results: there is not a definite trend of the saving rate over the available period. In 1995, the saving rate is clearly lower than in adjacent years, and in 1998 it is almost at the same level as at the beginning of the decade. The estimations with age and time dummies show alternatively positive or negative time coefficients (to be interpreted as deviations from the 1989 average), with a slightly declining tendency. This is confirmed by a simple observation of the values for the average saving rate in the various cross-sections: 0.26 in 1989, 0.28 in 1991, 0.25 in 1993, 0.22 in 1995 and 0.25 in 1998.

The regressions run on individual data show that the saving rate is higher in the northern part of Italy, the richest one, and that it is very positively correlated with the education of the household head. Self-employed do not appear to have saving rates different from the other working population.

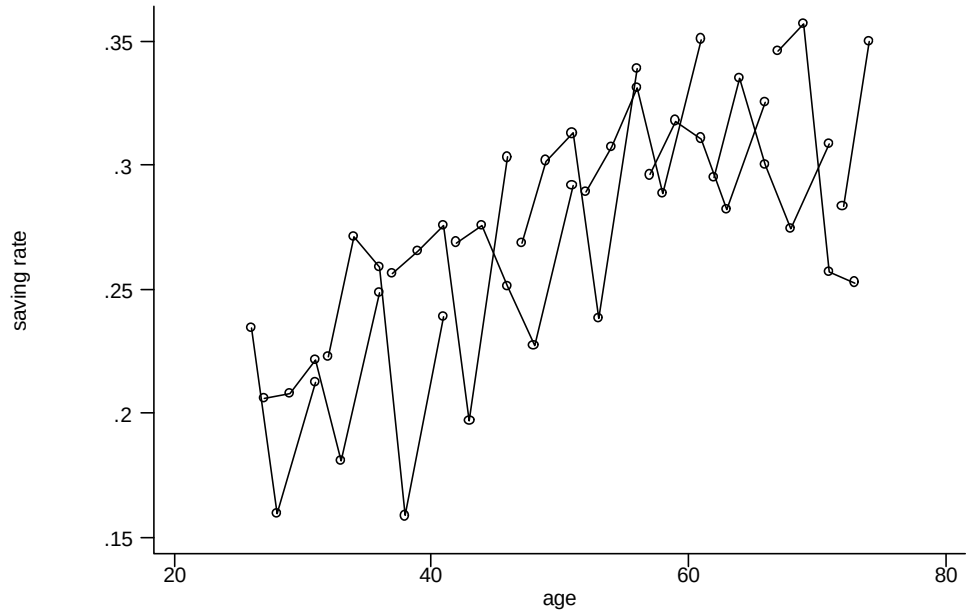
Table 2.1: Regression results for the saving rate: micro data - age and time or cohort effects

	Age and year effects				Age and cohort effects			
	coef	s.e.	coef	s.e.	coef	s.e.	coef	s.e.
Age	0.0019	0.0002	0.0020	0.0002	0.0007	0.0005	-0.0003	0.0005
Age^2	-7.83E-05	1.67E-05	3.87E-05	1.58E-05	-4.60E-05	3.12E-05	7.32E-05	2.93E-05
Age^3	-2.24E-06	4.82E-07	-7.26E-07	4.55E-07	-2.12E-06	8.05E-07	-7.83E-07	7.54E-07
Age^4	5.20E-08	2.66E-08	-4.62E-08	2.50E-08	-3.17E-09	4.06E-08	-8.86E-08	3.80E-08
1991	0.0255	0.0036	0.0204	0.0033				
1993	0.0001	0.0036	-0.0064	0.0034				
1995	-0.0454	0.0036	-0.0549	0.0034				
1998	0.0152	0.0038	0.0037	0.0035				
Cohort2					-0.0097	0.0091	-0.0148	0.0085
Cohort3					-0.0295	0.0102	-0.0334	0.0096
Cohort4					-0.0376	0.0117	-0.0454	0.0110
Cohort5					-0.0479	0.0129	-0.0616	0.0121
Cohort6					-0.0362	0.0140	-0.0586	0.0131
Cohort7					-0.0466	0.0149	-0.0725	0.0139
Cohort8					-0.0579	0.0158	-0.0864	0.0148
Cohort9					-0.0636	0.0167	-0.0958	0.0157
Cohort10					-0.0739	0.0178	-0.1162	0.0167
Cohort11					-0.0751	0.0187	-0.1290	0.0176
Cohort12					-0.0757	0.0203	-0.1318	0.0191
≤8 yrs edu.			0.0342	0.0030			0.0342	0.0031
High sch.			0.0729	0.0032			0.0734	0.0032
Degree			0.1240	0.0046			0.1243	0.0046
Centre			-0.0249	0.0029			-0.0250	0.0030
South			-0.0307	0.0025			-0.0315	0.0025
Male			0.0027	0.0028			0.0042	0.0028
Self empl.			0.0035	0.0029			0.0044	0.0030
N. earners			0.0867	0.0014			0.0862	0.0014
Const.	0.2400	0.0030	0.0511	0.0048	0.2892	0.0147	0.1192	0.0143
N. obs.	36745		36745		36746		36745	
R^2	0.017		0.142		0.006		0.131	

Turning to the cohort effects, they seem precisely estimated only on individual data, both with and without demographic controls; both regressions (pseudo-panel, and micro data) highlight the presence of a negative effect for the younger generations: at the same age, younger cohorts seem to save less than the older ones.

The different impacts on saving behaviour exerted by single cohorts and age effects are shown in *Fig. 2.2, 2.3* and *2.4*. *Fig. 2.2* shows the evolution of the saving rate over the life-cycle; the data are organised as ratios of the averages of saving and disposable income for each cohort in each survey[10]. The lines connecting the hollow circles describe the actual time behaviour of the propensity to save in the interval 1989-1998, for each cohort. The propensity to save is increasing up to the age of 65, and then declines only at very old ages. In any case saving is positive at all ages. Of course, as we have already mentioned, should we consider pension benefits not as income, but as a decumulation of the individual social security wealth, and should we compute saving as the change in the total wealth (including social security wealth), the propensity to consume of the elderly would be much lower. The 1998 survey (the year of the end of government budget consolidation, and of strong recovery of the equity market) shows a strong increase in the propensity to save for each cohort.

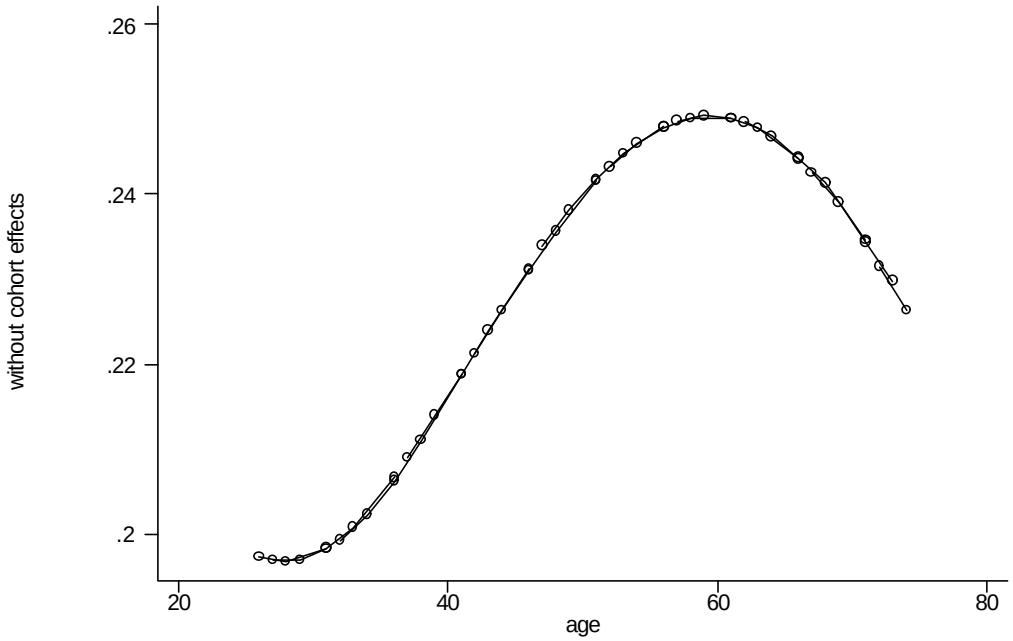
Fig. 2.2 Propensity to save: cohort averages



[10] The figure shows only the interval 25-75, so it excludes some observations for younger and older cohorts.

Fig. 2.3 describes the age effect resulting from a regression on the polynomial on age and time period dummies. The level of this profile depends on which time dummy we drop from the regressions; the shape of the profile, however, is by construction unique for each period. It confirms the shape observable in *Fig. 2.2*, of very limited decline at old ages.

Fig. 2.3 Propensity to save: age effect estimated from the regression on age polynomial and time dummies

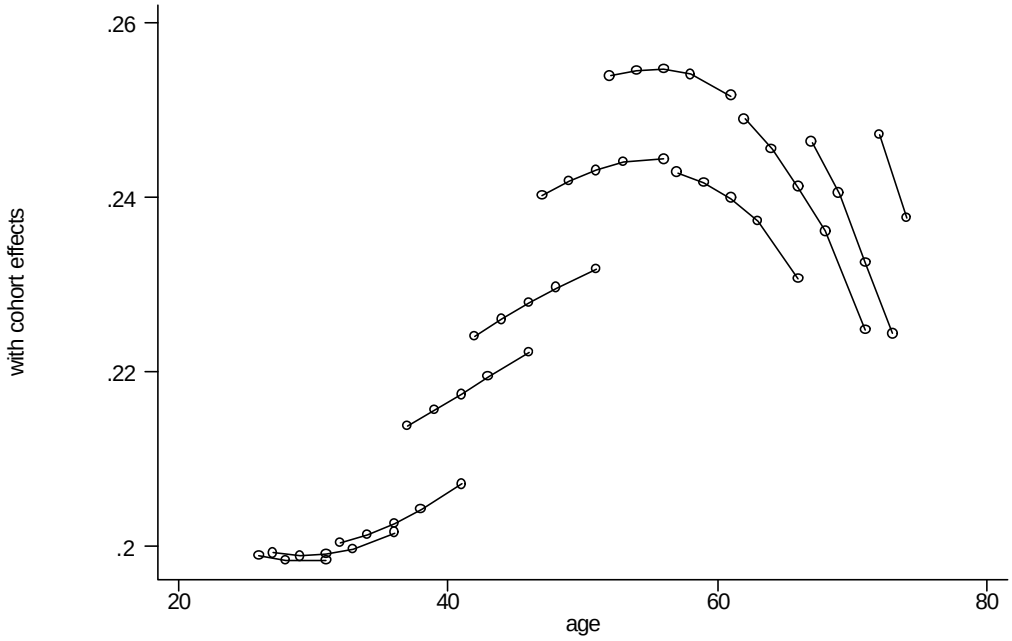


The following *Fig. 2.4* shows a profile that derives from a regression on the age polynomial and the cohort indicators (again from *Table 2.1*). The cohort effects seem to be negative for the younger generations. As younger and younger «breadwinners» enter the sample, they show a propensity to save, at a given age, lower than the one shown by previous generations at the same age. Ideally, if complete panel data sets for all the households observed were available, we would observe parallel age profiles, with the ones of younger cohorts placed below those of the older; this is of course a strong simplification of reality, but it could be useful if it were actually able to capture a possibly important phenomenon taking place in the last few years, namely a tendency by younger cohorts to reduce their propensity to save. Finally, both identification assumptions (age polynomial with time dummies, and age polynomial with cohort dummies) reveal the same age effect.

The uncertain results that we get from these regressions on the effects of a possible general macroeconomic trend (including the pension system reforms) on the behaviour of saving suggest taking into account different effects on different ages, and cohorts.

Together, these results suggest that over the '90s, in spite of the pension reforms, also at a microeconomic level of the analysis, the saving rate of Italian households showed a tendency to continue the decline of the previous decade. The decline appears more intense for younger cohorts, though they are the cohorts more strongly hit by the pension reforms of the decade.

Fig. 2.4 Propensity to save: age profile estimated with cohort dummies



2.3 Ageing and financial assets accumulation

The other side of the coin of the age distribution of the propensity to save is the age distribution of personal wealth. A section of the SHIW includes detailed information on the households' portfolio. Unfortunately, the surveys, during the nineties, changed the definitions of financial assets, they where referring to. As a consequence, it is not so easy to build detailed and homogeneous times series of the portfolio choices of Italian households.

To give an idea, in the 1998 Survey, mutual investment funds are considered as a single item of the portfolios independently of the degree of risk their assets may imply: mainly equities, mainly

bonds, or a mix of both. This requires to work with very wide definition of the financial aggregates, such as:

a) *AF1*: Deposits with both bank and postal system
b) *AF2*: Italian Treasury bonds with very different maturities
c) *AF3*: Other financial assets.

AF1 and *AF2* can be considered as risk free assets, whereas *AF3* includes very different assets with different degrees of risk. *Table 2.2* shows the average and median values of the whole stock of financial assets held by Italian households, and the change in their portfolio composition along the time period of the Surveys (1989-1998).

As time elapses, *AF3* increases its weight significantly. Though we should not neglect that government bonds can be held also through mutual investment funds, an increasing attitude to hold more risky assets seems to come out during the past decade.

Table 2.2: Composition of the Italian households' portfolio

	Average of the total financial Assets (Thous. of € 1998 prices) *AF*	Median of the total financial Assets (Thous. of € 1998 prices) *AF*	Bank and postal Deposits *AF1/AF*	Italian Treasury Bonds *AF2/AF*	Other financial assets *AF3/AF*
1989	16.8	3.8	0.61	0.29	0.10
1991	15.3	5.7	0.55	0.31	0.13
1993	18.4	5.7	0.46	0.32	0.23
1995	18.3	5.5	0.44	0.37	0.19
1998	24.2	7.7	0.49	0.12	0.39

Table 2.3 shows that during the same period the number of households holding at least one kind of financial asset has definitely increased. Nonetheless, in 1998 about 14% of households do not hold any kind of financial assets. The change that we observe in the preferences of Italian households seems to be a structural one, including both a growing preference for holding financial assets *vis a vis* real estate properties, and a stronger attitude toward risky assets.

Also in this case, we wonder whether the general macroeconomic effects allow detecting a precise trend effect on the behaviour of the ratio of financial assets to household disposable income.

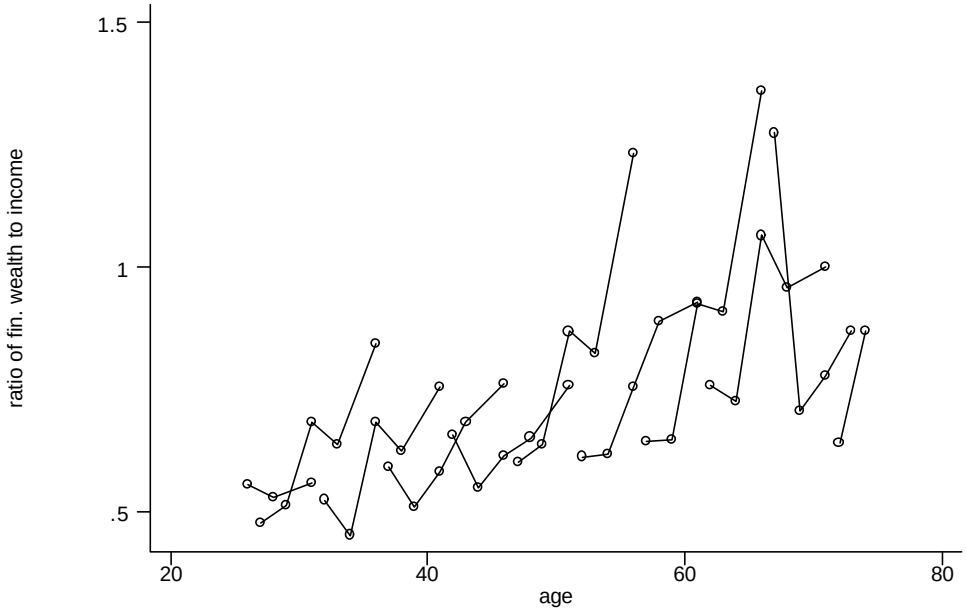
Table 2.3: Percentage of Italian households holding financial assets

	Bank and postal Deposits	Italian Treasury Bonds	Other financial assets	Total financial assets
	AF1	*AF2*	*AF3*	*AF*
1989	68.9	18	6	68.9
1991	80.8	23.2	7.5	81.1
1993	82.6	22.4	9.7	82.9
1995	83.4	26.2	10.5	83.8
1998	86	11.8	18.1	86.1

Moving to the analysis of time-period, age and cohort effects on the age profile of asset holding, we should remind that financial survey data as well include all the three effects. The propensities to hold financial assets and risky assets, as pure results of different ages, cannot therefore be isolated from the data of a single time period survey.

The first step is the estimation of the age profile of the ratio of the stock of financial assets (*AF*) to the disposable income (*Y*), *AF/Y*. *Fig. 2.5* shows its behaviour according to age, and along the five surveys taken into account. Each line connecting sets of five points refers to the *AF/Y* ratios for a single cohort.

Fig. 2.5 Ratio of total financial assets to annual disposable income



During the ten years of the surveys, all cohorts show a systematic increase in the *AF/Y* ratio. In 1998, the ratio increases to a larger extent for almost all generations, and particularly so for those in the second part of their life-cycles. As we have already mentioned, during the period 1995-1998 (the last and the last but one survey) the liberalisation of the capital markets, the large market value

of the privatisation of state-owned firms, the huge capital gains on the equity market, the sharp reduction in the inflation rate have increased both the value of the financial assets and the propensity to hold them. Moreover, the more mature generations of workers, and the generations of retirees have increased their *AF/Y* ratio to a larger extent. General macroeconomic phenomena combined with specific age and cohort behaviour seem to have been at work.

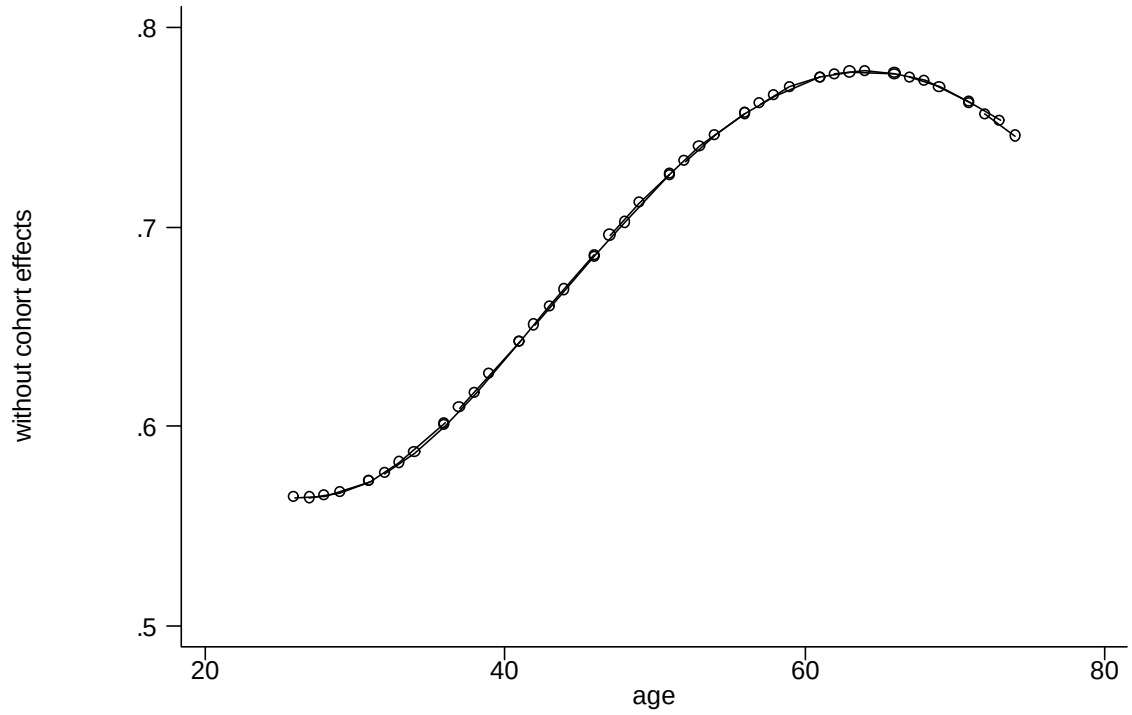
The very simple inspection of *Fig. 2.5* suggests that the time period effect is spread to all cohorts, even if to a different extent. This effect is so strong in 1998 to over-compensate the declines in the previous years.

At this point, the usual problem of separating age, time and cohort effects emerges. One of the most common procedures[11] followed by researchers consists in imposing that the coefficients of time dummies sum to zero, hence that they are serially uncorrelated random shocks. We have tried also this identification restriction, but from the regression of the *AF/Y* ratio on two fourth degree polynomials - one in the age, and one in the cohort index - and on time period dummies, whose coefficients are restricted to sum to zero, we have obtained an age profile for *AF/Y* always increasing during the life cycle, compensated by large and increasing cohort effects for the younger generations. These results are not shown, since the magnitude of the cohort effects that can be obtained in this way is so large to induce us to believe that a trend effect covering the whole sample period is dominant in these data, so it would be misleading to impose the absence of such a trend.

We thus try an alternative identification assumption (similar to one of the two used before for the saving rate), used by Paxson (1996) for the estimation of the age profile of the saving rate, and by Guiso and Jappelli (2000) for the estimation of the share of households holding risky assets: if we arbitrarily assume that different generations have no different attitudes toward financial assets, we can neglect possible cohort effects and regress our dependent variable both on age and on unrestricted time period dummies. The age profile that we get from this assumption is presented in *Fig. 2.6*.

[11] See Deaton and Paxson (1994).

Fig. 2.6 Ratio of total financial assets to disposable income: Age profile estimated without cohort effects



The absolute level of the profile comes from excluding the dummy for 1989 from the regression[12]. Moreover, the absolute level of the ratio is quite low, about a third of the amount of financial wealth emerging from the macroeconomic data.

The difference has to be imputed to the typical underestimation in the answers to a Survey, when personal wealth level is concerned. Actually, we are interested into the behaviour of the ratio during the individual life cycle, and during the time period, not into its absolute level. We must proceed as if the degree of the under declarations were the same at all ages, even if we understand that the degree of underestimation may be a function of the level of wealth, and the latter is not independent of age.

The *a-priori* exclusion of possible cohort effects is a strong assumption[13]. The attitude toward holding financial assets *vis a vis*, e.g., real estate may have changed with successive generations. The alternative solution, corresponding to the second restriction that we have already

[12] If we omit dummies relating to different years, the shape of the profile does not change. The low absolute level of this profile, if compared with that of *Fig. 2.5*, depends also on its derivation from a regression on the individual micro-data using the ratio *AF/Y* as the dependent variable, while *Fig. 2.5* describes the evolution of the ratio between average financial wealth and average income by cohorts and years: if households with high incomes have also higher ratios of financial wealth to income, the mean of the ratios (the dependent variable in the micro-level regressions) is lower than the ratio of the means.

[13] Robert Clark reasonably argued that risk preferences might be shaped by a cohort experience such as coming of age during a depression or experiencing a period of above normal returns. Given the short and very special period, which

used in the estimation of the saving rate, used by Venti and Wise (1993), and, more recently, by Poterba (2000), excludes the time period effects, through the use of polynomials (or equivalently sets of dummies) both in the age and the cohort index. Of course, this implies the risk to interpret general macroeconomic phenomena common to all generations as cohort effects[14]. We have tried also this alternative (very similar to imposing that estimated time coefficients but restricted to zero). The age profile that we get (from right part of *Table 2.4*) is continuously increasing, and shows relevant cohort effects. They are very large, and increasing mainly for the younger generations. The suspicion that age and cohort effects which emerge as very relevant, and with opposite sign are, actually, the result of a general trend in the data cannot be avoided. This is the same conclusion reached by Ameriks and Zeldes (2000), and by Guiso and Jappelli (2000) in very similar contexts. We however present results from both alternative regressions, *AF/Y* on age and time effects, and *AF/Y* on age and cohort effects, in *Table 2.4*, which provides the same information of the table shown above for the saving rate: the estimates of age, cohort and time coefficients for the ratio *AF/Y,* over the same sample period, according to these two alternative identification restrictions. The pattern of cohort and period effects is fairly clear: there is an increasing tendency to invest in financial assets, particularly by the younger generations. This is probably due to a time effect deriving from the structural changes mentioned before.

In this case too, the results from regressions on cohort averages are presented in Appendix III. They provide, with some exceptions, significant coefficients, and the profile of the cohort effects is similar to that observable from the individual-level estimates.

Turning again to the individual regressions (*Table 2.4*), the coefficients of year dummies, where present, are always very significant and of increasing magnitude; cohort coefficients are clearly influenced by the presence of a trend, leading to a rapidly increasing pattern of wealth-holding for younger cohorts. The socio-demographic controls show that more educated households own a much greater amount of financial assets, and that households living in the North are more richer than the others. Being self-employed is associate with a higher ratio of financial assets to disposable income. The values of time and cohort coefficients do not change very much with the inclusion of these additional regressors.

The age profile of total financial assets holding is slightly increasing, and it declines only in the very last part of the life cycle. The coefficients of the second column of *Table 2.4* (age and year

---

our surveys refer to (19989-1998), we assume that general macroeconomic effects dominate possible cohort effects coming from the past.

[14] In both the specifications that we choose (regression on age and time period dummies; regression on age and cohort index), the absence of interactions between age effects, on the one side, and either time or cohort effects, on the other, is equivalent to impose that the age profile be the same, respectively, either for each time period, or for each cohort.

effects in the individual data, without demographic controls) have been used to draw the continuous line in previous *Fig. 2.5*, relative to the pure age effect.

Summing up, data seem dominated by a structural change in attitude of all generations toward a greater propensity to invest in financial assets; as a result, the ratio of AF/Y increases up to age 70, then it declines but very slowly.

Table 2.4 Regression results for the ratio AF/Y: micro data - age and time or cohort effects

	Age and year effects				Age and cohort effects			
	coef	s.e.	coef	s.e.	coef	s.e.	Coef	s.e.
Age	0.0075	0.0010	0.0152	0.0011	0.0239	0.0030	0.0306	0.0030
Age^2	-8.12E-05	7.58E-05	-6.33E-05	7.49E-05	6.42E-05	1.52E-04	1.09E-04	1.49E-04
Age^3	-5.87E-06	2.26E-06	-9.96E-06	2.26E-06	-3.30E-06	3.65E-06	-7.97E-06	3.61E-06
Age^4	-2.51E-08	1.02E-07	2.22E-09	9.99E-08	-8.68E-08	1.52E-07	-8.50E-08	1.48E-07
1991	-0.0122	0.0209	-0.0098	0.0207				
1993	0.0522	0.0207	0.0647	0.0204				
1995	0.0856	0.0216	0.0925	0.0211				
1998	0.1760	0.0245	0.1592	0.0242				
Cohort2					0.1502	0.0573	0.1275	0.0549
Cohort3					0.2707	0.0660	0.2263	0.0639
Cohort4					0.3778	0.0739	0.3390	0.0711
Cohort5					0.4985	0.0881	0.4581	0.0850
Cohort6					0.5721	0.0968	0.5175	0.0937
Cohort7					0.7123	0.1074	0.6451	0.1043
Cohort8					0.7426	0.1078	0.6844	0.1046
Cohort9					0.8106	0.1113	0.7524	0.1082
Cohort10					0.8894	0.1141	0.8067	0.1114
Cohort11					1.0308	0.1167	0.9296	0.1142
Cohort12					0.9966	0.1192	0.9099	0.1164
≤8 yrs edu.			0.1278	0.0187			0.1296	0.0187
High sch.			0.2658	0.0199			0.2688	0.0198
Degree			0.4257	0.0274			0.4279	0.0274
Centre			-0.2195	0.0159			-0.2176	0.0159
South			-0.3287	0.0150			-0.3262	0.0150
Male			0.1204	0.0163			0.1172	0.0162
Self empl.			0.1903	0.0205			0.1904	0.0206
N. earners			-0.0744	0.0092			-0.0745	0.0093
Const.	0.5369	0.0182	0.5391	0.0327	-0.0985	0.1038	-0.0367	0.1039
N. obs.	38784		38784		38784		38784	
R^2	0.012		0.074		0.013		0.074	

2.4 Ageing and the attitude toward risk

Let us move to the age profile of the portfolio composition, focussing on the share of the risky assets held by Italian households.

We first show the regression results for the various effects; then we draw a figure with the original data and the age effect obtained from the regression on individual data without cohort effects (i.e. using the coefficients in the second column of the following table).

Table 2.5 Regression results for the ratio AF3/AF: micro data - age and time or cohort effects

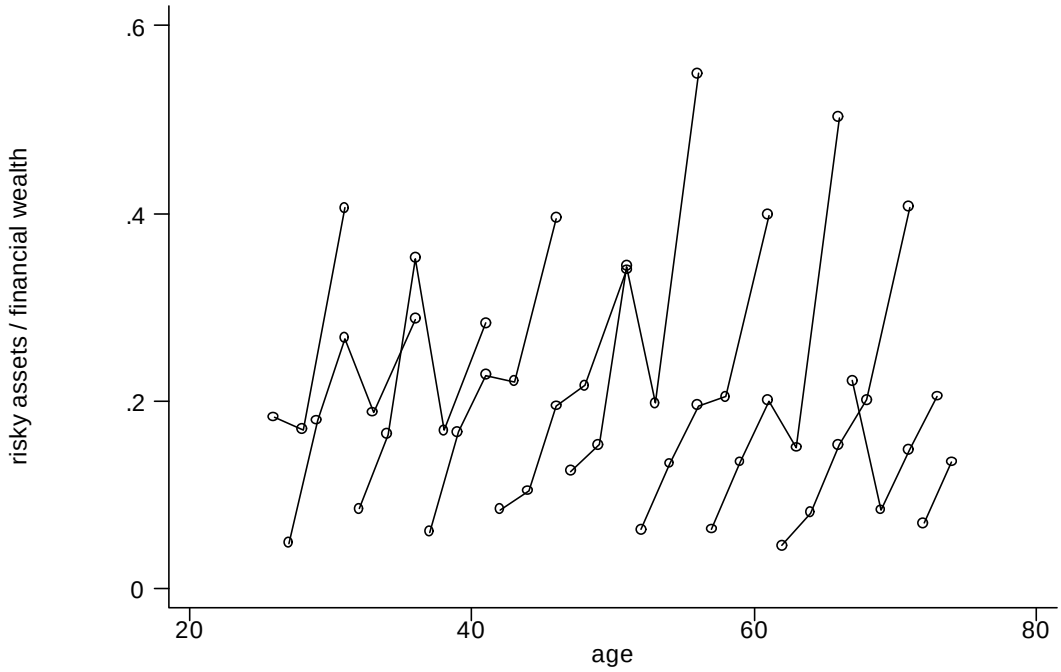
	Age and year effects				Age and cohort effects			
	Coef	s.e.	coef	s.e.	coef	s.e.	coef	s.e.
Age	-0.0004	0.0002	0.0008	0.0002	0.0086	0.0006	0.0096	0.0006
Age^2	-3.33E-05	1.36E-05	-7.68E-06	1.33E-05	-1.48E-05	2.64E-05	1.46E-05	2.52E-05
Age^3	3.63E-08	4.13E-07	-4.78E-07	4.05E-07	-8.53E-07	7.88E-07	-1.49E-06	7.50E-07
Age^4	-6.30E-10	1.80E-08	-1.01E-08	1.74E-08	-3.69E-08	2.77E-08	-4.80E-08	2.63E-08
1991	0.0115	0.0026	0.0110	0.0026				
1993	0.0303	0.0030	0.0317	0.0029				
1995	0.0327	0.0028	0.0324	0.0028				
1998	0.0930	0.0044	0.0888	0.0042				
Cohort2					0.0172	0.0070	0.0130	0.0065
Cohort3					0.0392	0.0075	0.0324	0.0071
Cohort4					0.0779	0.0100	0.0711	0.0094
Cohort5					0.1262	0.0119	0.1188	0.0112
Cohort6					0.1730	0.0140	0.1615	0.0132
Cohort7					0.2292	0.0154	0.2152	0.0146
Cohort8					0.2614	0.0160	0.2483	0.0153
Cohort9					0.2984	0.0173	0.2851	0.0166
Cohort10					0.3495	0.0180	0.3310	0.0173
Cohort11					0.3960	0.0195	0.3727	0.0187
Cohort12					0.4283	0.0227	0.4072	0.0215
≤8 yrs edu.			0.0207	0.0031			0.0216	0.0031
High sch.			0.0564	0.0035			0.0581	0.0035
Degree			0.1133	0.0065			0.1150	0.0065
Centre			-0.0316	0.0031			-0.0315	0.0031
South			-0.0532	0.0022			-0.0525	0.0022
Male			0.0126	0.0026			0.0125	0.0026
Self empl.			0.0372	0.0041			0.0374	0.0042
N. earners			0.0075	0.0017			0.0071	0.0017
Const.	0.0243	0.0020	-0.0152	0.0044	-0.1718	0.0146	-0.1998	0.0148
N. obs.	38784		38784		38784		38784	
R^2	0.038		0.107		0.032		0.101	

The cohort and year coefficients estimated on cohort averages are in general significantly different from zero (see Appendix III).

Like the ratio *AF/Y,* also *AF3/AF* has experienced a strong growth along the whole decade, with special improvement in the period 1995-1998. As a consequence, we have run both the two regressions we tried for *AF/Y*: the first one, without cohort effects, and the second without the time period effects. Also in this case, the latter estimation produces age and cohort profiles very big in size and with opposite signs (if we plot them in a same graph against age, the age profile is increasing with age, and the level of cohort coefficients is much higher for the younger generations). The age profile we get from the estimation without cohort effects shows first an

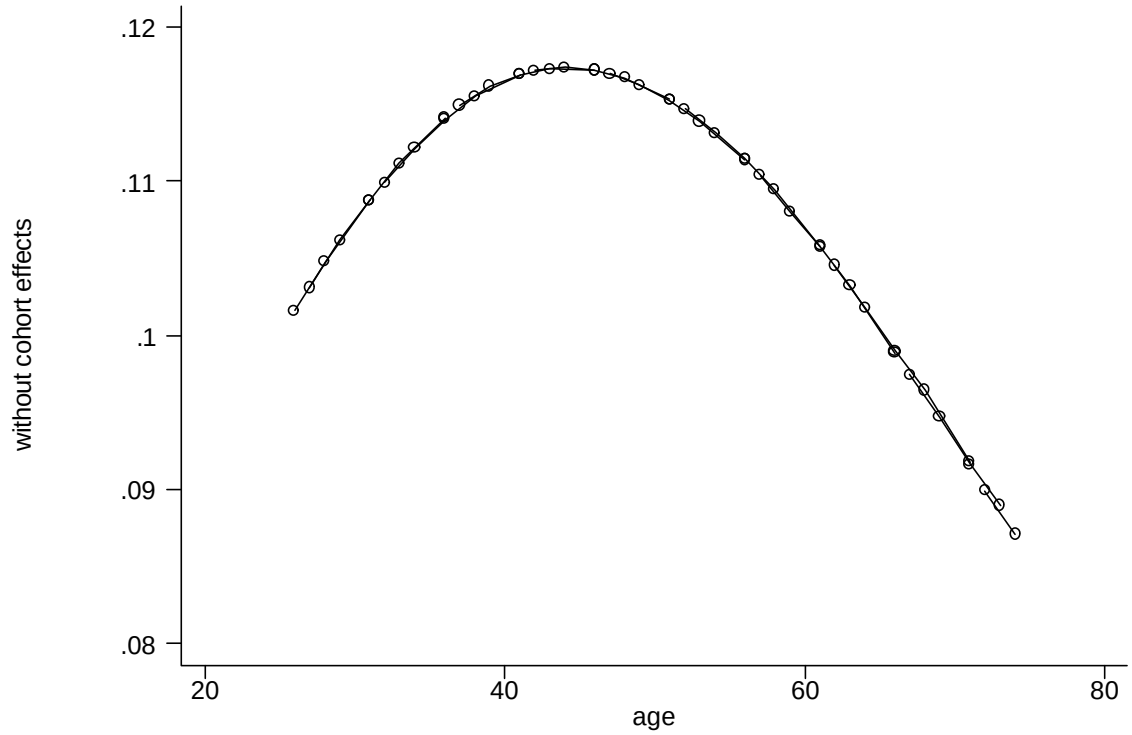
increase in the share of risky assets, and then a reduction after the age of 50[15]. This is common knowledge for financial promoters, even if both Ameriks and Zeldes (2000) for the Us, and Guiso and Jappelli (2000) for Italy have shown that the reduction in the share of risky assets holding with age, on average, is the result of two different phenomena: a hump-shaped age profile for the *holding* of risky assets as such, and a more or less stable profile for the *share* of risky assets, conditional to the holding of them. Also in this case, our opinion is that the age profiles estimated without cohort effects seem more reliable.

Fig. 2.7. Ratio of risky assets to total financial assets



[15] See previous note for an explanation of the absolute level of the line in *Fig. 2.8*.

Fig. 2.8 Ratio of risky assets to total financial assets: age profile estimated without cohort effects



Summing up, data appear dominated by a trend effect: the holding of risky assets has been strongly increasing during the period under observation. Cohort effects show that such an increasing attitude toward holding risky assets was stronger for the younger generations. Both these trend and cohort effects might distort the evidence on the attitude toward risk at old ages.

2.5 The evolution of housing wealth over the life-cycle

We end this section on the characteristics of the saving and wealth behaviour over the life-cycle with a description of the evolution of the holding of housing estate assets. We repeat for housing assets the same analysis described above. The main results are contained in *Table 2.6* and in the three graphs which follow. The regressions with age and year dummies point to the presence of a significant increase, over the period, of the ratio of real estate value to income. Controlling instead for cohort effects, there is a clear increase in the average amount of dwelling owned by successive generations, confirmed visually by *Fig. 2.9*, which plots the average ratio of the nominal value of the housing estate wealth to current disposable income between the ages of 25 and 74. After a period of rapid increase between 1989 and 1993, the curves flatten in the second part of the '90s.

Unlike the estimates previously shown for financial wealth, where the presence of a temporary shock in the period under analysis is very likely, in the case of real estate wealth, the cohort effects, although very big, are more realistic, because the process of housing accumulation is traditionally more stable than that of financial wealth, being less subject to the ups and downs of financial markets.

The introduction of the demographic variables does not change the pattern of time and cohort dummies, and shows that the holding of housing estate is higher among the more educated and those living in the North, and for households, whose head is a male. Finally, the ratio is very high among the self-employed.

Table 2.6 Regression results for the ratio Housing Estate / Income: micro data - age and time or cohort effects

	Age and year effects				Age and cohort effects			
	coef	s.e.	coef	s.e.	Coef	s.e.	coef	s.e.
Age	0.0570	0.0093	0.1130	0.0107	0.2647	0.0292	0.3300	0.0308
Age^2	-4.24E-03	7.41E-04	-3.43E-03	6.82E-04	-2.44E-03	1.16E-03	-1.23E-03	1.12E-03
Age^3	-8.77E-05	2.71E-05	-1.12E-04	2.60E-05	-6.60E-05	3.48E-05	-9.87E-05	3.46E-05
Age^4	3.50E-06	9.99E-07	3.04E-06	9.23E-07	1.71E-06	1.22E-06	1.11E-06	1.17E-06
1991	1.2152	0.1030	1.2754	0.1006				
1993	2.1678	0.1741	2.3366	0.1712				
1995	2.1923	0.2182	2.3565	0.2181				
1998	2.4116	0.1874	2.4188	0.1841				
Cohort2					1.2943	0.2983	1.3342	0.2829
Cohort3					2.0776	0.3092	2.0990	0.2921
Cohort4					3.2321	0.3832	3.3610	0.3614
Cohort5					4.7453	0.5418	4.9081	0.5120
Cohort6					5.9981	0.5996	6.1414	0.5772
Cohort7					6.9507	0.7054	7.2367	0.6826
Cohort8					7.9554	0.7508	8.3993	0.7318
Cohort9					9.0644	0.7531	9.4957	0.7358
Cohort10					9.8805	0.8391	10.2015	0.8189
Cohort11					10.6274	0.8796	10.8035	0.8598
Cohort12					12.3338	1.1072	12.6951	1.1054
≤8 years ed.			0.4994	0.1925			0.5435	0.1959
High sch.			1.2404	0.1826			1.2440	0.1856
Degree			1.0980	0.1852			1.0760	0.1866
Centre			0.3216	0.1451			0.3160	0.1472
South			0.0037	0.1637			0.0140	0.1664
Male			0.7556	0.1207			0.6692	0.1205
Self empl.			4.1855	0.3058			4.1963	0.3063
N. earners			-0.7859	0.1230			-0.7604	0.1241
Const.	3.3921	0.1167	2.5051	0.2761	-2.2431	0.6260	-3.3511	0.6427
N. obs.	38784		38784		38784		38784	
R^2	0.016		0.058		0.012		0.054	

Fig. 2.9 Ratio of housing estate value to annual disposable income

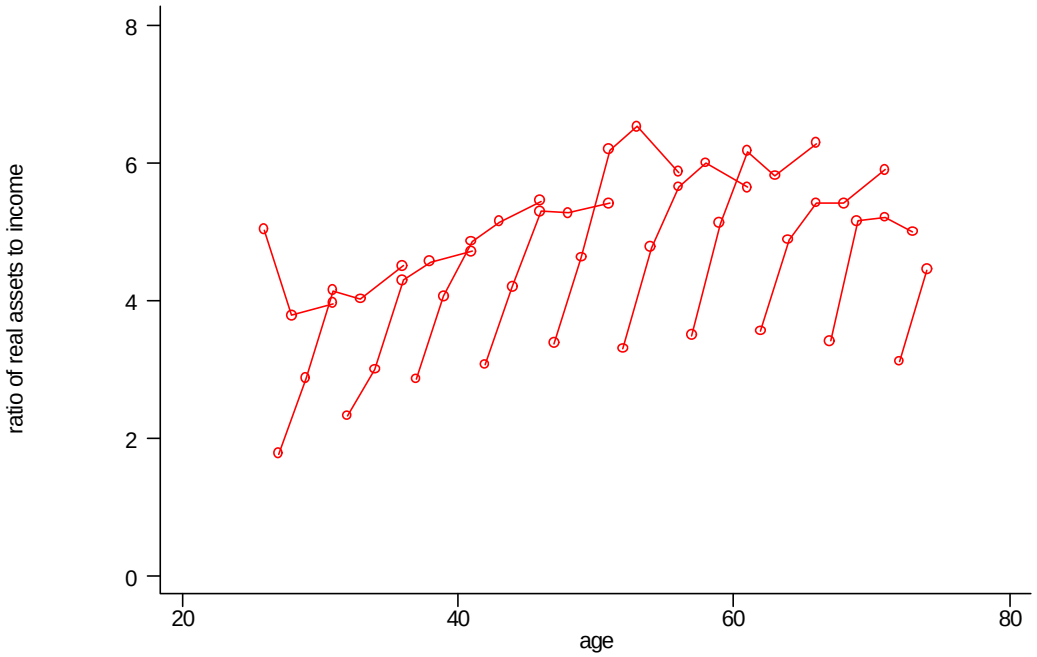
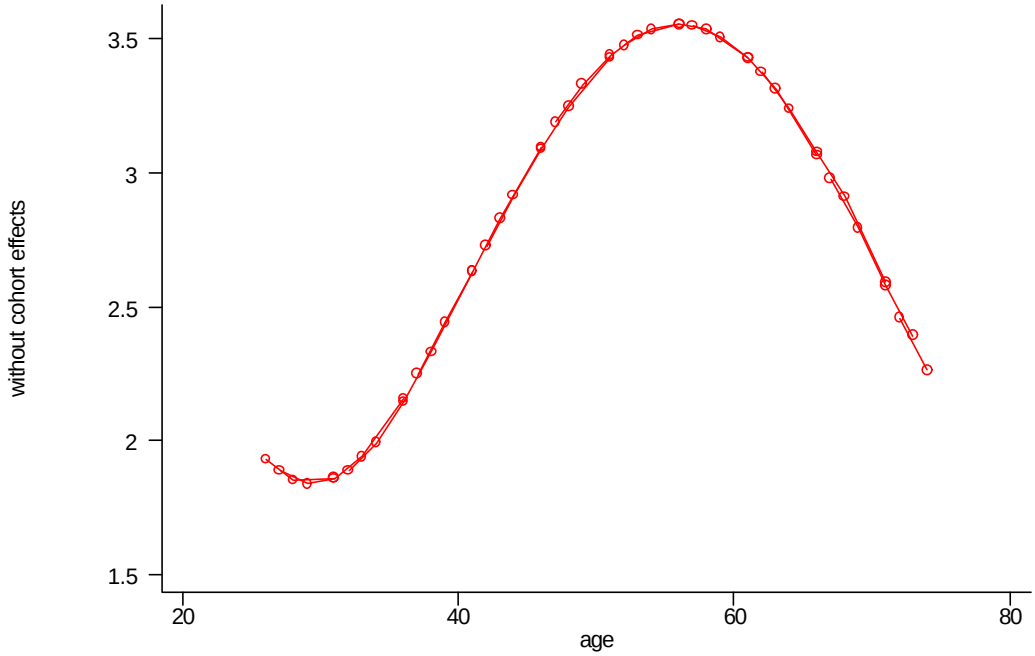


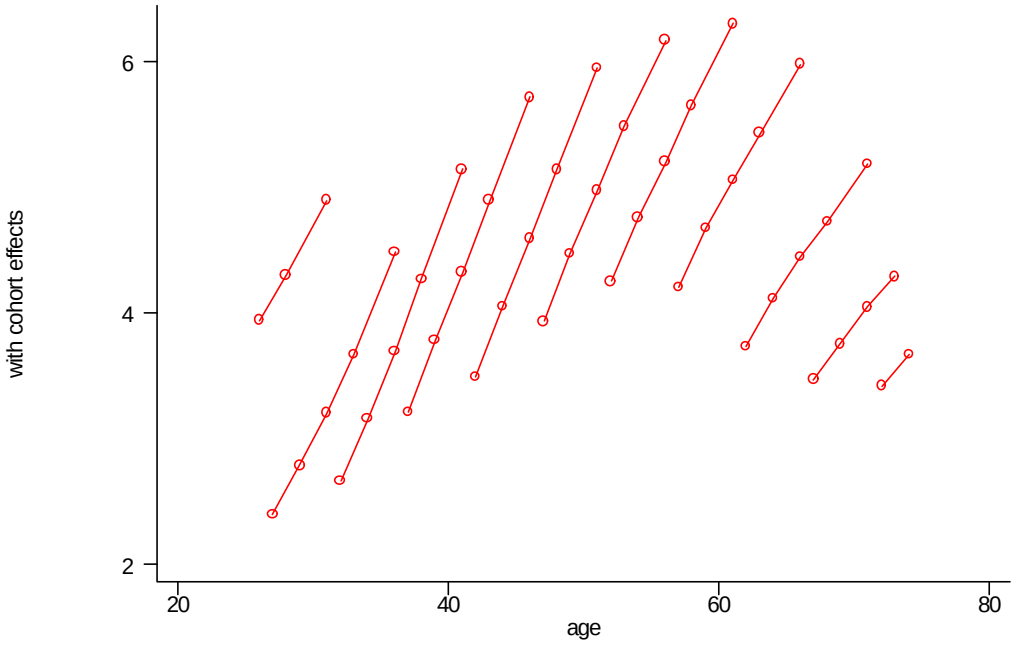
Fig. 2.10 Ratio of housing estate value to annual disposable income: age profile estimated without cohort effects



The age profile of *Fig. 2.10* is obtained from the regression on age and year dummies (without the demographic controls), and shows the typical shape found in a single cross-section, first increasing and then decreasing after a peak at 60.

The profile which takes account of cohort effects is very different, however: *Fig. 2.11* is derived from the regression on age and cohort dummies (without demographic controls), and shows the interaction between the age polynomial and the cohort dummies. It is not very different from the previous graph reporting real data.

Fig. 2.11 Ratio of housing estate value to annual disposable income: age profile estimated with cohort dummies



3. THE MICROECONOMIC EFFECTS OF THE REFORMS: THE DIFFERENCE-IN-DIFFERENCES APPROACH

As described in the first section, during the 1990s Italy underwent two major reforms of its pension system, with significant cuts in future benefits for several social groups. Summing up the results we got in the previous section, we can say that:

- aggregate propensity to save has been only slightly declining during the past decade, after two decades of stronger decline;
- the age profile of the propensity to save seems to have been influenced more by cohort effects than by general trend effects (however, when the time period effect is more precisely detected it seems to have reduced individual propensity to save);
- the age profile of the ratio of financial assets to household disposable income has been subject to relevant trend effects over the last decade;
- and, finally, the age profile of the holding of risky assets has as well shown a marked shift upwards.

As long as the substitutability between real and financial wealth, on the one side, and pension wealth, on the other, is different from zero, the picture which emerges from the former section is uncompleted. This section concentrates at a more detailed level on the role played by the reforms of the pay-go system, focussing on the saving behaviour of very specific groups of Italian households, hit to a different extent by the reforms.

The theory suggests that there should be a linkage between the generosity of the mandatory pension system and the level of voluntary saving: the higher is the standard of living that the state guarantees in the old age, the lower should be, *ceteris paribus*, the need to save for retirement. A reduction in the social security wealth determined by the reforms should therefore induce households to increase savings.

To this aim, it is convenient to define individual saving as the sum of compulsory and voluntary saving, where the former measures the participation both to pay-go and funded pension schemes (Miles 1999; Jappelli and Modigliani 1999; Borsch-Supan 2001). Some authors have, accordingly, argued that in the estimation of the age profile of saving, the contributions to a pay-go scheme should be measured as positive saving and pensions as a rent. Jappelli and Modigliani (1999) and Brugiavini and Padula (2001) use this definition of saving for Italy and they find that the sum of the estimated compulsory and voluntary saving produces an age profile much more

consistent with the one predicted by the life cycle hypothesis. Therefore they argue that the substantial flat profile of voluntary saving estimated from the data should not be considered as a rejection of the LCH.

The degree of substitutability between compulsory contributions to a pay-go system and voluntary saving is also important to explain the effects of pension policies on private saving. An increasing number of papers have estimated such a degree of substitutability for specific cohorts. Gokhale, Kotlikoff and Sabelhaus (1996) for example find that the generosity of the American social security system explains a large part of the decline in private saving for the generations which had gained more from these policies. Kapteyn, Alessie and Lusardi (1999) find that productivity growth and social security can explain most of the differences in wealth holdings among living cohorts in the Netherlands. They find that the cohorts that had social security throughout their life have less than half of the accumulation rate of older cohorts. In other words, the authors argue that past circumstances can explain the variation in the paths of wealth accumulation across cohorts. As we have seen, also in Italy the 1970s have witnessed the growth of a very extensive social security system which has realised a significant intergenerational transfer of resources in favour of the generations who retired between the beginning of the 1970s and the end of the 1980s (Castellino 1995). The high replacement rate of pension to final wage and the generous indexation of pensions to real wage growth until 1992 have determined a growth of the social security wealth from 40% of Gdp in 1980 to 270% of Gdp in 1992 (Beltrametti 1997).

According to the standard LCH, the generations who received this transfer of lifetime resources should have decreased the accumulation of voluntary saving and therefore also of private wealth. The available empirical evidence suggests that also for Italy the degree of substitutability between these two forms of saving is far from unity: on Italian micro data, Brugiavini (1987) found a substitution rate of only 10% between private and social security wealth, and Jappelli (1995) found values around 16-20%. In this section we provide new evidence on this topic in two different steps.

Firstly, by estimating the effects of pension reforms on the propensity to save of different socio-demographic groups, using the *difference-in-differences* approach. Secondly, computing social security wealth for each individual of the six surveys (1989, 1991, 1993, 1995, 1998, 2000).

Appendix I develops a possible rationalisation of the limited degree of substitutability between social security wealth and private wealth.

Social security reforms and household saving rate under the difference-in-differences approach

The reforms of the Italian public pension system provide a very interesting opportunity to test the degree of sensitivity of private saving to changes in social security wealth. They did not have a uniform impact on the population; they reduced pension wealth very unevenly across ages and social groups. In particular (see Castellino (1995), Beltrametti (1997)), the reforms reduced the rights of those who were already retired, at the moment of their introduction, only through the general abolition of real wage indexation, and guaranteed also a long transitory phase to preserve the positions of those workers who had a contributory record of at least 15 years of work in 1993. The reforms apply fully only to those who entered in the labour market after 1995. Other significant distribution effects cut through various demographic and professional groups. For example, the introduction of a close connection between contributions paid and future pension has strongly negative effects on the future benefits of the self-employed, who are still subject to lower contribution rates than the employees. On the other hand, public sector workers have been penalised by the sharp increase in the minimum number of contributory years to get an early retirement pension. Beltrametti (1997) shows that the social security wealth of the self-employed fell on average, after the reforms, by 18%, while for public sector workers it fell by 36%; for pensioners, however, the fall is limited only to 5%, entirely attributable to the 1992 reform.

Attanasio and Brugiavini (1995), using micro data for the 1991-1993 period, conclude that households of public sector employees actually increased their saving rate more than the other groups, and interpret this as evidence of a reaction to the 1992 pension reform. Here we extend their analysis to other demographic groups and to more recent sample surveys, which may take account also of possible effects of the more recent 1995-97 pension reform.

The data. To test the effects of pension reforms on private saving, we use the last six Bank of Italy Surveys of Household Income and Wealth that we have been using in the previous sections. We assume that the 1989 and 1991 surveys provide information about the saving behaviour of Italian households before the reforms, and that the successive surveys should incorporate the possible reactions by the households to the reforms themselves. In the course of the analysis, we

also consider the intermediate passages from some couples of years, to check the sensitivity (and variability) of the results to the particular survey used.

In each survey, households have been classified into different groups, according to the seniority of the head and his/her occupation. Then, the analysis proceeds to check whether these various groups changed in a significantly different way their saving behaviour as a consequence of the reforms.

We have classified households in four groups, on the basis of the occupational position of the head:

1. private sector employee
2. public sector employee
3. self-employed
4. other (i.e. pensioner age at least 60 in 1989)

Then, each of the first three groups has been divided into two sub-groups, according to the tenure of the head (less or more than 14 years of work in 1991, 18 in 1995, etc.).

Among these categories, the second and third groups (and in particular the young) should have been more severely hit by the reforms, which reduced only marginally the social security wealth of those belonging to the fourth group. *Table 3.1 reports some characteristics of the households in the various groups, in the first and last years of the sample period.*

Table 3.1: Sample means for selected variables, SHIW 1989 and 2000

	Private sector employees				Public sector employees				Self-employed				Other	
	young		old		young		old		young		old			
	1989	2000	1989	2000	1989	2000	1989	2000	1989	2000	1989	2000	1989	2000
% Freq.	5.5	11.8	21.0	8.1	3.7	8.1	10.9	5.2	3.7	8.8	16.2	6.7	32.4	18.8
Age	30.6	37.4	46.2	49.2	31.2	40.6	46.6	51.0	30.8	39.8	50.4	52.6	70.3	76.5
Education (years)	10.8	10.6	8.5	9.6	12.9	12.9	10.8	11.4	12.2	12.0	8.2	9.5	6.3	6.5
N. members	3.0	3.1	3.7	3.3	2.8	3.0	3.5	3.2	2.6	3.0	3.4	3.3	2.0	1.7
N. earners	1.6	1.7	1.8	1.9	1.5	1.6	1.7	1.9	1.5	1.6	1.8	2.0	1.6	1.5
Income	25.03	26.46	28.75	32.77	26.53	27.59	30.25	32.97	29.28	31.62	33.24	37.94	17.77	17.84
Consumpt.	19.15	20.04	20.85	23.63	20.48	20.75	21.55	22.53	22.42	23.42	23.70	25.91	12.69	12.95
Saving rate	0.24	0.24	0.27	0.28	0.23	0.25	0.29	0.32	0.23	0.26	0.29	0.32	0.29	0.27

Source: our computations from SHIW data; monetary values refer to thousands of € at 2000 prices.

The size of the groups of "young" workers tends to increase over the period, because they include all those workers with less than 15 years of seniority in 1992; in other words, this group is fed by the new entrants the labour market in the years following 1992, independently of their age. The last group, "others", reduces its dimension since it does not include those "old" workers who reached retirement age between 1991 and 1998, in order to avoid that the saving behaviour of this control group be an average of persons differently hit by the reforms. As expected, young

households tend to be more educated and to have a lower number of members and of income recipients. The average age of the “young” group increases more than that of the other groups, as a result of the increase of its size. The saving rate shows no change for the young private employees and an increase for the other employees, private and public. Just looking at the table is not enough to detect whether the increase of saving of the “young” group is the result either of the reforms or of the different changing features of the group.

After the exclusion of some households with implausible values of income or consumption (less than 2000 € per year), the saving rate has been defined for each household as the difference between the natural logarithms of income and consumption. The use of logarithms has the effect of reducing the impact of outliers on the averages and on regressions results.

The difference-in-differences estimation. The first kind of evidence that we provide is based on a simple difference-in-differences approach, which requires the subdivision of the sample into a “treatment” group, and into a "control" group. The treatment group is composed of those units who are subject to an exogenous policy change. The control group includes those households not interested by the policy.

Let us consider observations relative to the periods before and after the policy change, and compute the difference in the values of the variable of interest for each group. In so doing, we are building a test of the effect of the policy by observing whether the change relating to the treatment group is significantly different from the change observed for the control households. For the reasons already indicated, the control group of our analysis is the category “other”, essentially formed by those households who were already in retirement before the reforms took place. We have specified several treatment groups, described in the previous section, to observe any possible change in behaviour by households differently hit by the reforms. This method does not need the computation of the social security wealth and of its changes, but relies crucially on an appropriate subdivision of the observations between treatment and control groups.

If S_{it} is the variable of interest observed at time t for group i, it is possible to estimate this regression:

$$S_{it} = \alpha + \beta D_T + \gamma D_{POST} + \delta D_T D_{POST} + u_{it}$$

Where the index i refers to the treatment or control group, the index t to the initial or final period, D_T is a dummy equal to 1 if the household belongs to the treatment group, and D_{POST} a dummy for the post-policy (final) period, reflecting aggregate shocks. The coefficient δ provides

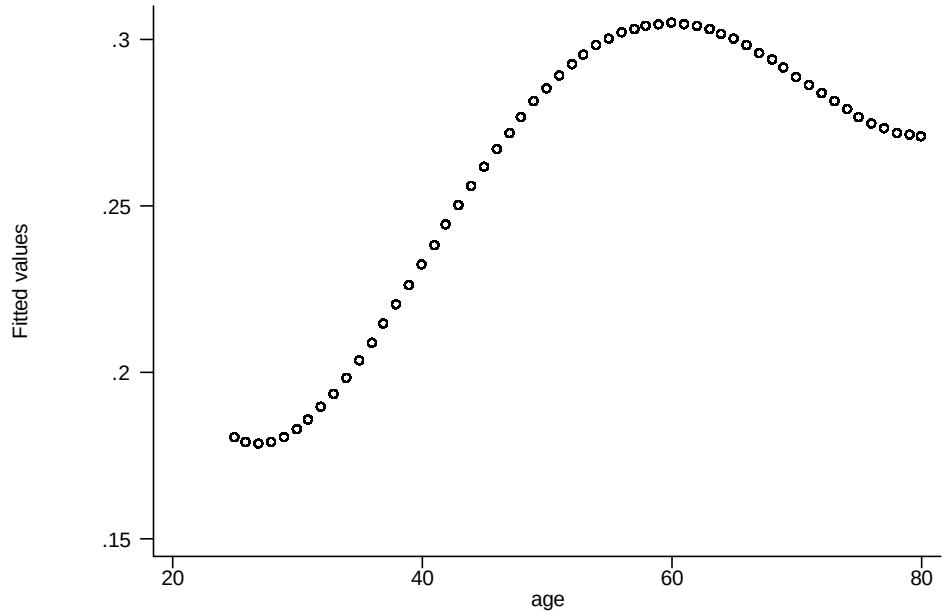
the estimate of the differential impact of the policy on the saving rate of the treatment group, separating the effect of the policy change from other unobserved determinants that were possibly changing over the same period.

The correct application of the difference-in-differences procedure requires some identifying assumptions. Among them, the most important is that the only significant difference between the treatment and the control groups consists in being or not subject to the policy measure. Otherwise, the change in the saving behaviour of the different groups between the initial and final period might have been driven by other unobserved factors. This is clearly not our case, since the control group is significantly different from the others, so a simple application of the approach through the computation of means of the saving rates and their differences would be meaningless. We turn therefore to a regression-based approach, where the explicit introduction of demographic attributes among the regressors allows isolating the net effect of the change in the policy regime. Since the saving rate typically follows a hump-shaped profile over the life-cycle, the systematic difference between the stages in the life-cycle of the treatment and control groups can be neutralised with a polynomial in age, which should also take into account the change in the average age within each group between the beginning and the end of the sample period. *Fig.3.1* shows the predicted shape of the life-cycle profile of saving obtained from a regression of the saving rate on a fourth-order polynomial in age on the four surveys pooled together. It shows the typical shape (see also Borsch-Supan, 2001) of saving for Italian households, with only a modest decline in old ages. The results presented below on the effect of pension reforms on saving rates are not affected by this profile[16].

Other systematic differences are apparent for average education and for the average size of the household. Our approach consists in a regression similar to the formula shown above, enriched with a vector of demographic variables, to isolate the net effect of the pension reform on the saving rate. The set of demographic factors that could influence the saving rate contains a third-order polynomial in age, the numbers of household members and of earners, and dummy variables for the sex of the head, his education level and the geographic area of residence.

[16] The fitted shape of the saving rate is slightly different from the age profile of *Fig.2* because *Fig.6* is based on a regression on micro-data, not on the pseudo-panel, which also does not control for time and cohort effects.

Fig. 6: Fitted values of the saving rate from a regression on a fourth-order polynomial in age.



Source: our computations on SHIW.

Table 3.2 contains the basic results of this section; it reports the estimates for various sub-periods of the coefficient d, which should represent the net effect of the pension reforms on the saving rate of the various groups. For example, the coefficient *0.037* in the top left part of the table means that the difference between the changes in the saving rate for the group formed by all private sector employees and for the control group is equal to *0.037* points of the saving rate.

The estimates have been obtained through a set of regression on the same control group and on the various treatment groups, pooling the data for the years before and after the reforms. The estimation method is ordinary least squares, with White robust standard errors. Results with robust regression, substantially very similar, are shown in Appendix II.

As discussed above, a priori we should expect an increase in the saving rate by those groups which have been more severely hit by the reforms, in particular the "young", those employed in the public sector, and the self-employed. We considered various couples of years to test the sensitivity of the results to the choice of a particular final period.

The observation from the 1989-93 or 1991-93 periods should provide information about the effects of the first pension reform, implemented at the end of 1992. Both private and public sector employees increased their saving rates in this period more significantly than the self-employed, with

respect to the treatment group[17]: the change is substantially similar for the young and the old, and greater for public sector employees. These results are also substantially similar taking either 1989 or 1991 as the starting year for the comparison, and could be actually interpreted as evidence of a sharp reaction to the reform (See also Attanasio-Brugiavini 1995). However, during the same period, after the currency crisis, a much tighter budget policy was enacted, which might have signalled a general reduction of the current and future private income net of taxes and transfers, which, on its turn, might explain the rapid diffusion of the signal.

Considering more recent surveys, the evidence of an increase in the saving rate by most demographic groups becomes definitely weaker. Taking into consideration the whole available period, from 1989 to 2000, no treatment group shows a relative increase in its saving rate, on the contrary in general the decreases are more frequent, in particular for the private sector employees. The only significant increase that remains is by the older civil servants, while, at first sight, we should expect a stronger reaction by the younger. Actually, the real change in the civil servant pension system mainly consists of the abolition of the very generous possibility of early retirement benefit, usually combined with new working activity in the hidden economy. While younger civil servants had already excluded this possibility from their future, for the older ones it was really an unexpected change in their life plan.

The young independent workers, those on the whole more severely hit by the reforms, actually show a significant relative decline in their saving rate.

The results do not change if we poole together the first two surveys to form the initial period and the last two surveys to represent the final period: the only significant relative reduction in the saving rate comes from the young self-employed and for private employees approaching retirement age.

[17] No significant change is observable for the self-employed with respect to the control group. The remarks of the text do not necessarily imply that the treatment groups actually increased their propensity to save; they might have reduced it to a lower extent than the control group.

Table 3.2: Estimated coefficients of the interaction term "Post x Treatment"

Treatment group	1989-93	1989-2000	1989+91-1998+2000	1991-93	1991-2000
Private sector employees					
All	0.037*	-0.051**	-0.019	0.081**	0.002
Young	0.037	-0.055*	-0.034	0.084**	-0.017
Old	0.033	-0.056**	-0.033*	0.075**	-0.006
Public sector employees					
All	0.068**	-0.016	0.012	0.100**	0.012
Young	0.052	-0.038	-0.024	0.069**	-0.033
Old	0.074**	0.027	0.041*	0.111**	0.055*
Self-employed					
All	0.002	-0.020	-0.023	0.100	0.012
Young	-0.007	-0.083*	-0.081**	-0.006	-0.112**
Old	0.008	-0.023	-0.016	-0.001	-0.039

Source: our computations on SHIW data; OLS with robust standard errors; ** significant at 5%; * significant at 10%. Each regression includes a polynomial in age, number of components and earners, dummies for sex of head, his/her education level, and the area of residence.

These results could be influenced by the different levels of permanent income and living standards of households belonging to the various treatment groups. In the same demographic group, more wealthy households, due to a higher level of sophistication in their financial decisions and a better knowledge of the implications of the policy changes, could offset the shock to a larger extent than other households could. Current disposable income cannot be used to classify households in different levels of well-being, since income is correlated with the saving rate; the education level of the household head is thus used here to approximate the distribution of permanent income across households; we distinguish three levels of education, primary (from 5 to 8 years of schooling), secondary (at least 13 years) and degree (at least 17 years).

Table 3.3 shows the estimated coefficients of the interaction term between the treatment group dummy and the final period dummy for smaller treatment groups, one for each educational category. In general, the relative rise in the saving rate between 1989 and 1993 appears to be due to the behaviour of the more educated households. This is particularly apparent for private sector workers, both employees or self-employed. Also in the passage from 1989 to 2000, the relative change in the saving rate is generally greater for the more than for the less educated households.

Aggregate numbers therefore conceal some reactions by specific demographic groups. The greater reaction by the more educated could be due not only to a greater ability to foresee the future consequences of current policy changes, but also to a change in the distribution of income favouring more skilled workers; there are some indications that in the 1990s in Italy the distribution of income

has actually become more polarised in favour of the more educated, who therefore were able to increase their relative saving rate. The introduction of a contribution related pension scheme, which reduces the advantage of dynamic careers, may also have played a role in the saving behaviour of the more educated.

Table 3.3: Estimated coefficients of the interaction term "Post x Treatment" by education group, 1991-93 versus 1991-98

	1989-93			1989-2000		
	Primary	Secondary	Degree or more	Primary	Secondary	Degree or more
Private sector employees						
All	0.023	0.070**	0.125**	-0.064**	-0.048*	-0.007
Young	-0.007	0.116**	0.096	-0.045	-0.052	-0.101
Old	0.028	0.040	0.166**	-0.080**	-0.051	0.132
Public sector employees						
All	0.038	0.114**	0.075*	-0.027	-0.004	-0.034
Young	0.042	0.127**	0.072	-0.126*	-0.015	-0.032
Old	0.075**	0.094**	0.062	0.031	0.042	-0.023
Self-employed						
All	-0.020	0.017	0.130**	-0.018	-0.018	-0.060
Young	-0.128	0.101	0.073	-0.123	-0.041	-0.145*
Old	-0.015	0.119**	0.089*	-0.008	-0.033	-0.174

Source: our computations on SHIW data; OLS with robust standard errors; ** significant at 5%; * significant at 10%. Each regression includes a polynomial in age, number of components and earners, dummies for sex of head, his/her education level, and the area of residence.

The results suggest therefore that a significant differential change in the propensity to save can be observed for most groups in the first part of the period, and this could be interpreted as an immediate reaction to the first pension reform[18]. In the following period, always keeping fixed the initial period as reference for comparisons, the only significant change that persists concerns the older public sector employees. These estimates could be interpreted as showing that the possible reduction in pension wealth produced by the reforms had only a limited effect on private wealth accumulation (See also Jappelli 1995), and that the consistent reaction of saving is concentrated in particular among the more educated and richer households. All over the 1989-2000 period, the relative increase in the saving rate within each treatment group is generally larger for the more educated households. The results obtained so far seem also to confirm the presence of negative cohort effects on saving for the younger generations (relatively lower for the more educated), already pointed out in previous sections of the paper.

As a whole, we sum up the following preliminary conclusions:

- the 1991-1993 reactions of the treatment groups show that dramatisation produces a relative increase in the saving rate (or a lower decline) of the groups hit by the reform;
- in the medium run, when general financial and currency crisis have been reabsorbed, the impact on saving rates of the groups hit by the reforms become weaker;
- within the treatment groups, the analysis shows that in the medium run the relative increase in the saving rate remains strong either if the level of education is higher or if income is higher (the two are not independently distributed);
- in the case of lower income households, they seem to behave as if the dramatisation produced a temporary reduction of their impatience *vis-a-vis* the future;
- even if we have not yet computed the substitution rates of private to social security wealth, the results we have got at this stage suggest a trivial statement: they may depend on the degree of information of households, which on its turn depends on their capability to be informed.

[18] However, we should not neglect that 1993 was a very peculiar year. As already mentioned, there was a deep recession and a strongly restrictive fiscal policy.

4. THE MICROECONOMIC EFFECTS OF THE REFORMS: THE INDIVIDUAL SOCIAL SECURITY WEALTH

The analysis of the previous section has been based on qualitative evaluations of the change in social security wealth for different household groups. In order to evaluate the quantitative importance of the difference-in-differences estimates we should compare the realised change in private wealth accumulation with the actual reduction in social security wealth. In the remaining part of the project, the analysis of the effects of pension reforms on saving will be extended to take into account the quantitative evaluation of social security wealth for each household of the sample before and after the reforms. The quantitative changes of the social security wealth will be compared with changes in saving and private wealth holding across time.

4.1 *The computation of the social security wealth*

The surveys (SHIW) data do not contain information on social security wealth. In this subsection we describe how we have estimated this variable. Social security wealth is defined as the sum of future expected benefits net of the sum of future expected contributions. According to this definition, at each point of time and for each individual, social security wealth expresses the accrued entitlements to wealth which the individual has realised through its participation into the public pension scheme.

For each individual observed in the six surveys (1989, 1991, 1993, 1995, 1998 and 2000), firstly, we compute the present value of future pension benefits. In so doing, we use information on age, sex, occupation, seniority, expected retirement age, lifetime earnings profile, life expectancies and the relevant social security legislation in the year of observation. Next, we estimate the present value of future contributions to the pension scheme, which an individual belongs to. Finally, we net out the present value of contributions from the present value of benefits to get the expected net social security wealth for each individual when he/she is observed in the survey. In other terms the net social security wealth (*SSWN*) is the difference between the present value of future benefits (*PVB*) and the present value of future contributions (*PVC*) evaluated at the time of observation for each individual in the sample.

The formula of the social security wealth for an individual (*i*), who belongs to a (*j*) pension scheme, at time (*t*) is defined as:

$$SSWN_{i,j,t} = \sum_{k=L+1}^{E(T)} \frac{P_{i,j,k}}{(1+r)^{k-t}} - \sum_{k=t}^{L} \frac{a_{i,j,k} W_{i,j,k}}{(1+r)^{k}} \qquad (1)$$

where:

$P_{i,j,k}$ = pension benefit of individual (i) which belongs to the (j) pension scheme, measured at time k;

$a_{i,j,k}$ = tax rate for individual (i) which belongs to the (j) pension scheme, measured at time k;

$W_{i,j,k}$= gross wage of individual (i) which belongs to the (j) pension scheme, measured at time k;

r = discount rate;

L = expected age of retirement;

$E_L(T)$ = life expectancy at age L;

The computation of equation (1) produces a value of the net social security wealth for each individual under observation in the given survey. As a whole, after considering individuals with full careers (employees and self employed) with gross annual earnings higher than 4.000 Euro and lower that 100.000 Euro, in order to exclude outliers from the computation, we have 30.078 observations for employees and 6.010 observations for the self employed. The following hypotheses are used in the computation of the social security wealth:

1. we express all values in 1998 constant prices and we assume perfect foresight about future inflation and a complete price indexation mechanism;
2. we assume that when an individual retires he/she has a good knowledge of pension rules and he/she will compute future taxes and benefits as if the pension legislation will persist in the future, unless new information on pension legislation becomes available to individuals;
3. the age of retirement is taken for each individual from subjective expectations expressed by respondents in the surveys;
4. life expectancies are taken from official statistics of the Italian Statistical Bureau in 1996;
5. lifetime earnings profiles that are used to compute future pension benefits and contributions, are estimated for three different level of education, ten cohorts, and for employees and self employed separately (a complete description of the estimation procedure of lifetime earnings profiles is given in the next subsection);
6. the discount rate used to compute the present value of pension benefits and contributions is assumed to be constant and equal to 3%.

4.1.1 The estimation of lifetime earnings profiles

We estimate lifetime earnings profiles for sex, occupation and educational level. We consider dependent and self employed workers; three level of education, primary school, high school and university degree. The combination of these economic and demographic characteristics gives us 12 stylised lifetime profiles. Using information on birth date and on estimated gross earnings of each individual we are able to generate "individualised" earnings profiles, where the shape corresponds to one of the 12 stylised profile, and where the level of gross earnings depends on the birth date of the individual, whom the profile refers to.

Income figures in the surveys (SHIW) are net of personal income taxes and social security contributions. The first step in the estimation was the construction of gross earnings. We used the following procedure: define YN_i as the net income of an individual (i); then his/her gross income is calculated by solving the following relation:

$$YL_i = \frac{\left[YN_i - (t_{j+1} - t_j)\,Y_{j+1} - (t_{j+2} - t_{j+1})\,Y_{j+2} - .... - (t_{j+n} - t_{j+n-1})\,Y_{j+n} - D_i\right]}{(1 - t_{j+n-1})} \qquad (2)$$

where:

Y_j: income bracket of the personal income tax

t_j: marginal tax rate on income bracket j

D_j: tax credit

$YL_{j+n} < YN_i < YL_{j+n-1}$

Next, compute gross earnings for the 1989, 1991, 1993, 1995, 1998 and 2000 surveys, by taking account of the changes in the personal income tax law occurred through the period. In the computation of gross income only full time workers were considered. Moreover, incomes of employees and self employed were considered separately, because of the different tax credit that the Italian fiscal law recognises to the two categories of workers.

Earnings profiles by sex, occupation, and education level are obtained by regressing the logarithm of gross earnings on a polynomial on age and a set of cohort dummies. Separate profiles for employees and self employed, for men and women and for three level of education were obtained. The stylised profiles are described in the *Fig. 4.1* for male and female employees.

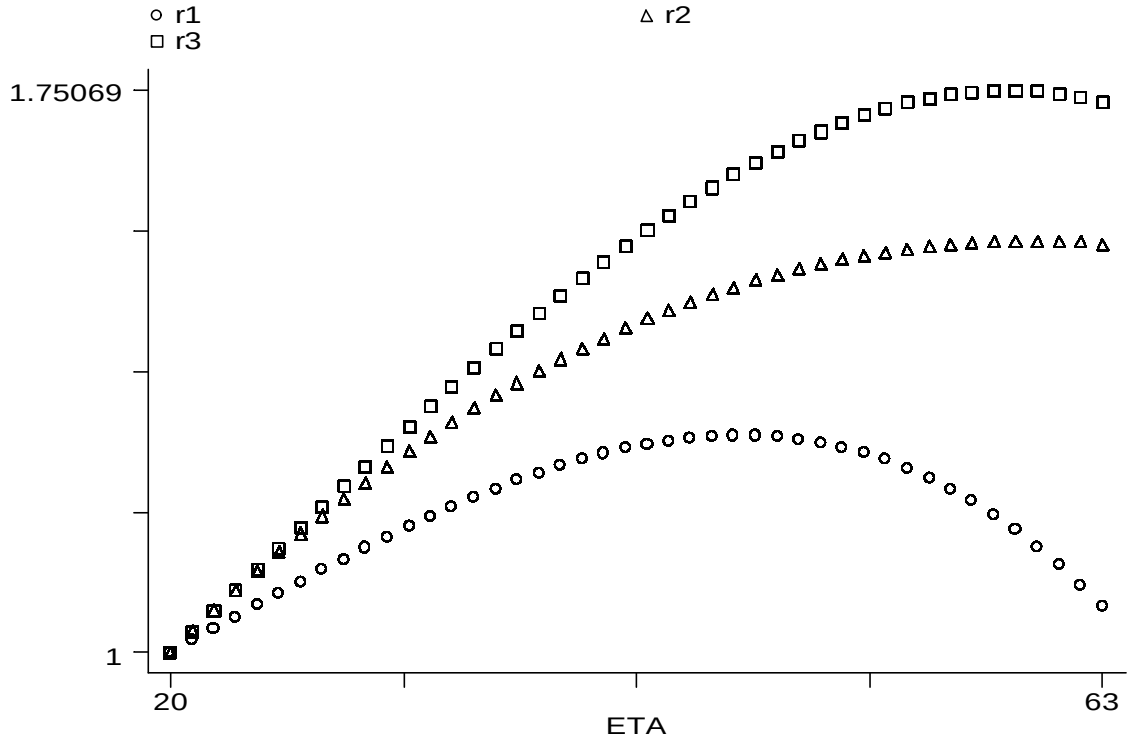
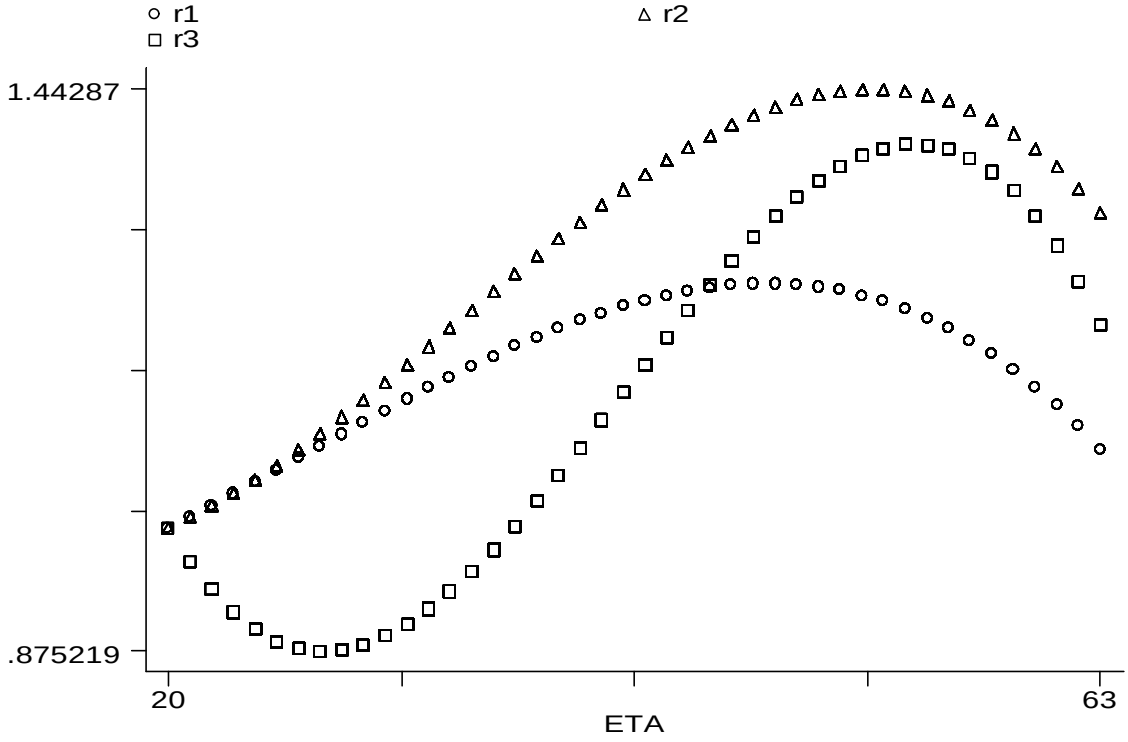


Fig. 4.1: Lifetime earnings profiles for employees male (A) and female (B) and three different level of education



For each observed individual in the surveys, the first gross earning is computed by re-scaling the estimated earning by both an age and a cohort parameter. In the same way, the earning in the year before retirement is estimated by using information on expected retirement age. The individualised earnings profile was used to estimate the average growth of gross salary and the seniority of each individual at the age of retirement. This information is then used in the computation of the social security wealth for each individual.

The different shape of the earnings profiles can be observed in *Fig. 4.1*. They reach a maximum before the age of retirement for low skilled workers, whereas the slope of the profile is positive all over the working life period both for the second and the third group of education (high school and graduate). The regression was truncated at the age of 55 for women, in order to reflect lower retirement age.

4.1.2 The effects of the 1992 and 1995 pension reforms on the individual social security wealth in the surveys (SHIW)

During the period under observation, in Italy, three reforms of the pension system occurred. The main legislative changes of the three reforms are reported in detail in the first part of this paper[19]. This subsection deals with the details of computation of the social security wealth in 1989 and 1991, the years before the first reform, and in 1993, 1995, 1998 and 2000, when the reforms had already been undertaken.

Social security wealth in the 1989 and 1991 surveys.

1. Employees in the survey compute their pension benefits according to the pre reform earnings related formula:

$$P_i = c * N * 0{,}2 * W_{i,1} * (1 + m_{i,j})^{N_i - 5} * \left[\frac{(1 + m_{i,j}) - 1}{m_{i,j}} \right] \quad (3);$$

self employed compute their pension benefit according to:

$$P_i = c * N_i * 0{,}1 * W_{i,1} * (1 + m_{i,j})^{N_i - 10} * \left[\frac{(1 + m_{i,j}) - 1}{m_{i,j}} \right] \quad (3').$$

where:

$c = 0,02$ is the internal rate of return of the earnings related formula;

N_i = seniority at retirement for individual i;

m_{ij} = average growth rate of real gross wage for individual (i) and pension scheme (j);

W_{i1}=gross wage in the first year of work of individual (i);

Values of W_{it}, N_i, $m_{i,j}$ are estimated following the procedure described in subsection *4.1.1*. They reflect the combination of personal characteristics like the individualised average growth of gross earnings, the seniority at retirement, the level of earnings, and of the shape of one of the stylised gross earnings profiles.

2. All pension benefits are indexed to real wages growth, which we fixed at 1.5% per year;

3. Contributions rate is equal to 27.4% and 12% for employees and self employed, respectively.

Social security wealth in the 1993 survey.

1. Individuals were divided according to their seniority. Define seniority in 1993 of individual (i) with $S_{i,1993}$, then three groups of individuals are identified: i) $S_{i,1993} \geq 16$ years; ii) $S_{i,1993} < 1$, and iii) $1 < S_{i,1993} < 16$. Individuals, who belong to group i) do not change the formula of computation of the pension benefits with respect to the formula used to compute the pension benefit in 1991. Individuals who belong to group ii) compute their pension benefits according to the new pension formula introduced in 1993 by the Amato government:

$$P_i = a\left(\frac{1}{N_i}\right)\left\{ W_{i,1}\left[\frac{(1+m_{i,j})^N - 1}{m_{i,j}}\right] + 0{,}01 \sum_{k=1}^{l-1} W_k\,(1+m)^{l-k}\,(L-k)\right\} \qquad (4)$$

Individuals who belong to group iii) compute their pension benefits according to the so-called *pro-rata* rule, i.e. their pension is calculated according to the 1991 rule for years before 1992 and according to the new rule introduced afterwards.

2. The lifetime profile of pension benefits is constant in real term for each individual, i.e. pension are not any longer indexed to real wage growth.

3. Retirement age is increased according to subjective expectations expressed by individuals in the survey.

[19] See also Franco, D., "Italy: A Never Ending Pension Reform", NBER, 2001

Social security wealth in the 1995, 1998 and 2000 surveys

1. Again, individuals observed in the two surveys are divided according to their seniority. In 1995 the three groups are: i) $S_{i,1995} \geq 18$ years; ii) $S_{i,1995} < 3$ and iii) $3 < S_{i,1995} < 18$. In 1998, individuals are divided according to the following rule: i) $S_{i,1998} \geq 21$ years; ii) $S_{i,1998} < 5$ and iii) $5 < S_{i,1998} < 21$ years. In 2000, individuals are divided according to the following rule: i) $S_{i,2000} > 23$ years; ii) $S_{i,2000} < 7$ years; iii) $7 < S_{i,2000} < 23$ years.

Pension benefits of individuals who belong to group i) in 1995, 1998 and 2000 are computed according to the 1991 pension rule. Pension benefits of individuals who belong to group ii) are calculated with the notional defined contribution rule introduced by the Dini government in 1995:

$$P_i = k * a_{i,j} W_{i,1} \left[\frac{(1+g)^{N_i} - (1+m_{i,j})^{N_i}}{g - m_{i,j}} \right] \qquad (5)$$

where:

$g = 1{,}5\%$ is the real growth rate of *Gdp*;

m_{ij}= real growth of individual gross wage,

a_{ij} is equal to *33%* for employees and *20%* for self employed;

k is the coefficient of conversion provided by the pension law which depends on the average expected life at retirement and on a 1,5% discount rate.

Pension benefits for individuals who belong to group iii) are calculated according to the *pro-rata* rule, i.e. their pension is computed according to the three rules described above for years before 1992, from 1992 to 1995 and after 1995 respectively.

2. Contributions rate for employees is raised from 27.4% to 32.7% since 1995 onwards.

3. Contributions rate for self employed is raised from 12% to 15% in 1995; from 15% to 19% since 1998 onwards.

A crucial variable in the computation of the social security wealth is the retirement age. In particular, when the pension formula is earnings related there is an incentive to retire earlier because the amount of the benefit is not directly related to the expected life at retirement[20]. In the computation of the net social security wealth we decided to consider retirement age as it is reported by the subjective expectations expressed by each individual in the survey. A feasible alternative would have been the imputation of the "legal" retirement age in each year of the survey to each

[20] In order to have neutrality in an earning related pension scheme, the internal rate of return (the term "c" in equation (3), (3') and (4) should be a function of the age of the individual when he/she retires.

individual[21]. Both the first, and the second alternatives have advantages and disadvantages. We preferred the first, because it appears more useful for one of the main aim of the paper, that is the estimation of the degree of substitutability between public pension and private saving. By considering the subjective expectations of the retirement age we are able to capture the individual expected working time from the year of observation onwards. This variable gives us a more precise picture of the planned future earnings for each individual, a crucial variable for the determination of the optimal level of consumption and saving in an intertemporal context. However, by considering subjective expectations of the retirement age, we implicitly assume a complete knowledge of the pension law by all the individuals.

4.3 Analysis of the net social security wealth and its relation with total private wealth in the surveys

In this subsection we examine the path of the social security wealth and some other indicators of the expected values of variables which help the description of the Italian social security system, as they result from the micro data of the six surveys used in this paper, before and after structural reforms of the last decade.

Both stock and flow variables are considered. The stock variables are: the present value of pension contributions (*PVC*), the present value of pension benefits (*PVB*), and the resulting net social security wealth (*SSWN*), as defined in equation (1). Pension benefits are calculated in each year of observation by applying formulae of equations (3), (3'), (4) and (5) or the appropriate combinations of them according to the seniority of the individual at the time of observation. Gross earnings are estimated following the procedure described in subsection (4.1.1), and are then used for the computation of pension benefits and contributions. Each stock variable is measured at time (t), therefore the value of *PVB*, *PVC* and *SSWN* depends on the expected level of contributions, benefits, and discount rate; moreover, it depends on the age of the individual at the time the variable is computed. In order to have an index which measures the pension benefit in terms of lifecycle resources, hence independent of the age of the individual when he/she is observed, for each individual belonging to the sample, we divide the annuity value of the pension benefit by the annuity value of earnings, both evaluated at the year of retirement. This ratio supplies a *time independent* measure of the replacement rate of pension resources to life time earnings.

[21] Legal retirement age has been gradually increased since the 1992 reform. It is today 60 years for women and 65 years for men.

Other indicators are considered. The expected age of retirement, the expected replacement rate defined as the ratio of the first gross pension benefit to the last gross earnings for each individual in the survey *RR* and the expected seniority at retirement *SR* defined as the estimated expected total number of years of contributions to a pension scheme by each individual in the survey. They may be useful to analyse some microeconomic effects of the reforms, e.g., on labour supply.

Table 4.1: Expected values of pension benefits, replacement rate and seniority at retirement for Employee and Self Employed (each number represents the value expected by the average Employee and/or Self Employed at work in year t, t =1991, 1993, 1995 and 2000).

	1991		1993		1995		2000	
	Employee	S E	Employee	SE	Employee	SE	Employee	SE
Pension benefits	16,167	18,864	16,211	16,590	15,547	13,911	16,345	14,395
Replacement Rate	71.4%	71.9%	67.6%	68.5%	68.2%	58.6%	69.8%	56.2%
RR for adult worker	/	/	69.2%	69.0%	74.4%	75.9%	75.8%	75.7%
RR for young worker	/	/	65.9%	68.0%	63.1%	46.8%	67.4%	46.5%
Seniority at retirement	36.6	38.8	36.7	37.8	37.6	38.7	38.7	38.4
Income	16,815	18,856	18,216	16,580	17,065	17,303	17,866	21,745

Note: Adult worker is defined as an individual with seniority allowing him/her to belong to the first group described in subsection 4.1.2 Young worker is defined as an individual with seniority allowing him/her to belong to the third group described in subsection 4.1.2

In *Table 4.1*, we report some information about the expected effects of the reforms of the '90 in terms of these indicators. We consider in particular the expected value of the first year pension benefit, the average replacement rate and the average replacement rate for young (<15 years of seniority in 1992) and adult (>15 years of seniority in 1992) workers, and the expected seniority at retirement. Values of the pension benefits seem to signal a general tendency to decrease. However, they can be misleading because they are computed on different samples. Other variables give more interesting indications. Average expected replacement rate slightly declines for employees. The reduction is stronger for self employed whose benefit was reduced significantly by the introduction of the notional defined contribution scheme in 1995 and afterwards[22]. It is interesting to split the population into young and adult workers. If we look at the data reported in the third and fourth row, we notice that the reduction in the replacement rate is stronger for young

[22] Self employed pension benefit in the notional defined contribution scheme introduced in 1995 are computed on the basis of contributions equal to 20% of their gross income. The contributions rate used for the computation of employee is 33%.

workers, in particular if they are self employed. This difference can be explained by the slow speed with which the pension formulae have been introduced for adult workers both in the 1993 and 1995 reforms. Expected seniority at retirement increases on average for employees, whereas it remains constant for self employed.

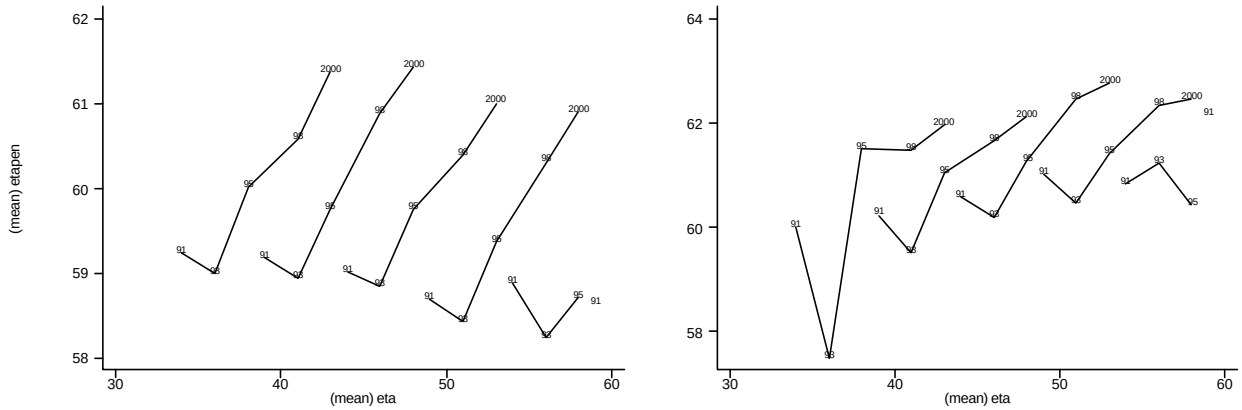
Table 4.2: Subjective expectations of the retirement age. 1991-2000.

	1991	2000
Employees	59.3	61.0
Self employed	61.4	62.4
Adult worker	59.9	60.1
Young worker	59.2	61.7
Primary school	59.2	60.7
Secondary school	58.9	61.5
University	60.2	62.2

A similar effect is noticeable in *Table 4.2*, where we report the expected retirement age for different groups of the population. The increase in the expected age of retirement is on the average equal to 1.6 years for employees and 1 year for self employed. Young workers seem to expect a longer stay in the labour market with respect to adult workers, perhaps as a reaction to the more severe computation rules introduced in the pension system. There is also a common tendency to raise the expected retirement age for different levels of education.

Expectations about retirement age do not appear to be very different if we split the data by cohort. Figure 4.2 displays the average value of expected retirement age from 1991 to 2000 for different cohorts. There is a common tendency, after 1993, to increase the expected number of working years either for young and adult generations. At the end of the observation period expected retirement age is higher for young workers among employee and it is higher for adult workers among self employed.

Fig. 4.2: Expected retirement age by cohort of employees (A) and self employed (B)



Other important effects of the reforms are outlined by the total amount of resources which individuals in the sample were expecting in different years from the Italian pension system. *Table 4.3* shows the average values of *PVC*, *PVB*, and *SSWN* for employees and self employed in selected years. The last row of the table, where the average net social security wealth is reported, shows the general strong reduction in the net liabilities of the Italian social security system, after the reforms of the nineties. In absolute terms, the 1992 reform appears the most effective, whereas the 1995 reform did not seem to reduce significantly, at least on the average, *SSWN*. Both the two component of *SSWN* contribute to its reduction.

Table 4.3: Expected present value of contributions, pension benefits, and net social security wealth for employees and self employed. 1991-2000. Euro constant 1998 prices.

	1991		1993		1995		2000	
	Employee	SE	Employee	SE	Employee	SE	Employee	SE
PVC	75.101	39.289	93.059	57.010	82.958	53.651	95.305	61.052
PVB	157.545	67.335	135.558	131.392	129.269	101.188	128.237	117.663
SSWN	82.443	128.045	42.498	74.381	40.001	47.536	32.931	56.058

The *PVC* increases and the *PVB* decreases, this is true to a larger extent for self employed. The average values of the net pension multiplied by the number of employees and self employed wealth can be used to calculate the total amount of pension liabilities of the Italian social security system. According to this very approximate computation total net pension liabilities from 1991 to

2000 were reduced by 52%. The ratio of net social security wealth of active cohorts to Gdp at 1998 prices moved from 201% in 1991 to 96% in 2000. It is not easy to compare these calculation with other more sophisticated estimations of the Italian pension liabilities. First, we do not consider the pension entitlements of the retirees; second, we do not take explicitly into account either survivor or invalidity pensions; finally, the discount rate used in the computation of the net social security wealth (3%) may not be the same used in other estimations. Given all these differences, however, the magnitude of the effects appears to be comparable with those of other studies (Beltrametti 1995; Rostagno 1997, Van Der Nord 1993, Zollino 2001).

The reduction of *SSWN* is unevenly distributed among individuals in the surveys. Moreover it depends on more measures. The most effective one in the reduction of *PVB* is the general abolition of the indexation mechanism introduced in 1993. Changes in the eligibility and computation rules have different effects on individuals in the sample. As we stressed in subsection 1, the transition to the contribution related pension scheme is very slow, mainly for adult workers. *Table 4.1* shows that the expected replacement rate will almost be untouched for workers with more than 15 years of seniority in 1992. The reforms are expected to have a stronger effects on self employed with respect to employees, because of the introduction, in 1995, of a contribution related pension scheme coupled with the lower contribution rate of this category (15-19% instead of 32.7%). Increase in the contribution rate have also effects on *SSWN* through greater values of *PVC*. A more controversial effect on *SSWN* is the one exerted by the increase in the retirement age because it determines either an increase in the value of future contributions and in the value of future benefits. The relative strength of the two effects determine the sign of the change in *SSWN*. Table *4.4* summarises other distributive features of the changes in the average values of *PVC*, *PVB* and *SSWN*.

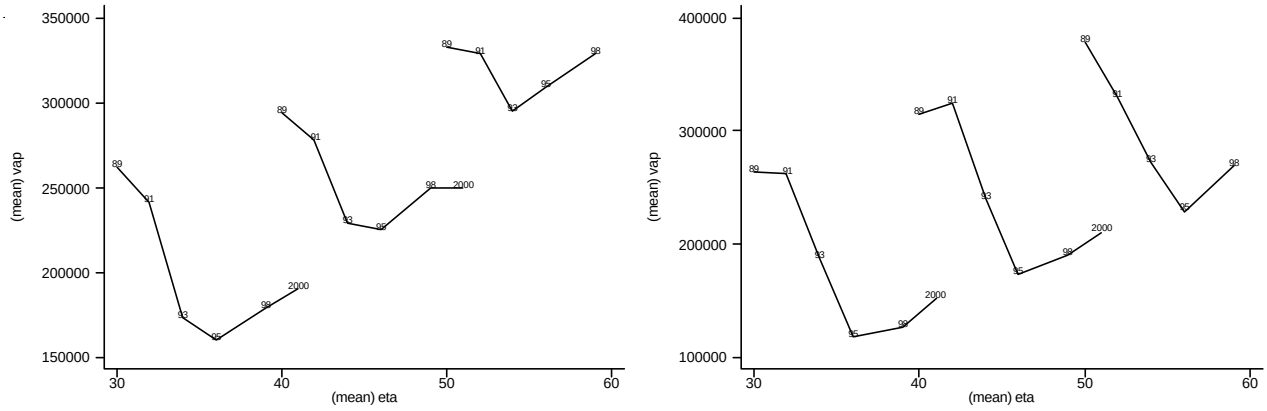
Table 4.4: Changes in the present value of contributions, benefits and net social security wealth, by occupation, education level and sex. 1991-2000

	Employees	Self employed	First degree	Second degree	University	Men	Women
PVC	26,9%	56,8%	22,0%	19,0%	31,1%	30,2%	21,7%
PVB	-18,6%	-29,7%	-23,0%	-21,4%	-9,6%	-19,4%	-23,3%
SSWN	-60,1%	-56,2%	-50,9%	-58,2%	-45,0%	-52,8%	-54,7%

The reduction of the net social security wealth is stronger for employees (60,1%), workers with low degree of education (50,9% and 58,2%) and for women (54,7%). *PVC* raises especially for self employed (56,8%) and for low high skilled workers (31,1%); whereas *PVB* decreases strongly

for self employed (-29,7%), women (-23,3%) and low skilled workers (-23,0%). It is worthwhile to notice that a reduction in the *SSWN* can have different effects on saving if it derives from a reduction of the present value of future benefits or from a raise in the present value of future pension contributions. In the second case one may to take account on the presence of liquidity constraints for individual interested by the reform.

Further evidence of the different effects of the pension reforms by age is given in *Fig.4.3* where we display the value of *PVB* by ten years cohorts and occupation.



The reduction in the future expected value of *PVB* is particularly strong for the younger generations and for self employed. In particular the absolute value of PVB decreases for all the average cohorts values in 1993. The reduction of the present value of future benefits continues in 1995 for self employed. From 1995 on the value of PVB increases for each cohort. However we must take into account that the paths of *SSWN* and its component (*PVC* and *PVB*) are driven both by changes occurred in the pension rules, and by time. As time passes, the date of retirement gets closer for each cohort and this fact alone makes the value of *PVB* larger (at least, until the age of retirement) and the value of *PVC* smaller (less perspective contributions to pay). Therefore it might be misleading to compare the value of *PVB* or *SSWN* for different cohorts in a certain year. In order to disentangle the first effect (changes in *SSWN* caused by the reform) from the second one (time effect) we use the ratio between the annuity value of *SSWN* and the annuity value of the discounted value of the whole working life earnings, both evaluated at the age of retirement. This ratio gives us a “time free” measure of the effects of the reforms on the net social security wealth of individuals with different age. *Table 4.5* reports the percentage change of this ratio between the two years indicated. If we look at the table by column, we have a measure of the effect of pension reforms in a specific year for different cohorts. There seem to be a common tendency: in almost all cases, the changes in the ratio is

more pronounced for younger generations, even though the reduction appears to be relevant, in particular from 1991 to 1993, for all the generations. If we look at the table by row we have a measure of the different effects of the reforms in the decade. In this case, the stronger effect of the 1992 reform becomes quite evident. Afterwards, the effects are more contrasted: from 1993 to 1995 the reduction in the ratio is more pronounced for self employed; from 1995 to 1998 for employees.

Table 4.5 : Percentage change in the ratio between the annuity value of SSWN and the annuity value of all lifetime earnings, both evaluated at the age of retirement. Employees (DEP) and self employed (SE).

Age in 1991	93-91		95-93		2000-98	
	DEP	SE	DEP	SE	DEP	SE
46	-16.44	-15.52	2.30	-10.64	-7.44	12.76
41	-17.91	-18.41	9.75	-12.18	-2.03	11.23
36	-18.20	-13.92	7.13	-13.35	-0.49	1.91
31	-21.39	-18.32	7.01	-13.78	-0.84	-1.83
26	-23.47	-19.89	3.85	-29.90	-2.81	1.41
21	-27.68	-23.48	-0.09	-38.57	-2.18	1.07
16	-31.08	-32.31	0.10	-33.60	-4.93	-4.06

4.3 Pension and private wealth: the behaviour of Italian households

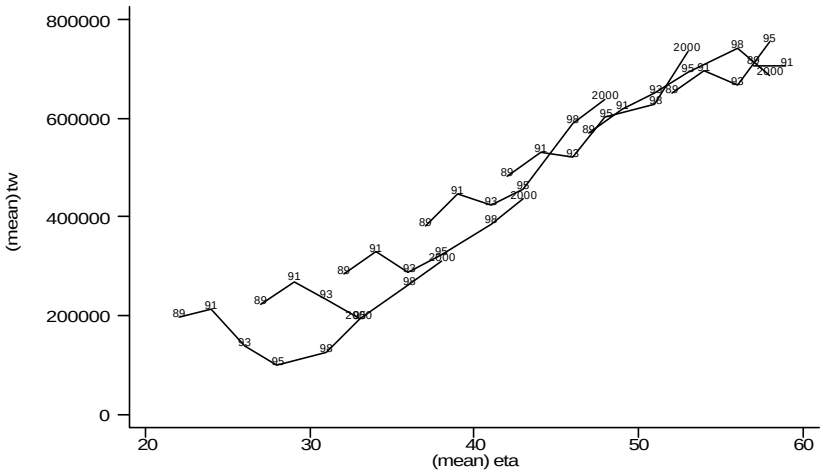
The degree of substitutability between social security wealth and total private net wealth is the objective of the next part of the project. Preliminary, we provide some description of these two variables as they are measured and computed in the four surveys. We aggregate both social security wealth and total net private wealth by household. In particular, we consider only households, where at least one member is working. Social security wealth is now defined as the sum of husband and wives social security wealth. Total private wealth (PW) is the sum of financial and real assets less the sum of financial liabilities for each household.

Table 4.6: Mean and median values for household net social security wealth and private wealth in different years. Euro constant 1998 prices.

	SSW Mean (A)	SSW Median (B)	A/B	PW Mean (A)	PW Median (B)	A/B
1989	150,051	125,770	1.19	104,537	61,084	1.71
1991	140,449	122,896	1.14	121.532	80.875	1,50
1993	84,472	70,070	1.21	154.001	97.354	1,58
1995	78,327	58,198	1.35	149.820	99.938	1,50
1998	74,846	50,309	1.49	156.400	103.808	1,51
2000	70,255	40,655	1.72	161.808	101.639	1,59

Table 4.6 reports some statistics for the two variables in the four observed years. The mean value of net social security wealth by family decrease from an average value of 150 thousand Euro in 1989 to a value of 70 thousand Euro in 2000 with a reduction of 53%. During the same period, total private wealth increases from 104 thousand Euro in 1989 to 161 thousand Euro in 2000 with an increase of 54%. By comparing mean and median values for *SSWN* and *PW*, we notice that net social security wealth is more equally distributed than private wealth, a result common to other developed countries. The ratio of the mean to the median value for private wealth decreases from 1,7 to 1,59 from 1991 to 2000, whereas the same ratio increases from 1.14 to 1.72, in the same period, for net social security wealth. From this point of view, the mitigating effect of the social security system on the uneven distribution of private wealth has been reduced by the reforms of the pension system.

Figure 4.4: Total household wealth (SSWN+PW), by cohort and year. Average values. 1998 constant Euro



In figure 4.4 we report the average household total wealth for active cohorts in the observed period. The effects of the reduction of social security wealth is more evident for the two younger cohorts. Older working cohorts seem to show a tendency to recover the values of total wealth in the years after the first reform. As long as the generation gets closer to retirement age the value of total wealth increases because of the time effect (future pension benefits are less discounted)[23].

Table 4.7: Mean values for household SSWN and PW by different level of education, 1991 and 1998. Euro constant 1998 prices.

	1991	2000	%	1991	2000	%
Primary school	128.867	70.278	-45,5%	97.053	114.129	17,6%
Secondary school	152.153	66.472	-56,3%	137.533	176.388	28,3%
University	168.974	77.510	-54,1%	210.367	283.113	34,6%

In the remaining tables we compare the situation just before the first reform with that in 2000. In *Table 4.7* and in *Table 4.8* we can see that the reduction of the net social security wealth of

Italian families is more pronounced for those, whose "breadwinner" has either a secondary or university level of education and in the less reach part of the countries. In particular if we split the sample by geographical area, we have a confirmation of the effects of the reforms in term of the distribution of total wealth. Families living in the South of Italy, the less rich area of the country, have reduced their net social security wealth by 47,5% and increased their total private wealth by only 20,6%.

Table 4.8: Mean values for household SSWN and PW by geographical area. Euro constant 1998 prices.

	SSWN			PW		
	1991	2000	%	1991	2000	%
North	153.635	80.667	-47,5%	119.850	189.477	58,1%
Centre	142.913	63.994	-55,2%	143.649	134.525	-6,4%
South	119.885	54.533	-54,5%	109.903	132.550	20,6%

Finally, it is interesting to compare the distribution of net social security wealth and total private wealth by age, and by occupation. In *Table 4.9* we describe the evolution of the share of social security net wealth and private wealth. In 1991 the share of SSWN over total wealth was 59.7%. It decreases to a ratio of 38,6% in 2000.

Table 4.9: Composition of total household wealth (TW) in different years. SSWN: social security net wealth; PW private net wealth.

Year	SSWN/TW	PW/TW
1991	59,7%	40,3%
1993	24,7%	75,2%
1995	43,2%	56,7%
1998	42,0%	58,0%
2000	38,6%	61,4%

[23] We do not compute the path of wealth for retired generation. Therefore the figure cannot be used to infer anything about the lifecycle behaviour in consumption and saving of the Italian households.

Finally *Table 4.10* reports the composition of the sum of total wealth in different years for employees and self employed

Table 4.10: Percentage of the total household wealth in different years and by employees and self employed

	1991		1993		1995		2000	
	SSWN	*PW*	*SSWN*	*PW*	*SSWN*	*PW*	*SSWN*	*PW*
Employees	55.0	45.0	40.1	59.9	41.2	58.8	41.5	58.5
Self employed	44.8	55.2	33.2	66.8	24.5	75.5	25.4	74.6

The composition of total wealth between the private and the public component seems balanced at the beginning of the period observed. As long as reforms in the pension system take place, during the decade, the ratio between private and total wealth increases, particularly for self employed.

Results presented in this subsection give a first picture of the problem of the substitutability between private and social security wealth. The motivation for saving and wealth accumulation are far from been captured only by retirement reason. Precautionary saving, bequest motives intergenerational transfer are some other important factors. The existence of a causal relation between the path of the social security net wealth and the private wealth we are going, in the next subsection, to present some econometric evidence which should give us a more precise measure of the degree of substitutability between these two variables.

4.4 The Attanasio-Gale correction

The analysis developed in the former section has shown that the effects of the reform of the Italian pension system have been different for different groups. In particular future pension benefits of younger generations will be lower either because of the general cut in the indexation mechanism, introduced in 1993, and because of the more restrictive rule of computation of the pension benefit introduced in 1993 and 1995, which hit differently individuals according to their year of seniority in the year of the reform. More controversial is the effect of the increase in the legal retirement age.

In this subsection we use the computed social security wealth for families observed in the four surveys to analyse the degree of substitutability between private and social security wealth. A preliminary problem to solve is the following: the reaction of consumption and saving to a change in the future entitlement of social security wealth depends on the age of the individual at the time of the observation. This point was first raised in the pension-saving literature by Gale (1998) who suggests a method to correct the value of net social security wealth in the regression which estimate the substitutability between private and social security wealth. Consider for example two individuals who differ only with respect to their age. Within the life-cycle model, the same reduction in the social security wealth occurred at time (t) will generate a different reaction in saving and wealth accumulation: the younger individual will have more time to absorb the reduction in social security wealth with respect to the older. Therefore changes in consumption and saving at time (t) will be higher the older is the individual. In order to take account of these problem we use a parameter which correct the social security wealth in the regression against private wealth. The parameter takes account both of the age effect and of the number of years elapsed from the current time of the observation and the time when the reform had taken place. In the construction of the correction parameter we follow the method suggested by Gale (1998) and recently revisited by Attanasio-Rohwedder (2001).

The theoretical framework which supports the construction of such a parameter, as already mentioned, is the lifecycle model. Consider a situation without uncertainty where an individual works for L years and receives pension benefits for P years. The life span of the individual is certain and equal to $T=L+P$. In the first L years of his/her life, the individual works and accumulates saving, which is the sum of public pension contributions and private voluntary saving. The individual maximizes a logarithmic utility function:

$$U = \sum_{t=1}^{T} g^{t-1} \log C_t \qquad (6)$$

under the intertemporal budget constraint:

$$\sum_{t=1}^{T} C_t \, R^{t-1} \leq \sum_{t=1}^{L} (1-a) W_t R^{t-1} + \sum_{t=L+1}^{T} B_t \, R^{t-1} \qquad (7)$$

where:

g is the factor which discounts future utility;

R is the factor of financial discount;

C_t is consumption at time (t), $t = 1,2,\ldots T$;

B_t is the pension benefit, $t = L+1, L+2,\ldots,T$;

W_t is gross earning at time (t);

$WN_t = (1-a)\ W_t$ is the net of contributions earning at time (t);

$T = L + P$ is the lifetime horizon for consumption and saving planning;

a is the constant rate of contribution to the paygo system.

In this very simple version of the model, the degree of substitutability between private and social security wealth should be equal to one, but the reaction of consumption and saving to the same change in future pension benefits is different when we consider different ages[24].

From the solution of the optimization problem we derive, for a given path of current disposable income WN_t, the optimal level of saving and private wealth accumulation PW_t at each time $t = 1,\ldots, T$. In order to have a solution for the wealth accumulation equation that we are going to estimate in the next part of this section, we first derive the value of PW_t in the absence of any reform in the pension system. In this case, we find a coefficient, which relates, at each age, *SSWN* (net social security wealth) and *PW* (private wealth). Next, we consider a situation where at time (k) a reform of the public pension system takes place. In this case, the individual re-programs his optimal path of saving and wealth accumulation from (k) onwards. The parameter which relates *PW* to *SSWN* at each age will now depend on the age of the individual and on the difference between the year of observation and the year when the reform had taken place.

In order to keep the exposition simpler, we consider the case where the rate of interest is equal to the subjective rate of discount. Under this case, the level of consumption is constant during lifetime. In term of the variables of equations (6) and (7), the value for C_1 is given by:

$$C_i = \frac{1-R}{1-R^T}\ (RV + NPW)\quad i = 1,2,.....T \qquad (8)$$

where *RV* is lifetime income, and *SSWN* is net social security wealth. These variables are defined respectively as: $RV = \sum_{t=1}^{L} (1-a)\ W_t\ R^{t-1}$ and $SSWN = -\sum_{t=1}^{L} a\, W_t\ R^{t-1} + \sum_{t=L+1}^{T} B_t\ R^{t-1}$. Given that $C_t = C_{t+i},\ \ i = 1, 2,.., T-1$, we can derive the equation for the accumulation of wealth at time (j), when no reform takes place from time *1* to time (j):

[24] More realistic models could also take into account uncertainty, liquidity constraints, precautionary saving, etc. Our goal here is only to show how the reaction of saving to a change in *NPW* varies with age.

$$PW_j = \sum_{t=1}^{j} (1-\alpha)\frac{W_t}{R^{t-1}} + R\,\frac{1-R^{-j}}{1-R^{T}}\,(RV+SSWN) \quad (9)$$

The equation relates the private wealth at time (*j*) to the present value of earnings received from *t=1* to *t = j* and to the total lifecycle wealth (the sum of lifetime income and net social security wealth), which an individual expects at the beginning of his/her working life. The derivative of *PW* with respect to *SSWN* is negative and depends on the age of the individual.

Let's consider now a situation where at time (*k*), *k < j*, a reform in the pension system takes place. How will the individual modify his/her optimal path of consumption, saving and wealth accumulation, if he/she has the possibility to re-program them at time (*k*)? Intuitively, we can imagine that the individual at time (*k*), when the reform is announced, starts a new program of consumption, where the lifetime resources are the inherited wealth at time (k), , the present value at time (*k*) of the sum of future earnings and the present value of the new net social security wealth (SSWN*). We can re-write the maximizaton problem at time (*k*) as:

$$\max \sum_{t=k}^{T} \gamma^{t-k} \log C_t \qquad (10)$$

$$st \quad \sum_{t=k}^{T} C_t R^{t-k} \le \frac{PW_{k-1}}{R} + \sum_{t=k}^{L} (1-\alpha) W_t R^{t-k} + \sum_{t=L+1}^{T} B_t R^{t-k} \qquad (11)$$

Now, the optimal value of consumption C_k depends on the total wealth at time (*k*), and on the number of years along which the individual must divide these resources. We are interested in the level of private wealth accumulation which derives from the optimal path of consumption and saving at time *j > k.* If we substitute the new re-programmed value for consumption from (*k*) to (*j*) in the equation of the private wealth accumulation we get:

$$PW_j = \frac{PW_{k-1}}{R^{j-k-1}} + \sum_{t=k}^{j} \frac{(1-\alpha)W_t}{R^{j-t}} + R\,\frac{1-R^{k-j}}{1-R^{T-k}}\left[\frac{PW_{k-1}}{R} + RV + SSWN^*\right] \qquad (12)$$

where *SSWN** is the value of the net social security wealth after the reform.

The first two terms in the right hand side of the equation represent the amount of resources, which the individual would have accumulated until time (*j*), had the consumption been equal to zero. The last term of the right hand side measures the present value of consumption realised until *j*. We use the term $R\frac{1-R^{k-j}}{1-R^{T-k}}$ as the adjustment factor in the regression of private wealth against net

social security wealth; (*k*) is the age of the individual at the time of the reform, and (*j*) is the age of the individual at the year of the observation (*j*)[25].

[25] Equation (10) could be further expressed as $PW_j = f(PW_{k-1}k(RV + SSWN)) + g\left(\sum_{t=k}^{j} \frac{W_t}{R^{j-t}}\right) + h(RV + SSWN^*)$. In this case, the computation of *PW* and *SSWN* at time (*k-1*) would be informative. However, the computation of these two variables without panel data would be just a transformation of *PW* and *SSWN*.

4.5 The estimation of the private to social security wealth substitution

On the basis of the variable that we have just described we are going to estimate the relationship between net social security wealth and private wealth, on the surveys data covering the period 1991-1998. The basic regression has the following structure:

$$PW/Y^P = \alpha X + \beta SSWN/Y^P + u$$

W/Y^P, the dependent variable, is the ratio of household real and financial wealth net of debts to the permanent income of the household, Y^P. X is a vector of demographic control variables, and SSW is net social security wealth of the household. The construction household permanent income has been described above.

To isolate the effect of social security wealth on the other components of household wealth, the independent variables in vector X should be associated with the evolution of wealth over the life-cycle: we have included a third-order polynomial in the age of the head of the household, two dummies for his/her education level (compulsory school, degree or more), two dummies for the area of residence (Central or Southern Italy), family size, the number of income recipients, and year dummies.

SSWN is the net social security wealth of the household, obtained by summing the levels of social security wealth of the head and of the spouse, if present. Social security wealth is, as already explained, net of the present value of future social security contributions. The value of social security wealth has been adjusted taking into account the Attanasio-Gale suggestions, which we referred to, in the previous paragraph.

The sample includes those households whose head is aged between 21 and 60, and receives a positive amount of labour income. Moreover, we consider only households with no more than two earners. Families with outliers in the amounts of income or wealth are also excluded[28]. Two different estimation methods are used: ordinary least squares (with robust standard errors) and quantile regression, allowing to estimate the degree of offset between the two forms of wealth at different levels of the wealth-income distribution[29].

---

[27] Permanent income is defined as the average present discounted value of the stream of future earnings. They are estimated by regressing net earnings on a polynomial on age and assuming that incomes grow at a constant productivity rate. For simplicity we also assume that productivity rate and the discount rate are equal.

[28] Households with a wealth / permanent income ratio greater than 30 are excluded, as well as households where the head or the spouse earns more than 200 million lire per year.

[29] If not otherwise specified, quantile regressions refer to the median of the distribution of the dependent variable.

Table 4.11 provides a broad view of the substitution coefficients (the bs in the previous expression) for various sub-groups of the population; the first row refers to the whole sample, then the coefficients are shown for households classified according to the occupational condition of the head.

Tab. 4.11: Substitution coefficient between net social security wealth and private wealth

	With Gale correction		Without Gale correction	
	Ols	Quantile Regression (50%)	Ols	Quantile regression (50%)
a. **All households** (b+e)	**-0.6045**	**-0.4691**	**-0.3183**	**-0.2568**
	(0.061)	**(0.054)**	**(0.039)**	**(0.033)**
b.*Employees* (c+d)	*-0.5368*	*-0.4384*	*-0.3123*	*-0.2627*
	(0.054)	*(0.054)*	*(0.035)*	*(0.031)*
c. Private sector employees	-0.4985	-0.4191	-0.2913	-0.2367
	(0.078)	(0.062)	(0.043)	(0.035)
d. Public sector employees	-0.6018	-0.4847	-0.3512	-0.3146
	(0.090)	(0.062)	(0.057)	(0.047)
e. *Self-employed*	*-0.9215*	*-0.8752*	*-0.6656*	*-0.6607*
	(0.192)	*(0.144)*	*(0.115)*	*(0.081)*

Note: standard errors in parentheses

All coefficients are negative and significant; we therefore find support for the hypothesis of a negative relationship between pension and private wealth, although the degree of substitution is lower than 100%. For the whole sample, the coefficient is greater than the values found in previous studies on Italian data (Brugiavini 1987, Jappelli 1995). The use of quantile regression, which should reduce the impact of outliers, tends to lower the absolute value of the estimated coefficients, while the application of the correction proposed by Gale (1998) and Attanasio-Rohwedder (2001) has, as expected, the effect of raising the identified degree of offset.

Results for the complete regressions (with SSW/Y^P always multiplied by the Attanasio-Gale correction) on the whole sample are illustrated in the following *Table 4.12*, which shows first the coefficients estimated by Ols, and then by quantile regressions, calculated at the 25th percentile, the median, and the 75th percentile of the distribution of the ratio W/Y^P.

As for the Ols equations, the overall degree of substitution is estimated at –0.56, very significantly different from zero. Quantile regressions show that richer households are more responsive to changes in social security wealth: the offset goes from –0.25 for households at the 25th percentile, to –0.47 for those at the median, to –0.64 for households in the 75th percentile of the wealth-income distribution.

Tab. 4.12 Relationship between social security wealth and private wealth – all households

	OLS		Quantile regr. (0.25)		Quantile regr. (0.5)		Quantile regr. (0.75)	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	Coeff.	s.e.
SSW/Y^P	-0.6045	0.0615	-0.3566	0.0270	-0.4691	0.0536	-0.7561	0.0615
Age	0.2358	0.0170	0.1483	0.0064	0.1945	0.0142	0.2860	0.0165
Age^2	0.0038	0.0014	0.0016	0.0006	0.0005	0.0013	0.0044	0.0015
Age^3	0.00002	0.00004	-0.00004	0.00002	-0.00003	0.00005	0.00001	0.00005
≤8 yrs educ.	-0.4658	0.0751	-0.4202	0.0392	-0.6311	0.0815	-0.5549	0.0938
Degree	0.0590	0.1023	0.2377	0.0573	0.1708	0.1158	0.2180	0.1372
Centre	0.0588	0.0893	-0.0307	0.0470	0.1568	0.0952	0.2234	0.1090
South	-0.0174	0.0864	-0.0351	0.0413	-0.0433	0.0885	-0.1053	0.1036
n. members	0.0827	0.0325	0.0742	0.0167	0.0874	0.0335	0.1138	0.0380
n. earners	-0.3910	0.0735	0.2921	0.0375	-0.0560	0.0770	-0.7358	0.0895
1991	0.2310	0.1185	0.2147	0.0569	0.5472	0.1185	0.2003	0.1348
1993	0.1826	0.1206	0.1655	0.0602	0.6597	0.1255	0.2272	0.1465
1995	-0.2834	0.1208	-0.0164	0.0593	0.2260	0.1235	-0.4664	0.1441
1998	-0.6385	0.1274	-0.1074	0.0623	-0.1173	0.1300	-0.9641	0.1541
2000	-0.9973	0.1259	-0.2615	0.0639	-0.4920	0.1327	-1.3950	0.1534
Cons	6.4595	0.2811	1.9188	0.1223	4.8224	0.2493	9.0049	0.2861
R^2	0.0930		0.047		0.065		0.07	

Note: Age is defined as *age of the head - 50*

Besides this basic specification, we have carried out the same regression on sub-samples defined according to certain characteristics of interest of the households. *Table 4.13* shows, for example, that the Ols estimation on the sub-sample of households with a head aged between 51 and 60 provides a coefficient of the degree of substitution between *SSW* and private wealth of –0.6259, which becomes –0.5159 with median regression. Almost all coefficients are negative, as expected, and above –1. This first set of results shows that the offset is negative only for households headed by persons aged 40 years or more, while younger households actually display a positive coefficient.

Table 4.13: Substitution coefficient between net social security wealth and non-social security wealth for different groups of the whole households sample

	OLS		Quantile regression	
	coeff.	s.e.	coeff.	s.e.
Whole sample	**-0.6045**	**0.061**	**-0.4691**	**0.054**
Age of the head				
21-40	1.1696	0.134	1.2136	0.122
41-50	-0.2184	0.077	-0.2526	0.078
51-60	-0.5888	0.077	-0.5039	0.067
Education of the head				
First level education	-0.5699	0.085	-0.4130	0.064
High school	-0.7210	0.100	-0.6100	0.072
Degree	-0.596	0.164	-0.6058	0.120
Computation rule of the pension of the head				
Earnings-related	-0.8510	0.069	-0.7674	0.045
Contribution-related	0.5576	0.166	0.8399	0.152
Year				
1989	-0.7960	0.162	-0.8741	0.095
1991	-1.0002	0.151	-0.868	0.113
1993	-0.5784	0.145	-0.4629	0.119
1995	-0.5479	0.149	-0.3423	0.129
1998	-0.4382	0.132	-0.4440	0.096
2000	-0.2864	0.157	-0.0743	0.130

Note: these coefficients have been estimated from separate regressions, each containing the same set of control variables shown in previous table. The only exception is that in the regressions for different age groups the age polynomial has not been included.

This result is consistent with those obtained in the previous sections of this research, in particular with the findings of negative cohort effects in the saving rate for younger generations, and of a limited reaction of the saving rate of the young after the pension reforms. Households headed by workers aged more than 40 years are therefore more reactive to changes in social security wealth. The offset, however, is below 100%. Younger households could suffer from the presence of liquidity constraints, which make it difficult to change the accumulation pattern of financial or real wealth.

Regressions separately carried out on samples with different level of education do not produce significant behavioural differences; only in the quantile regression the coefficient of the more educated is greater than that of households with only compulsory education.

The third set of regressions in *Table 4.14* checks whether there is a significant difference in the reaction of households differently hit by the pension reforms; in particular, the sample has been split between those households whose head has retained the old computation method of the pension (earnings-related defined benefit) and the households whose head had to shift to the new

contributory regime (notional defined contribution). The first group is composed by heads with a contributory record of at least 16 years in 1993 (18 in 1995, 21 in 1998). Only for this first group, i.e. the older part of the labour force, the offset coefficient is negative and significant, in accordance with results differentiated by age of the head. Finally, estimations on the separate cross-sections of the four years show a tendency towards the reduction of the coefficient in more recent years.

The result that older households turn out to be more reactive than younger ones is contrary to what one could *a priori* expect, because of the greater reduction in social security wealth for younger generations, but is consistent with the evidence obtained from the difference-in-differences estimations shown before.

Results from the sub-sample of the employees are shown in the following *Table 4.14* and *4.15*. The overall substitution coefficient is negative and significant, and increasing in absolute value in the three quantile regressions as before. In general, all previous patterns of the coefficients are confirmed, which should not be surprising, given that employees represent 80% of the dimension of total sample. Interestingly, the offset coefficient declines in absolute terms moving from 1991 to 1998.

Tab. 4.14 Relationship between social security wealth and private wealth –households of employees

	OLS		Quantile regr. (0.25)		Quantile regr. (0.5)		Quantile regr. (0.75)	
	coeff.	s.e.	Coeff.	s.e.	coeff.	s.e.	Coeff.	s.e.
SSW/YP	-0.5369	0.0591	-0.2406	0.0325	-0.4384	0.0535	-0.7324	0.0673
Age	0.1832	0.0168	0.0843	0.0084	0.1464	0.0144	0.2399	0.0185
Age^2	-0.0003	0.0012	-0.0011	0.0007	-0.0042	0.0013	0.0008	0.0016
Age^3	-0.00008	0.00004	-0.00008	0.00003	-0.00017	0.00005	-0.00007	0.00006
≤8 yrs educ.	-0.6986	0.0680	-0.4445	0.0460	-0.7464	0.0775	-0.8024	0.0987
Degree	0.0909	0.0987	0.3027	0.0658	0.0089	0.1087	0.1976	0.1402
Centre	0.1603	0.0821	-0.0142	0.0555	0.2042	0.0908	0.4848	0.1143
South	-0.0752	0.0790	-0.0584	0.0494	-0.0369	0.0847	0.1175	0.1096
n. members	0.0845	0.0306	0.0719	0.0200	0.1039	0.0326	0.1099	0.0400
n. earners	-0.0321	0.0680	0.3683	0.0441	0.2866	0.0733	-0.3485	0.0940
1991	0.4994	0.1049	0.2669	0.0686	0.5436	0.1155	0.4890	0.1446
1993	0.5191	0.1099	0.2607	0.0720	0.6994	0.1212	0.5654	0.1529
1995	0.0625	0.1085	0.0273	0.0707	0.3104	0.1185	-0.0561	0.1518
1998	-0.2039	0.1207	0.0131	0.0728	0.0622	0.1241	-0.4992	0.1621
2000	-0.6317	0.1125	-0.1011	0.0766	-0.4024	0.1280	-0.8980	0.1628
Cons.	5.1120	0.2665	1.1848	0.1449	3.8350	0.2431	7.4768	0.3114
R^2	0.108		0.049		0.078		0.076	

Note: Age is defined as *age of the head - 50*

Tab. 4.15 Substitution coefficient between net social security wealth and private wealth for different groups of the sample of employees

	OLS		Quantile regression	
	coeff.	s.e.	coeff.	s.e.
All Depend. Work.	**-0.5368**	**0.059**	**-0.4384**	**0.054**
Age of the head				
31-40	0.8717	0.135	1.1082	0.119
41-50	-0.1891	0.078	-0.2380	0.064
51-60	-0.4911	0.071	-0.4710	0.067
Education of the head				
≤8 years	-0.414	0.082	-0.3522	0.073
High school	-0.792	0.096	-0.6380	0.066
Degree	-0.555	0.164	-0.0526	0.160
Head subject or not to pension reforms				
Not Subject	-0.763	0.065	-0.7264	0.054
Subject	0.375	0.165	0.7050	0.170
Year				
1989	-1.186	0.154	-1.1398	0.099
1991	-0.8509	0.138	-0.8839	0.068
1993	-0.5140	0.157	-0.3416	0.117
1995	-0.3720	0.149	-0.2167	0.119
1998	-0.1648	0.141	-0.2332	0.109
2000	-0.1532	0.110	-0.0334	0.171

Note: these coefficients have been estimated from separate regressions, each containing the same set of control variables shown above. The only exception is that in the regressions for different age groups the age polynomial has not been included.

5. SUMMARY AND CONCLUSIONS

In the nineties, Italy experienced a U-turn in economic policy management, and in the structural conditions of the markets:

- liberalisation of the capital markets;
- strong reduction in the government budget deficit;
- three steps reform of the public pay-go pension system;
- privatisation of almost all state-owned firms;
- liberalisation of some of the markets for public utilities;
- more flexibility in the labour market legislation.

The main features of the pension system reform were:

- retirees do not any longer share technical progress with current working generations, i.e. benefits are not any longer indexed to real wage growth;
- benefits are going to be computed according to a notional defined contribution system, which is fairer from an actuarial point of view;
- when the new system works fully at regime all the workers (private and public employees, and self-employed) get the same return on the contributions paid;
- with the new regime, the legal age for retirement is flexible, and the replacement rate is going to diminish to a larger extent for workers retiring earlier;
- early retirement without actuarial adjustment is going to abolished, during the current and next decade.

The transition to the new pension regime will be quite long, hence working population is hit to different degrees by the reform, according both to the seniority of each worker, and to the sector he/she belongs to.

As far as *aggregate* propensity to save is concerned, Italian households do not seem to have reacted significantly to the U-turn. At first sight, propensity to save out of household disposable income has continued declining along the general trend of the eighties. Different definitions of income (either net of interest revenue, or gross of capital gain) allow either a stabilisation, or even an increase in the propensity to save to emerge, during the second half of the nineties.

On a macroeconomic ground, three main forces might have been at work influencing the behaviour of the propensity to save to a different extent, and in different directions, in the recent years:

- the structural impact of the budget consolidation, and the consequent reduction of the real return on the government bonds denominated in domestic currency;
- the impact of the reduction of the social security wealth, as a consequence of the reform of the pay-go system;
- the long wave change in the intertemporal preferences of the population, as new cohorts enter their working age period with higher impatience *vis à vis* the future.

This research project was intended to investigate whether, below the macroeconomic surface, the microeconomic behaviour of Italian households reveals possible reactions of the individual propensity to save, and of the accumulation of private wealth to the pension system reforms.

The Bank of Italy Surveys, we worked on, have revealed interesting features of the Italian household behaviour. Let us start with the *age profile of the propensity to save*:

- it has a peak around the age of 60 years, in the neighbourhood of 25 per cent, and declines only mildly at older ages (not more than 2/2.5 percentage points);
- as new cohorts age, they reduce their propensity to save with respect to the older cohorts by about 1.5 percentage points on average, when they reach the age bracket of 40-60 years;
- no systematic drift in the profile comes out of the estimate, independently of the cohort effect.

As far as the *age profile of wealth to income ratio* is concerned,

- financial wealth reaches a peak around the age of 65, but does not decline to a relevant extent as the household head gets older;
- the age profile of financial wealth have definitely drifted upward, as a result of general macroeconomic effects; it did it to such an extent that if we try to identify a separate cohort effect, the cohort effect assumes an incredibly high value;
- the ratio of housing wealth to income peaks at a younger age (around 55 years), and declines much more than financial wealth does at older ages;
- positive time and cohort effects are influencing the age profile of housing wealth.

Even stronger positive cohort and time effects emerge for holding risky assets.

These results give some clues about the role of *inter vivos* transfers: younger cohorts seem able to have both a lower propensity to save, and a higher wealth to income ratio, as they started with higher real and financial resources endowment than the older cohorts. The implications of these results for the future aggregate propensity to save seem to suggest that the behavioural components of the new cohorts might be more important than the change in the demographic composition of the population.

Table 5.1 shows that the pure change in the age composition of the Italian population implies a stability of the aggregate saving rate up to year 2025, due to the average increase of the age of the working population; during the following fifteen years, the increasing share of the dependent elderly dominates the positive effect on saving of the maturing working age population, and reduces the aggregate propensity to saving by two percentage points.

The same table show further that, if we consider the estimated negative cohort effect on saving, the ageing of the already born cohorts implies a reduction of the aggregate propensity to save by six percentage points in between 2010 and 2045.

Tab. 5.1 Aggregate saving rate as a result of the expected change in the age composition of Italian population (*).

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
a)Without cohort effects											
Saving rate	0.28	0.27	0.28	0.28	0.28	0.28	0.27	0.27	0.26	0.26	0.26
b) With cohort effects											
Saving rate	0.26	0.26	0.25	0.24	0.24	0.23	0.22	0.22	0.21	0.20	0.20

(*) Figures for the year 2000 differ because they are a forecast out of the 1989-1998 sample.

According to a simple Solow growth model accounting, given the current features of the Italian economy[30], and the expected change both of the size of the population, and of the share of working population, the steady state equilibrium propensity to save would be allowed to reduce by about 2.5 percentage points, in the next forty years. Which means that it is the behavioural component of the demographic effect, rather than the size of the pure composition effect, that might create possible troubles in the future decades.

[30] The capital-output ratio, the capital-consumption ratio, and the depreciation rate

This partial conclusion suggested us to deepen our analysis of the behaviour of Italian households saving, as a reaction to the public pension system reform, and to the new offer of occupational pension funds.

The latter topic is dealt with in the companion paper by P. Bosi and M.C. Guerra (*The Role of Tax Incentives in Voluntary Pension Schemes in Italy: what can other countries learn from this?*), the third and fourth parts of this paper has dealt with the former topic, the reaction to the pension reform.

As already mentioned, the long transition to the new pension system implies that different groups of workers are going to be hit to a different degree by the reforms. When we compare the behaviour of the groups of households that we assume to have been subject to the reform with the control group that we assume not touched by the reform, the *difference-in-differences* analysis suggests:

- when the first toughest step of reform was enacted, in 1992, the groups hit by the change seem to have reacted with an increase of about seven percentage points in the relative saving rate[31];
- after six years since the reform, in 1998, no relevant differential change in propensity to save for the groups presumably hit by the reform can be detected; which seem to suggest that it is difficult to identify a specific pension reform effect within the more general effect of the government budget crisis, at that time (1992-1993);
- however, within the groups hit by the reform, the household, whose head is the more educated, shows the highest and persistent relative increase of the propensity to save (of course, the education level is not independently distributed with respect to income level).

These did not seem to be exhaustive answers; thus we embarked in computing individual social security wealth, and in the estimation of substitution coefficients of private to social security wealth.

The computation of the present value of individual social security wealth net of the present value of future contributions shows that

[31] The figure mentioned refers to the difference in the behaviour of the propensity to save between “treatment” and “control” groups; which means that propensity to save of the treatment groups might have declined seven percentage points less than that of the control group.

- on the whole, the aggregate liabilities of the social security system *vis à vis* the working labour force halved between 1991, when was as high as twice the Gdp, and 1998;
- on an individual basis, the employees experienced the strongest reduction, as a consequence of the 1992 reform;
- the three steps of the reform reduced the present value of the benefit for the employee by about 14 per cent, and increased the value of contribution by 19 per cent;
- the self employed experienced the toughest reduction with the second step of reform (the transition to a notional defined contribution);
- during the period 1991-1998, the self employed value of the benefits was reduced by 37 per cent, and the value of contributions was increased by 45 per cent;
- the changes in the net social security wealth has reduced its re-distributive impact on total wealth (the ratio of the mean to the median net social security wealth increased 1.15 to 1.31 during the period 1991-1998, in the same period the same ratio for private wealth did not significantly changed) ;
- a worker, who was sixteen years old in 1991, saw, in the following seven years, the ratio of his/her annual benefit expected at the retirement to his/her average annual income during the working life reducing by about a third, if an employee, and by a little more than forty per cent, if a self-employed;
- if he/she was 46 years old, the reduction was by 20 and 15 per cent, respectively;
- finally, while in 1991 the individual net social security wealth, on the average, was of the same order of magnitude of the total private wealth (real plus financial wealth), in 1998 it was only slightly higher than the half of the private wealth;
- in other words, households have seen the composition of their portfolio of lifetime assets significantly moving from government liabilities to private sector liabilities;
- the more so, the younger is the household.

The previous remarks do not allow to understand how much of the change in the composition of the overall wealth of the household was the result of an individual voluntary change, and how much of the compulsory modification of the pension system. The econometric analysis of the relationship between private and pension wealth shows that

- a reduction of one euro in the net present value of the pension wealth seem to induce, on the average, a compensating increase in private wealth by about fifty cents;

- the richer the worker, the higher the substitution coefficient;
- the older the worker, the higher the substitution coefficient, even when corrected for the Attanasio-Gale effect;
- the previous piece of evidence seems to be the result of a complex interaction of factors: the older worker is on the average richer; the older worker has probably a higher propensity for precautionary saving;
- the stronger the impact of the reform, the higher the substitution: the self-employed, and, among employees, the civil servants react more through private wealth;
- the more educated the worker, the higher the substitution rate;
- the previous relationship is mainly relevant moving from first level education to the other two, which might suggest that it is not only the mirror image of the relationship of the substitution rate to the level of private wealth; in other words, there seems to be a pre-determined level of education which is needed to be fully aware of the impact of the reforms, and of the alternatives available.

As a whole, the young do not seem to have reacted to the strong reduction of their net social security wealth; they start their working life better endowed than their predecessors, and seem to accumulate private wealth to a definitely larger extent than their predecessors did in the past. On the other side, the more mature workers reacted to the pension reform, even if their net pension wealth did not change so much.

The behaviour of the young, revealed by the non existence of any offset effect of private to pension wealth, confirms the relevant negative cohort effect on saving extracted from the data. On the other hand the very cautious behaviour of the more mature generations might increase their propensity to save with ageing more than we expect from the estimated age profile. This looks like a precautionary behaviour induced by the fact that the reforms as such spread uncertainty also among groups less involved by the reforms.

Having said that, we should go back to question we raised: the behavioural component of the propensity to save, as cohorts age, might implies a decrease of the aggregate propensity to save in the next forty years by about three-four percentage points in excess of the reduction of the equilibrium saving rate.

As such the absence of any reaction of the young to the pension reform confirm the plausibility of the estimated cohort effects. On the other hand, there might be a further positive effect of a stronger than expected precautionary saving by the more mature working generations.

This seems to suggest that if pension reforms are aimed also at increasing propensity to save they have not to be too far targeted into the future: middle age workers must be involved.

Might tax incentives for funded private pension systems be of any help in supporting to increase voluntary saving? The Italian experience does not give a clear answer: almost ten years of efforts to support the start of a second private (either occupational, or individual) pillar were not so successful. The still high replacement rate of the pay-go, and the availability of a compulsory system of precautionary saving (severance payment fund, Tfr) refrained Italian workers from moving significant amount of funds from Tfr to pension funds, even if the Italian tax system for the return to capital invested in pension funds seem quite favourable, and the return earned on the severance fund is quite low. This is a lesson about the importance the worker attribute to the precautionary motive for saving. A motivation, which has a positive macroeconomic effect on the efficiency of the capital markets, rather than on the overall size of saving.

APPENDIX I

Habit formation and saving

The age-cohorts profiles of saving and financial wealth show that those generations who gained more from the pension policies in the 1970s and in the 1980s have brought down their saving rate less than the others. How can we reconcile these facts with the prediction of the theory? A possible explanation of the behaviour of these cohorts could be the presence of habit formation. Given this kind of preferences, individuals take time to incorporate permanent changes in future income on their current consumption. If habit formation is a good approximation of preferences of middle age and retired Italian households and if changes in the social security system during the 1970s and 1980s were unanticipated, the decrease of saving for these cohorts could have been slow. For the same cohorts the sum of real and financial wealth and social security wealth would be today more than necessary to finance present and future consumption. How financial and real wealth will be used in the future (consumption, intergeneration transfers, gift, and bequests) becomes of crucial importance in explaining the future dynamics of private saving.

The slow reaction of saving to pension policies can be summarised in a model were consumer exhibits habit formation preferences. In the simple case where time horizon goes to infinity and utility at time (t) depends on consumption at time (t) and on consumption at time (t-1) the problem can be stated as follow (Alessie and Lusardi 1997; Seckin 2000):

$$\max E_t = \sum_{t=t}^{\infty} (1+r)^{t-t} U_t (C_t - \alpha C_{t-1})$$

$$ST \quad \sum_{t=t}^{\infty} (1+r)^{t-t} C_t = (1+r) A_{t-1} + \sum_{t=t}^{\infty} (1+r)^{t-t} Y_t$$

C_{t-1} and A_{t-1} given.

E_t is the expectation operator, C_τ is consumption, Y_τ is non capital income, A_τ is wealth, r is the interest rate, $0<\alpha<1$ is the parameter which measures the weight of past habits on current utility, and ρ is the rate of time preference. In order to have a closed form solution for this problem one has to assume a quadratic intertemporal utility function and $r=\rho$. Given these assumptions the solution in term of consumption at time (t) is (Alessie and Lusardi 1997):

$$C_t = \frac{\alpha}{1+r} C_{t-1} + \left[1 - \frac{\alpha}{1+r}\right] YP_t$$

where YP_t is permanent income at time (t):

$$Y_t^P = rA_{t-1} + \frac{r}{1+r} \sum_{t=t}^{\infty} (1+r)^{t-t} \; E_t \, Y_t$$

Two aspects are important to notice: i) when $\alpha=0$ (no habits) consumption is equal to permanent income; ii) when $0<\alpha<1$ the impact of a change in permanent income is smaller because $1-\frac{a}{1+r} \pi 1$.

The consumption equation can be used to solve the model in term of the optimal saving at time (t), which is given by:

$$s_t = a \, s_{t-1} + \frac{a}{1+r} \Delta Y_t - \left(1 - \frac{a}{1+r}\right) \sum_{t=t}^{\infty} (1+r)^{t-t} E_t \Delta Y_t$$

The solution for the equation of saving makes clear that with habit formation the level of saving at time (t) depends both on the past level of saving s_{t-1} and on a weighted average of current and future expected income changes.

The next step is to use these results to study the reaction of consumption and saving to an unexpected change in permanent income produced by a modification in the future level of social security benefits. In other terms, we want to describe the effects of a revision in the social security system, which takes place at time (t), on the consumption plan of an individual who exhibit habit formation preferences. The revision in the level of the social security benefit (SS*) increases the level of the social security wealth by an amount equal to: $\sum_{t=L+1}^{D} (1+r)^{L+1-t} \; SS*$ which causes a modification in permanent income at time $t<L+1$ equal to:

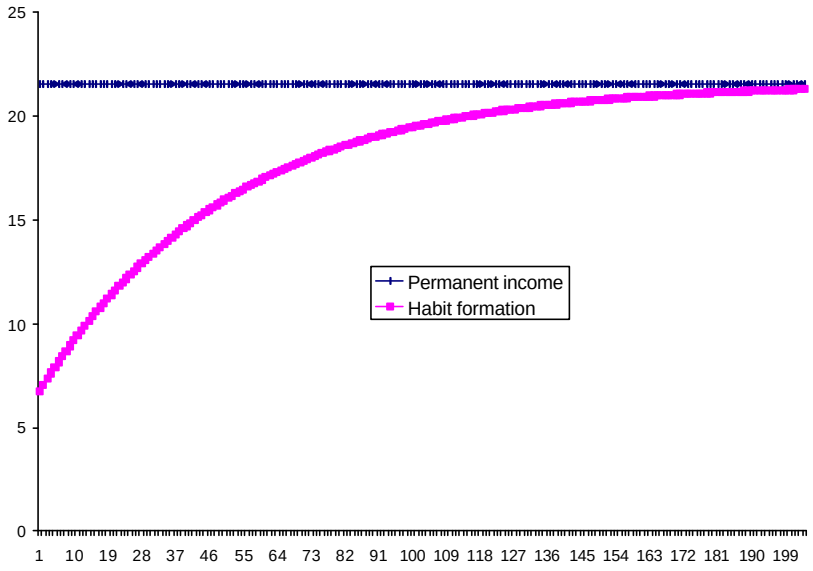
$$Y_t^P - E_{t-1} Y_t^P = \frac{r}{1+r} \sum_{t=L+1}^{D} (1+r)^{t-t} \; SS$$

In the PIH model ($\alpha=0$) the change in consumption would be equal to the revision in permanent income. With habit formation preferences, the change in consumption will be less than the change in permanent income, because the past level of consumption plays a role in the

determination of the current level of consumption. The weight of past level of consumption on the revision of the current consumption is a decreasing function of time. In the period i>t the change will be given by a fraction of the new permanent income according the following relation:

$$C_{t+i} - E_{t-1}C_{t+i} = \left[1 - \left(\frac{a}{1+r}\right)^{i}\right]\left(\frac{r}{1+r}\sum_{t=L+1}^{D}(1+r)^{t-t}\ SS\right)$$

Notice that for i→∞ the change in current consumption is equal to the change in permanent income. The speed of adjustment depends on the value of α and r. In particular for a given level of r a value of α near to one makes the adjustment slower. The previous figure, for example, compares how two individuals with α=0 and α=0,7 consume a permanent increase of 100 in their pension benefit introduced at the age of 40. In the second case, the decline in the saving rate, for a given current income profile, will be less pronounced and it will reach the case of α=0 after 200 periods.



Appendix II

Robust regression estimates for the coefficients of the interaction term "Post x Treatment"

Treatment group	1989-93	1989-2000	1989+91-1998+2000	1991-98	1991-93
Private sector employees					
All	0.037**	-0.014	0.010	0.015	0.061**
Young	0.022	-0.016	0.002	0.012	0.054**
Old	0.037**	-0.016	0.0002	0.010	0.059**
Public sector employees					
All	0.078**	-0.005	0.017*	-0.0006	0.081**
Young	0.094**	-0.017	0.005	-0.026	0.089**
Old	0.066**	0.007	0.024**	0.011	0.072**
Self-employed					
All	0.031**	0.015	0.010	-0.016	-0.002
Young	0.053**	-0.049*	-0.030*	-0.067**	0.007
Old	0.026*	0.026	0.023*	-0.008	-0.004

Source: our computations on SHIW data; ** significant at 5%; * significant at 10%. Each regression includes a polynomial in age, number of components and earners, dummies for sex of head, his/her education level, and the area of residence.

Appendix III
Regression results from the pseudo-panel of cohort averages

Table A3.1: Regression results for the saving rate on the pseudo-panel of cohort averages

	Age and cohort effects		Age and year effects	
	Coef.	Std. Err.	Coef.	Std. Err.
Age^1	0.0006	0.0023	0.0028	0.0005
Age^2	-5.77E-05	1.02E-04	-9.06E-05	3.31E-05
Age^3	8.71E-07	2.33E-06	-6.81E-07	9.19E-07
Age^4	2.98E-08	8.99E-08	3.26E-08	3.97E-08
Cohort2	0.0539	0.0275		
Cohort3	0.0377	0.0346		
Cohort4	0.0417	0.0419		
Cohort5	0.0453	0.0496		
Cohort6	0.0523	0.0566		
Cohort7	0.0325	0.0624		
Cohort8	0.0074	0.0672		
Cohort9	0.0112	0.0717		
Cohort10	-0.0078	0.0762		
Cohort11	-0.0115	0.0803		
Cohort12	-0.0212	0.0845		
1991			0.0269	0.0101
1993			0.0078	0.0102
1995			-0.0383	0.0103
1998			0.0225	0.0105
Constant	0.2594	0.0622	0.2832	0.0086
n. obs	60		60	
R^2	0.53		0.77	

Table A3.2: Regression results for the ratio AF/Y on the pseudo-panel of cohort averages

	Age and cohort effects		Age and year effects	
	Coef.	Std. Err.	Coef.	Std. Err.
Age^1	0.0384	0.0094	0.0116	0.0029
Age^2	3.62E-04	4.18E-04	1.11E-04	1.98E-04
Age^3	1.18E-06	9.52E-06	-6.40E-06	5.48E-06
Age^4	-5.32E-08	3.68E-07	-1.61E-07	2.37E-07
Cohort2	0.4715	0.1126		
Cohort3	0.8317	0.1415		
Cohort4	0.9743	0.1717		
Cohort5	1.2119	0.2031		
Cohort6	1.2992	0.2318		
Cohort7	1.5769	0.2555		
Cohort8	1.5783	0.2752		
Cohort9	1.7272	0.2935		
Cohort10	1.8655	0.3118		
Cohort11	2.0309	0.3288		
Cohort12	2.0315	0.3460		
1991			-0.0345	0.0604
1993			0.0864	0.0608
1995			0.0852	0.0613
1998			0.3388	0.0624
Constant	-0.7934	0.2545	0.6392	0.0516
n. obs	60		60	
R^2	0.63		0.62	

Table A3.2: Regression results for the ratio AF3/AF on the pseudo-panel of cohort averages

	Age and cohort effects		Age and year effects	
	Coef.	Std. Err.	Coef.	Std. Err.
Age^1	0.0335	0.0046	0.0010	0.0012
Age^2	0.0002	0.0002	-3.62E-05	8.02E-05
Age^3	-5.70E-06	4.59E-06	-3.56E-06	2.23E-06
Age^4	-8.76E-08	1.78E-07	1.49E-08	9.61E-08
Cohort1	0.1152	0.0543		
Cohort2	0.3016	0.0682		
Cohort3	0.4363	0.0828		
Cohort4	0.6363	0.0980		
Cohort6	0.7968	0.1118		
Cohort7	1.0428	0.1233		
Cohort8	1.1213	0.1327		
Cohort9	1.3011	0.1416		
Cohort10	1.4382	0.1504		
Cohort11	1.5476	0.1586		
Cohort12	1.6865	0.1669		
1991			0.0612	0.0245
1993			0.1285	0.0247
1995			0.1093	0.0249
1998			0.3022	0.0253
Constant	-0.8112	0.1228	0.0927	0.0209
n. obs	60		60	
R^2	0.63		0.73	

Table A3.2: Regression results for the ratio real wealth / annual income on the pseudo-panel of cohort averages

	Age and cohort effects		Age and year effects	
	Coef.	Std. Err.	Coef.	Std. Err.
Age^1	0.2929	0.0408	0.0755	0.0075
Age^2	-0.0024	0.0018	-0.0037	0.0005
Age^3	-9.17E-05	4.11E-05	-1.11E-04	1.42E-05
Age^4	2.88E-06	1.59E-06	3.96E-06	6.15E-07
Cohort2	1.7004	0.4862		
Cohort3	2.5691	0.6109		
Cohort4	3.8572	0.7415		
Cohort5	5.2330	0.8769		
Cohort6	6.1193	1.0012		
Cohort7	7.7138	1.1036		
Cohort8	8.5199	1.1883		
Cohort9	9.8623	1.2673		
Cohort10	10.6084	1.3467		
Cohort11	11.4870	1.4198		
Cohort12	12.9017	1.4943		
1991			1.2757	0.1568
1993			2.1147	0.1578
1995			2.1293	0.1591
1998			2.2119	0.1620
Constant	-2.7226	1.0989	3.5143	0.1340
n. obs	60		60	
R^2	0.67		0.88	

REFERENCES

Alessie, R. and A. Lusardi, (1997), "Consumption, saving and habit formation", *Economics Letters*, 55, pp.103-08.

Alessie R., A. Kaptein, and A, Lusardi, (1995), "Saving and Wealth Holdings of the Elderly", *Ricerche Economiche*,

Alessie R., A. Kaptein, and A, Lusardi (1997), "Explaining the Wealth Holdings of Different Cohorts: Productivity Growth and Social Security", TMR Progress Report, n. 6.

Ameriks J., Zeldes P. (2000), How do Household Portfolio Shares Vary with Age?, *mimeo*, Wharton School, University of Pennsylvania.

Ando A., L. Guiso and I. Visco (1994), "*Saving and the Accumulation of Wealth: Essays on Italian Household and Government Saving Behaviour*", Cambridge, Cambridge University Press.

Attanansio, O. and J. Banks, (1999), "Trends in Household Saving: A Tale of Two Countries", *Economic Policy*

Attanasio O. and A. Brugiavini (1997), "Gli effetti della riforma Amato sulla formazione del risparmio" in Banca d'Italia – CIDE, "Ricerche quantitative per la politica economica", Roma

Attanasio O., and S. Rohwedder, (2001), "Pension Wealth and Household Saving: Evidence from Pension Reform in the UK", *IFS Working Paper*, n.21, September 2001.

Attanasio, O., and A. Brugiavini, (2002), "Social Security and Household's Saving", mimeo.

Beltrametti, L (1995), "On Pension Liabilities in Italy", *Ricerche Economiche*, n.1, pp. 1-36.

Beltrametti, L. (1997), "Il debito pensionistico in Italia", Il Mulino, Bologna.

Bosworth, B, G. Burtless and E. Steuerle, (2000), "*Lifetime Earnings Patterns, the Distribution of Future Social Security Benefits, and the Impact of Pension Reform*", Brookings Insitution,..

Borsch-Supan A. (1995), Age and Cohort Effects in Saving and the German Retirement System, in *Ricerche Economiche*, 49, 207-233.

Borsh-Supan, A. (2001), "Introduction to International comparison of household savings behaviour: A study of life-cycle savings in seven countries", *Research in Economics*, 55, pp. 1-14.

Brandolini A., Cannari L. (1994), Methodological Appendix: The Bank of Italy's Survey of Household Income and Wealth, in Ando et al. (eds), *Saving and the Accumulation of Wealth in Italy*, Cambridge University Press.

Brugiavini A. (1987), "*Empirical Evidence on Wealth Accumulation and the Effects of Pension Wealth: an Application to Italian Cross-Section Data*", Financial Markets Group Discussion Paper 20. London: London School of Economics.

Brugiavini, A. and M. Padula, (2001), "Too much for retirement? Saving in Italy", *Research in Economics*, 55, pp. 39-60.

Castellino, O. (1995), "Redistribution Between and Within Generations in the Italian Social Security System", *Ricerche Economiche*, Vol. 49, n. 4, pp. 21-30.

Cutler D., Poterba J., Sheiner L. and Summers L., (1990), An Aging Society: Opportunity or Challenge, in *Brookings Papers on Economic Activity*, n.1.

Deaton A., Paxson C. (1994), Saving, Growth and Ageing in Taiwan, in D. Wise (ed.), *Studies in the Economics of Ageing*, University of Chicago Press.

Franco, D. (2001), "Italy: A Never Ending Pension Reform", in "Social Security Pension Reform in Europe,, Feldstein, M and H. Siebert (ed.), NBER, Forthcoming.

Gale, W.G., (1998), "The Effects of Pension on Household Wealth: A re-evaluation of Theory and Evidence", *Journal of Political Economy*, vol.106, n.4, pp. 706-24

Gokhale, J., Kotlikoff, L. and Sabelhaus, J. (1996), "Understanding the Postwar Decline in United States Saving: A Cohort Analysis", *Brooking Papers on Economic Activities*, n. 1, pp. 315-90.

Guiso L., Jappelli T. (2000), Household Portfolios in Italy, *Csef working paper* n. 40, University of Salerno.

Jappelli T. (1995), "Does Social Security Wealth Reduce the Accumulation of Private wealth? Evidence from Italian Survey Data", *Ricerche Economiche*, 49, 1-31.

Jappelli T. (1999), The Age-Wealth Profile and the Life-Cycle Hypothesis: a Cohort Analysis with a Time Series of Cross-Sections of Italian Households, in *Review of Income and Wealth*, 45, 1, 57-75.

Jappelli, T. and F. Modigliani, (1998), "The Age-Saving Profile and the Life Cycle Hypothesis", *CSEF Working Papers*, n. 9, University of Salerno.

King, M.A., and D.L. Dicks-Mireau, (1982), *"Asset Holdings and the Lifecycle"*, The Economic Journal, 92, pp. 247-67.

Miles D. (1999), "Modelling the Impact of Demographic Change Upon the Economy", *Economic Journal*, 109 (January), pp. 1-36.

Ministry of Treasury (1998), *Italy's Convergence toward Emu*, Rome, January, 1998.

Paxson C. (1996), Saving and Growth: Evidence from Micro Data, in *European Economic Review*, 40, 255-288.

Poterba J. M. (2000), Demographic Structure and Asset Returns, December, *mimeo*.

Rostagno, “Il percorso della riforma 1992-1995. Nuovi indicatori di consistenza e sostenibilità per il FPLD”, in Padoa Schioppa Kostoris, F. (ed) “Pensioni e risanamento della finanza pubblica”, Il Mulino, Bologna, 1996

Seckin, A. (2000), “Consumption with Habit Formation”, *CIRANO WP*, University of Montreal.

Van Der Noord P. and R. Herd, (1993), *Pension Liabilities in the Seven Major Econoies*, OECD, Paris.

Venti S. F., Wise D. A. (1993), The Wealth of Cohorts: Retirement Saving and the Changing Assets of Older Americans, *NBER working paper* n. 4600.

Zollino F. (2001), Personal Saving and Social Security in Italy: Fresh Evidence from a Times Series Analysis, *Bank of Italy, Temi di discussione*, n. 417, August 2001 (www.bancaditalia.it)