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WORKING PAPER NO. 234

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July 2009

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The Portfolio Effect of Pension Reforms

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Abstract
We estimate the portfolio effect of changes in social security wealth exploiting a decade of Italian pension reforms as a source of exogenous variation. The Italian Survey of Household Income and Wealth records detailed portfolio data and elicits expectations of retirement outcomes, thus allowing us to measure the expected social security wealth and to assess to what extent Italian households perceive the innovations brought about by the reforms. We find that households have responded to the cut in pension benefits mostly by increasing real estate wealth, and that the response is stronger among households that are able to estimate more accurately future social security benefits. We also compute that for the average household consumable wealth increases by 40 percent of the reduction in social security wealth.

JEL classfication: H55, E21.

Keywords: Pension Reform, Portfolio Choice, Retirement Saving

Acknowledgement: We thank Christian Gollier, Filippo Taddei and seminar participants at the 2008 CERP Conference on Financial Security in Retirement for comments, and the Observatoire de l'Epargne Européenne for financial support.

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1. Introduction

The demographic transition of the last decades has severely challenged many pension systems around the World. In many countries this has brought about several reforms, whose ultimate effect has been to increase retirement age and to cut pension benefits. The body of evidence shows that the reduction in pension benefits brought out by pension reforms has increased saving and private wealth accumulation, although at a rate of considerably less than one-for-one. Feldstein (1974) and Feldstein and Pellechio (1979) estimated the displacement effect of pension wealth on national saving using U.S. time series and microeconomic data, respectively. Since then, a growing literature has used individual level data to provide evidence on the degree of substitution between discretionary accumulation and pension wealth in the U.S. and other countries (Gale, 1998; Bernheim, 2002). A more recent literature exploits the exogenous innovations induced by the pension reforms to estimate the effect of changes in social security wealth on private accumulation. Attanasio and Brugiavini (2003) find that the reduction in pension wealth induced by the Italian 1992 pension reform has increased the saving rate. Attanasio and Rohwedder (2003) obtain similar results with British data. Bottazzi, Jappelli and Padula (2006) find that the Italian 1992 and 1995 pension reforms increased the household wealth-income ratio.

Despite existing evidence on the extent of the offset between private and pension wealth, no empirical study so far has studied the portfolio effect of pension reforms on the allocation of wealth. To the extent that reforms affect not only how much people save but also the mix of assets in households' portfolios, simply estimating the wealth effect of pension reforms might give a wrong impact of the long-term consequences of pension reforms. Since different wealth components are imperfect substitutes, the wealth reallocation that follows a pension reform can impact the amount of consumable wealth that individuals can spend down during retirement. Even if total wealth increases after a reduction in pension benefits, consumable wealth might increase or decrease depending on the impact of the reforms on financial assets (which are readily available for consumption) and real assets (which can be converted in consumption at a cost). For households that do not save enough for retirement, understanding which component of private wealth is more responsive to changes in pension wealth helps also at designing policies to increase retirement saving.

In the paper we relate expected social security wealth to financial and real wealth and estimate the displacement effect of pension reforms on various components of private wealth, including risky and safe financial assets, real estate and business wealth. In trying to account for the displacement effect, we also investigate the effect of innovations of social security wealth on financial market participation in pension funds, life insurance and ownership of real and financial assets.

We focus on Italy, which underwent three major pension reforms in the nineties, and use the Survey of Household Income and Wealth (SHIW), a large representative survey of the Italian population carried out by the Bank of Italy. There are several advantages of using Italian data. First, the pension reforms have dramatically reduced pension benefits for young cohorts, but left a group of workers essentially unaffected, thus providing the exogenous variation that we exploit to identify the displacement effect and to instrument social security wealth. Second, the SHIW elicits information on individual expectations of retirement age and replacement rate, which allows to compute a measure of expected social security wealth and to assess the degree of household's awareness of pension reforms by comparing statutory with expected social security wealth. We are particularly interested in testing if the portfolio effect of pension reforms depends on the extent of information on pension matters. Third, SHIW data offer a complete picture of the composition of Italian households wealth, allowing us to study which wealth component has been mostly affected by the reforms. Finally, the data are available for a long time span, which allows us to focus on the long-run effect of pension reforms. To the extent that workers take time to understand the rules implied by the new pension regime it should be easier to detect an effect in the long run.

We find that a reduction in social security wealth by the equivalent of 1 year's income has been followed by an increase of 7 months' income in real assets and an increase in safe financial assets of 1 month's income. We also show that the response is stronger among households that are better able to estimate more accurately social security benefit. Overall, we estimate that for the average household the reduction in 45,000 euro of social security wealth due to the reforms has prompted an increase in 20,000 euro of consumable wealth.

The paper is organized as follows. Section 2 illustrates the Italian pension reforms of the last decades and the effect of the reforms on social security wealth. Section 3 describes the trends in the two main wealth components, financial and real wealth, for different cohort and employment groups. Since the effects of reforms differ across these groups, one might expect that the most affected groups also exhibit the largest financial and real wealth adjustments, which is indeed what our findings suggest. In order to understand whether this is due to how social security wealth has changed after the reform, we estimate in Section 4 the displacement effect between social security wealth and several components of private wealth. The results highlight that real estate wealth has responded more than other asset categories, and that an increase in financial market participation accounts only for a minor component of the increase in private wealth. Section 5 summarizes our main findings and draws policy implications by relating them to the adequacy of saving debate.

2. The pension reforms

Until the early nineties, the Italian social security system featured high replacement rates, earnings-based benefits, indexation of pensions to real earnings and cost of living, generous provisions for early retirement, and a large number of social pensions (i.e., old-age income assistance). This resulted in the ratio of pension benefits to GDP reaching almost 16 percent in 1991, the highest value among industrialized countries.

The high burden of pension benefits on the state budget prompted a series of reforms starting from 1992. The main features of the reforms were an increase in the retirement age and minimum years of contributions for pension eligibility, abolition of seniority pensions for all those who started working after 1995, a gradual reduction in pension benefits, and indexation of pension benefits to prices rather than to wages. The reforms maintained the generous provisions of the pre-1992 regime for relatively old workers, who in 1995 had at least 18 years of contributions, and different rules for private employees, public sector employees and self-employed.

Although the current regime combines some features of each of the reforms, we do not detail here their specific features.[1] In fact, we compare pension regimes and individual expectations omitting the transitional years between the Amato and Prodi reforms (1992-1997).[2] Our dataset allows us to observe workers in two regimes, one with generous provisions (before the Amato reform, or simply the pre-reform period) and one – ten years later - with much lower benefits (after the Prodi reform, or the post-reform period), at least for some categories of workers. For brevity, we refer as the complex reform process that took place in the nineties as "the reform."

2.1. The contribution and earnings-based pension award formula

The top panel of Table 1 compares statutory retirement ages in the pre and post-reform regimes. For brevity we refer to workers with more than 18 years of contributions in 1995 as the "old", to those with less than 18 years of contributions in 1995 as the "middle aged", and to those who started working after 1995 as the "young". In the new regime the young are entitled to a flexible retirement age (from 57 to 65), subject to incentives. For those already working in 1995 (the old and the middle-aged), the reform raises minimum retirement age for old age pensions of private sector employees (65 for men and 60 for women), but not for public employees and self-employed. For the old and middle aged, the reform raises minimum years of contributions for both seniority pensions and old age pensions; for the young, whose pension award formula is entirely contribution based (see below) the minimum years of contributions is just 5 years.

The bottom panel of Table 1 summarizes the pension award formula before and after the reform. In the pre-reform regime social security benefits were computed according to an earnings-based formula, $\rho N\overline{w}_R$, where ρ, N and $\overline{w}_R$ are, respectively, the accrual rate, the years of contributions and the average of the last R years of salary.[3] The shift to the new regime

[1] Brugiavini (1999) provides details of the specific features of the three Italian pension reforms, which took place in 1992 (the Amato reform), 1995 (the Dini reform) and 1997 (the Prodi reform).

[2] Since our sample extends to 2006, we neglect a fourth pension reform which further increased retirement age starting in 2008.

[3] The accrual rate was 2 percent for private employees and self-employed, and ranged from 2.2 to 2.5 percent for public employees, depending on the years of contribution. R was 5 for private employees, 1 for public employees, and 10 for the self-employed.

dramatically altered the pension award formula for new cohorts, but retained the main features of the pre-reform formula for older workers.

In the post-reform regime pensions are computed distinguishing between three cases: an earnings model for the old, a contribution model for the young, and a pro-rata model for the middle-aged (less than 18 years of contributions as of 1995). In each case, different rules apply to public employees, private employees and self-employed.

For older workers, pensions are still computed using the earnings model, and are the sum of two components. The first component is $\rho\alpha_{92}\overline{w}_R$, where α_{92} is the number of years of contributions at the end of 1992. The second component reflects a gradual increase of R to 10 for private and public employees and to 15 for the self-employed.[4] In practice, for realistic earnings growth rates, the second component has a small impact on the final pension with respect to the pre-reform regime.

For young workers benefits are computed according to a contribution model, $\gamma\tau\sum_0^{N-1} w_t (1+g)^{N-1-t}$, where τ is the contribution rate and g a 5-year moving average of the GDP growth rate. Contributions are proportional to earnings, capitalized on the basis of a 5-year moving average, and then transformed in flow benefits using a coefficient (γ), set by legislators, that depends on retirement age and life expectancy.[5] Since the contribution rate τ is 33 percent for private and public employees and 20 percent for the self-employed, in the new regime the self-employed will receive substantially lower pensions than employees. The contributions-based model has identical minimum retirement age for males and females, in both old age and seniority pensions. However, the new regime applies only to the young cohorts, who entered the labor market after 1995, and will presumably start to retire after the year 2030.

[4] Namely, for years of contributions between 1992 and 1995, R is increased by 1; for years of contributions between 1995 and the year of retirement, R is increased by the minimum of 5 and 2/3 of the years of contributions between 1995 and the year of retirement. For instance, for those retiring in 2000 R is increased by 3; for those retiring in 2005 it is increased by 5. The second component is therefore $\rho(\alpha_{95}-\alpha_{92})\overline{w}_{R'}+\rho(N-\alpha_{95})\overline{w}_{R''}$, where α_{95} is years of contribution at the end of 1995, $R' = R+1$ and $R'' = R+\min[5, \mathrm{int}((2/3)\times(N-\alpha_{95}))]$. Therefore, the pension for the old is: $\rho\left[\alpha_{92}\left(1-\frac{R}{R'}\right)+\alpha_{95}\left(\frac{R}{R'}-\frac{R}{R''}\right)+N\frac{R}{R''}\right]\overline{w}_R$.

[5] Currently, γ ranges from 4.720 percent for somebody retiring at 57 to 6.136 percent for somebody retiring at 65.

Finally, for the middle-aged (less than 18 years of contributions as of 1995), pensions are computed according to a "pro-rata model": earnings-related for working years before 1995, and contributions-related afterwards.

2.2. The estimate of social security wealth

We derive the estimate of the ratio between social security wealth and disposable income from individual expectations of retirement age and replacement rate; see Appendix for details of the computation. For this, we exploit the Survey of Households Income and Wealth, which elicits the expected retirement and replacement rate through the following two questions.

- *When do you expect to retire?*
- *Think about when you will retire, and consider only the public pension (that is, exclude private pensions, if you have one). At the time of retirement, what fraction of labor income will your public pension be?*

These questions are available in 1989-91 (three years before the first pension reform) as well as in 2004-06 (six years after the third reform). We focus on the group aged 20 to 50, including in our sample individuals born between 1939 (who were 50 years old in 1989) and 1986 (20 years old in 2006). The composition of the sample of older workers is likely to reflect self-selection into higher expected retirement ages, and so these workers are dropped from the analysis. A small number of individuals younger than 20 are also excluded (less than 1 percent of the sample). We focus on how expectations change after the reform and therefore drop workers that are interviewed in the transitional years (1992-2002). We define as the pre-reform period the pooled 1989-91 sample, and as post-reform period the pooled 2004-06 sample. Finally, we consider only workers who are employed or self-employed in the survey year, excluding the unemployed, retirees and other individuals not in the labor force. Overall, we compute social security wealth for 17,628 individuals observed between 1989 and 2006.

Table 2 reports the expected and the statutory social security wealth for male workers in three occupational groups (private and public employees and self-employed). In general there is a good match between expected and statutory rates. The reduction in pension wealth after the reforms is more pronounced for middle-aged public employees and self-employed; old private employees are virtually unaffected in that the statutory social security wealth is very similar before and after the reform. While the young were not in the labor market before the reform and therefore no direct comparison can be made for them, one should notice that after the reform the statutory social security wealth is quite low for this group.

Using the same data, we can also define the expectation error as the absolute value of the difference between the statutory and the expected social security wealth to disposable income ratio. We then plot in Figure 1 the cross-sectional distribution of the absolute value of the expectation error before and after the reform. Even though on average expected social security wealth is close to statutory wealth, the expectation error of the social security wealth-income ratio is sizeable: the average is 1.57 before the reform and 1.41 in the post-reform period. This implies that for about half of the sample expected social security wealth exceeds (in absolute value) statutory wealth by about 18 percent, and for 25 percent of the sample by 23 percent. Since the response of changes in pension wealth depends on the degree to which people are able to understand the rules of the social security system, in the empirical analysis we find it useful to split the sample between "Informed" households (the expectation error is below the median) and "Uninformed" households (the expectation error is above the median) and to check for the stability of the coefficients in the two groups.

2.3. Pension reform and the allocation of retirement saving

In a standard life-cycle framework, households compensate a reduction in social security wealth by saving more in order to keep their consumption unchanged during retirement. In a complete markets world, it would not matter what specific asset households buy to compensate the reduction in social security wealth: all assets have the same risk-adjusted return. However, to the extent that households are borrowing (and short-sale) constrained, face uninsurable risks and transaction costs, the effects of reducing future social security benefits might differ according to the particular asset bought by the households.

The Italian pension reforms have reduced replacement rates and social security wealth at retirement which, according to the life-cycle model, requires households to increase their discretionary saving for retirement. To illustrate the effects of pension wealth on portfolio allocation, suppose that households can invest their wealth in safe and risky asset. If preference exhibit constant relative risk aversion preferences (CRRA), changes in social security wealth should not affect portfolio rules (see Samuelson (1969) and Merton (1969)). If one adds labor income, the portfolio rule changes with age, even if income is not uncertain (Merton, 1971). The analysis is more complicated if income risk is not insurable and households face borrowing (and short sale) constraints. In this case, Cocco, Gomes and Maenhout (2005) show that portfolio rules become a function of age and wealth even in a CRRA framework. Thus, cuts in pension benefits have the potential to alter also the portfolio allocation rule. How the rule changes depends on the age at which the reduction of social security wealth is announced (or perceived) and on the shape of the age-income profile. This happens because the share of wealth invested in the risky asset is lower for households close to retirement, and decreases with wealth at a rate that varies non-monotonically with age.

To understand the possible effects of pension reforms on portfolio choices, one should also take into account that individuals invest in housing a substantial fraction of their wealth. Housing price risk might crowd out stockownership (Cocco, 2005) but also serve as a hedge against rent risk (Sinai and Souleles, 2005). Therefore, if the increase in private wealth brought about by the reform triggers an increase in housing wealth, the share of wealth invested in risky assets, such as stocks, might decrease or increase depending on whether the crowd out or the hedge effects dominate. On the other hand, if housing wealth is not annuitizable, households might not choose to increase the share of wealth invested in housing after a pension reform. Transaction costs might have a similar effect and discourage households from investing in the housing market.

So far we have assumed that the pension reforms simply reduced the level of social security wealth at retirement. This is not, however, the only effect of pension reforms, which might also affect the risk of future benefits. This effect is potentially important, because social security contributions are mandatory and pension risk is not avoidable: in this sense, wealth is like human capital, and its risk plays the role of a background risk. To the extent that reforms have reduced the risk associated with social security wealth, one might see households investing a larger share of their wealth in risky assets.

Whether or not the Italian reforms have reduced the riskiness of social security wealth is open to discussion. Pension reforms have increased the solvency of the system, and therefore reduced the risk of future defaults. Moreover, in the new contribution model pension benefits depend on the entire life-time earnings profile; depending on the timing of income shocks, this can reduce the risk of future benefits. However, the new contribution formula links the replacement rate and social security wealth to a larger set of risks, including aggregate and demographic risks. This makes the new schemes potentially more risky than the old.

In summary, there are many reasons to believe that pension reforms might have affected portfolio rules, but the direction of effects is a priori ambiguous, making the empirical analysis of the portfolio effect of pension reforms more interesting.

3. Trends in financial and real wealth

Since the effects of the reforms differ across cohort-employment groups, one might expect that the most affected groups also exhibit the largest financial and real wealth adjustment. To investigate this possibility, we normalize financial and real wealth by disposable income and compute the averages of financial and real wealth before and after the reforms for the old, the middle aged and the young for three employment groups (private and public employees and self-employed).

Table 3 shows that financial and real wealth increase after the reform. The increase is more pronounced for the middle-aged (in particular for middle-aged self-employed, which, according to Table 2, is the group most affected by the reform), but non-negligible for old private employees, a group which is relatively unaffected by the reform. Furthermore, changes in real wealth are larger than changes in financial wealth in absolute and relative terms. For middle-aged self-employed, financial wealth increases by a quarter of annual income in absolute terms, and by 50% in relative terms; real wealth increases by more than 5 times annual income in absolute terms, and by 150% in relative terms.

In Table 3 one could compute the "difference-in-difference" among employment groups. Since old private employees are unaffected by the reform, the wealth difference after the reform for the middle-aged should be attributed to the reform. This would imply that the effect of the reform on financial wealth for middle-aged self-employed is 50 days of income, while the effect on real wealth is over 3 times annual income. For middle-aged public employees the effects are smaller, close to zero for financial wealth and about 1 year's income for real wealth.

But this back-of-the-envelope calculation does not provide a conclusive answer on the effect of the reforms because it does not consider other variables that could induce shifts in the composition of employment groups after the reform. We know that stock market participation differs across education and income groups, and it would be useful to measure changes in wealth after the reform for a given education and income groups. Age affects portfolio decisions; for instance, after a pension reform individuals close to retirement might not increase stockholding at the same rate as the young. Macro shocks also shape household portfolios differently over time; examples include the stock market crash of the early 2000s and subsequent recovery, the decline of the yield on short-term government bonds after the introduction of the euro and the recent house price boom.

To gain further insights on the portfolio effect of pension reforms, in the next section we explore the link between various components of private wealth and social security wealth in a regressions framework that exploits the exogenous variation in social security wealth brought about by the reforms.

4. The portfolio effects of pension reforms

As shown in Section 2, the Italian pension reforms of the last decade have reduced social security wealth for most households. The reduction is more dramatic for the young and the middle-aged, and among the self-employed. In Bottazzi, Jappelli and Padula (2006) we show that this reduction prompted an increase in private wealth for those most affected by the reforms (middle-aged public employees and self-employed) and with better understanding of the new pension regime. But finding an overall displacement effect between private wealth and social security wealth is only part of the story. Do households react to a pension reform increasing the liquid component of wealth? Do they take more or less risk after the reform? What about the demand for targeted retirement saving ?

To answer these questions, we first analyze the offset between social security wealth and the two main components of private wealth, real and financial assets. We then consider different components of wealth, and sample splits defined on the basis of households' degree of information about future benefits. Finally, we focus on ownership of stocks, mutual funds, real estate, business wealth, private pension plans and life insurance.

4.1. The econometric model

Our empirical specification relates the ratios of financial and real assets the ratio of social security wealth to disposable income and to a set of observable variables potentially affecting portfolio choice. More specifically, we denote the ratio of financial (real) wealth to income for household *i* at time *t* by y_{it}^* and adopt the following specification:

$$y_{it}^* = \delta SSWY_{it} + X_{it}\beta + \theta_t + \varepsilon_{it}$$

where $SSWY_{it}$ is the ratio of expected social security wealth at retirement (evaluated at time *t*) to disposable income, X_{it} a vector that includes age of the household head, year and employment dummies, a dummy for middle aged and the interaction with employment dummies, and interactions between employment dummies and a post-reform dummy, region and education dummies and disposable income. Age, income, and education are proxies for lifetime earnings, while year dummies capture macroeconomic effects.[6] Regional dummies control for differences in wealth across Italian macro-regions, while employment dummies and their interactions control for group and time effects not due to the reform. Demographic variables refer to the head of the household, defined as the partner with higher earnings. To focus on the long-run effects of the reforms, we omit the transitional period, and estimate the model merging four surveys (1989-91 and 2004-06). We limit the sample to people in their working age, dropping the 50+. Moreover, those who entered the labor market after 1995 (the *young*) cannot be used to evaluate the effect of the reform and are dropped from the analysis.

The expected social security wealth-to-income ratio is adjusted by the factor suggested by Gale (1998). This factor considers the number of years people have contributed to the social security system as well as for when in their life cycle they have experienced the pension reform.

[6] In the regressions, the reference group is private employees without a college degree and living in Northern Italy.

The adjustment depends on the utility function that is chosen for the underlying life-cycle model and on the values for the discount rate, the interest rate and the time preference rate. We assume a utility function with constant relative risk aversion and set the discount and interest rates to 2 percent (for details see Appendix).

In the estimation we adopt an IV approach to deal with the potential endogeneity of social security wealth with respect to portfolio decisions. The endogeneity is due to unobserved factors which affect both productivity and portfolio decisions. For instance, if thrift and hard work are correlated tastes, people with these traits might choose to retire later with higher pension wealth and to invest in long-term saving instruments. We thus rely on the variability introduced by the reforms to construct a measure of statutory social security wealth as an instrument for expected social security wealth. Statutory wealth is correlated with expected pension wealth, but is not affected by individual preferences or beliefs. In particular, statutory social security wealth depends on statutory retirement age and legislated replacement rates, which change after the reform according to employment and cohort groups. As discussed in Section 2, for old private employees statutory social security wealth was essentially unaffected by the reforms, while other groups (public employees, self-employed, the young and the middle-aged) were affected and should have revised their expectations downward (as shown in the lower panel of Table 2).

4.2. Wealth allocation

The regressions in Table 4 show that a reduction in social security wealth equivalent to 1 year's income is associated with an increase in financial wealth of just below 1 month's income. The estimates also indicate that the financial wealth-income ratio falls with age during the working lifetime (the sample does not include households over 50), is lower in the South, and increases with income and education; the coefficients of the employment dummies are not statistically different from zero. We then check if information about pension reforms prompts larger wealth adjustments. Accordingly, we split the sample on the basis of the difference between statutory and expected social security wealth. We call "Informed" and "Uninformed" households for whom the difference (in absolute value) is, respectively, less or more than the median (just above 1). In Columns 2 and 3 of Table 4 we find that the offset coefficient is about twice as large for the "Informed" group. [7]

The other columns of Table 4 refer to real wealth. The displacement coefficients are negative and precisely estimated for the total sample, and for both the "Informed" and the "Uninformed" sub-samples. A reduction in social security wealth of 1 year's income is associated with an increase in real assets of about 9 months of income for the "Informed" and just below 4 months for the "Uninformed". Overall, the evidence suggests that the effect of the reform is larger on real assets than on financial assets and for the "Informed" group.[8]

Table 5 breaks down financial wealth into "risky" and "safe" financial assets, and real wealth in real estate and business wealth. Risky financial assets include stocks held directly or indirectly through mutual funds and other investment accounts; safe financial assets include corporate and government bonds and transaction accounts. In the first two columns of Table 5 the displacement coefficients are negative, statistically different from zero, but small in size. In line with previous studies, we also find that stockholding is positively correlated with income and education, and is lower in Central and Southern Italy (Guiso, Haliassos and Jappelli, 2003).

The results in column 3 indicate that the displacement effect for safe financial assets (-0.076) is stronger than for risky financial assets. The relation with income is again positive but not precisely estimated; safe assets increase with education and are lower in the Centre and in the South. Distinguishing further between corporate bonds, Treasury Bills, and transaction accounts reveals that the demand for corporate bonds has not been affected by the pension reforms. Instead, reducing social security wealth by 1 year's income is associated with an increase in the demand for Treasury Bills of about 10 days of income (6 days for transaction accounts). For brevity, these results are not reported.

The remaining columns of Table 5 refer to real estate and business wealth. The effect of social security wealth on real estate (-0.597) is negative and statistically different from zero, in line with the predictions of the life-cycle framework. Instead, in the regression for business

[7] We also add to the baseline specification the interaction between the information indicator and the social security wealth to income ratio, run the regression on the whole sample and find that the coefficient is statistically different from zero at the 10% confidence level for real wealth.

[8] We also estimate the elasticity of real and financial wealth with respect to social security wealth. They are, respectively, -0.802 (with a standard error of 0.056) and 0.237 (with a standard error of 0.036).

wealth the coefficient is positive (0.11) and statistically different from zero at the 10 percent level.

To explore the effect of people's awareness of pension reforms, in Table 6 we repeat the estimation distinguishing between "Informed" and "Uninformed" households. For brevity, we report only the displacement coefficients between social security wealth and the various wealth components. The table suggests that there are not large differences between the two groups for risky assets and real estate, while differences are larger and statistically significant for safe financial assets (-0.120 for the informed and -0.046 for the uninformed). The results for business wealth show a statistically significant effect only for the uninformed (0.320). The effect for this group of households is hard to reconcile with the standard life-cycle model, where a reduction in pension wealth should be associated with an increase in private wealth.

4.3. Asset ownership

People can respond to pension reforms by adjusting wealth levels as well as by changing ownership of particular assets. The first column of Table 7 reports instrumental variable probit regressions for direct and indirect stock market participation, using the same specification as in Tables 5 and 6. The instrument for expected social security wealth is again statutory social security wealth, imputed from legislation in 1989-91 and 2004-06. The results suggest that the probability of investing in stocks is negatively associated with social security wealth, but the marginal effect reported in the last row is small: -0.012 for total stockholding and -0.009 when only direct stockholding is considered. The positive effect of income and education on stock market participation is consistent with previous evidence (Guiso, Haliassos and Jappelli, 2003).

Ownership of safe financial assets is not related with social security wealth (column 3), because a vast majority of households has transaction accounts before and after the pension reforms. The final two columns of Table 7 report probit regressions for the propensity to invest in real estate and business wealth. Both variables are negatively correlated with social security wealth, and the marginal effect is higher in absolute value for real estate than for business wealth (-0.063 and -0.017 respectively).

In Table 8 we again split the sample according to households' information. For stockholding the marginal effects of social security wealth are similar in the two groups: -0.011

for total stockholding and -0.010 for direct stockholding in the informed group, and -0.018 and -0.011, respectively, for the uninformed.[9] For safe financial assets the marginal effects are negative for the "Informed" (-0.006) and positive (0.013) for the "Uninformed". The effects on the propensity to invest in real estate are similar in the two groups (-0.069 for the Informed and -0.072 for the Uninformed), while the effect on the propensity to invest in business wealth is larger in the Informed group. Overall, the results for asset ownership suggest that the response to pension reforms is larger for real assets, and that differences between "Informed" and "Uninformed" groups are relatively small.

4.4. Life insurance and pension funds

An analysis of the effect of pension reforms on the portfolio allocation of private wealth ideally should also consider saving targeted for retirement such as private pension plans and life insurance policies. Our data contains only information on ownership, and not on the market value, of such products, which is the reason why we only deal with it at this stage of the analysis.

In the last two decades, pension legislation has repeatedly tried to encourage the development of pension funds and life insurance in what appears to be an "infant industry" in Italy (Fornero, Borella, Fugazza and Ponzetto, 2002). Favored fiscal treatments of contributions to life-insurance policies have been introduced since 1986, and have been later extended to contributions to pension funds.[10] Whether or not such measures have been effective is an open question, though the evidence presented in Jappelli and Pistaferri (2003) suggests that tax incentives have been ineffective at stimulating households' propensity to invest in retirement saving instruments. Here, we address a related question, that is, whether the reduction in social security wealth brought about by the reforms has stimulated the propensity to invest in saving plans targeted for retirement. We therefore run instrumental variable probit regressions for the propensity to invest in pension plans and life-insurance maintaining the same specification as for ownership of other assets.

[9] As a further check, we also run an instrumental variable probit regression on the total sample and interact social security wealth with the information variable. The coefficient of the interaction term is not statistically different from zero.

The first three columns 1 to 3 of Table 9 focus on private pension plans. The regression coefficients indicate that the demand for private pension plans is higher among the self-employed and in Northern Italy, and that it increases with income and education. The coefficient and marginal effect of the ratio of social security wealth to disposable income are negative but not statistically different from zero. Splitting the sample between informed and uninformed households does not change the overall picture.

The other columns of Table 9 refer to ownership of life-insurance.[11] The results are similar to those for pension plans: the association with social security wealth is negative, but the effect is small and not statistically different from zero; the effect of the other variables (income, education, region of residence) is also similar.

Overall, the results in Table 9 suggest that pension reforms have not been associated with an increase in households' propensity to invest in assets targeted for retirement. This finding is in line with recent evidence. Cesari, Grandi and Panetta (2008) suggest that the low development of the third pillar in Italy is the consequence of high social security contribution rates. Bottazzi, Jappelli and Padula (2006) refer to lack of adequate financial education and lack of information on pension matters as a reason for the low saving response to pension reforms. Cesari, Grandi and Panetta (2008) point out that discontinuous careers and limited labor market participation also account for the low take-up rate of pension funds among young workers and women. Finally, due to the high cost of annuities, most Italian households consider life insurance contracts as a financial investment rather than as an insurance contract to protect against longevity risk.[12] According to Guazzarotti and Tommasino (2008), the money's worth ratio (the ratio between the present value of annuity payments and the premium paid to the insurer), is at most 84 percent for a private life insurance contract; in contrast, the ratio is much higher (around 100 percent) for social security benefits.

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[10] More recent policy interventions have been directed at diverting contributions to the severance payment fund (so-called TFR) towards complementary pension products. Starting from January 2007 workers can choose to direct TFR contributions to complementary pension plans.

[11] Since we aim at capturing the demand for long-term saving, life insurance excludes term policies, where the premium is paid to the heirs only in case of death of the subscriber, as well as indexed and unit linked policies.

[12] At the end of the accumulation phase, life insurance contracts give investors the option between an annuity and a lump sum. Data from the National Association of Insurance Companies (ANIA) reported by Guazzarotti and Tommasino (2008) indicate that in 2003-05 only 11,000 investors out of 1,940,00 opted for the annuity.

5. Summary and policy implications

Pension reforms have reduced dramatically social security wealth of certain groups of Italian households, and especially that of self-employed, public employees and workers with less than 15 years of contributions in 1995. In contrast, older workers have been insulated from the reform,. The aim of the paper is to exploit changes in expected social security wealth on households' portfolio allocations. In our exercise we use the Bank of Italy Survey of Household Income and Wealth, a large representative sample of the Italian population available from 1989 to 2006, and construct expected social security wealth using individual subjective beliefs about social security benefits after retirement. But we also recognize the potential endogeneity of the constructed measure of expected social security wealth, which depends on observed and unobserved households' characteristics. Accordingly, we adopt an instrumental variables approach, using an instrument social security wealth computed from current legislation. The pension reform provides the variability in our constructed measures of expected and statutory social security wealth that allows us to identify the effect of pension reforms of household portfolios.

Our indicators of social security wealth also allow us to investigate how the portfolio response to the pension reform depends on the degree of uncertainty about social security benefits. Our findings suggest that Italian households have responded to the reduction in pension wealth brought about by the reform investing more in real assets and in safe financial assets. In particular, a reduction in social security wealth by the equivalent of 1 year's income has been followed by an increase of 7 months' income in real assets and an increase in safe financial assets of 1 month's income. The regression estimates uncover other interesting results. First, the response is stronger among households that are able to estimate more accurately future social security benefits. Second, there is negligible effect on financial market participation after the reform. Third, despite the fact that pension reforms have reduced substantially pension wealth for a large fraction of workers, we do not observe an increase in the propensity to purchase private pension funds and life insurance after the reform.

Since the increase in wealth after the reform is mostly due to an increase in real estate wealth, essentially substituting an annuity with assets which do not insure against longevity risk and that can only be liquidated at a cost, one wonders if after the reform households are preparing adequately for retirement. To see the issues involved, suppose that people wish to annuitize their housing wealth at retirement, which we take age 65. With risk-neutral lenders the fraction of consumable housing wealth depends on the expected growth of house prices and the interest rate. The larger the gap between the expected growth rate of house prices and the interest rate, the larger the amount of housing wealth that can be consumed.

Under plausible assumptions, a 65-years-old male can consume at most 85 percent of his housing wealth, a similar fraction to what found by Sinai and Souleles (2008) with U.S. data in the absence of credit market imperfections.[13] This implies that total amount of consumable wealth after retirement is at most 85 percent of real estate plus financial wealth.[14] On average, social security wealth for a middle-aged household falls by 45,000 euro after the reform (1.3 years of disposable income). Since for the average household the real estate wealth-income ratio increases by 0.78 and financial wealth by 0.11, the overall consumable wealth-income ratio increases by 0.77 (and the level of consumable wealth by 26,600 euro). But the actual increase in consumable real estate wealth is likely to be much lower, due to credit market imperfections and informational asymmetries in the reverse mortgage and annuity markets. Sinai and Souleles estimate that in the presence of credit market imperfections U.S. households could consume about 60 percent of real estate wealth during retirement. If one applies this more realistic value, the increase in the consumable wealth-income ratio after the reform shrinks to only 0.58 (and the level of consumable wealth to 20,000 euro).

Our results have four main implications. First, though Italian households seem to be aware of the effect of pension reforms on replacement rates and social security wealth, there is still a considerable gap between expectations and legislated values for pension benefits. Improving information about pension benefits is therefore of paramount importance. A second implication is that since the offset between social security wealth and private wealth is considerably less then one-for-one even for informed households, increasing information is not be sufficient to induce households to increase their private wealth.

[13] The typical mortgage rate in Italy is 4.6 percent (European Mortgage Federation, 2006); we set the expected nominal growth rate of house prices at 3.5 percent.
[14] In the calculation we exclude business wealth from the definition of consumable wealth.

The third implication has to do with the particular asset mix of Italian households, where real assets, and housing in particular, play a dominant role. Pension reforms have not diminished the propensity to invest in real estate. On the contrary, they have apparently induced additional demand for housing. Will people be able to use this additional wealth to supplement the fall in income after retirement? Our calculations above show that pension reforms have reduced social security wealth of middle-aged workers by about 45,000 euro, and that this reduction is likely to be offset by an increase of consumable private wealth of only 20,000 euro. This means that the response of private wealth to pension reforms is still limited, and that the adequacy of saving issue will be an important concern for future generations of retirees. The final, and related implication is that despite a decade of intense legislative efforts, a negligible fraction of the increase in private wealth has been channeled in private pension plans.

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Appendix

1. The construction of social security wealth

We calculate the ratio of expected social security wealth (at retirement) to earnings (evaluated at time t) in a way that keeps the computation as simple as possible while being tailored to the inclusion of elicited expectations of the replacement rate and the retirement age. To do this, we use the following proxy for each worker's expected social security wealth-to-income ratio:

$$SSWY_t = \left[P(N_t \mid t) \left(\frac{1+g_u}{1+r} \right)^{N_t - t} \sigma_t \right] \sum_{\tau = N_t}^{T} P(\tau \mid N_t) \left(\frac{1+g_N}{1+r} \right)^{\tau - N_t}$$

where σ_t is the expected replacement rate and N_t the expected retirement age elicited at time t,[15] T the maximum length of life, $p(\tau|N)$ the probability of surviving to age τ, conditional on being alive at age N, g_u the growth rate of earnings for group u, r the real interest rate, and g_N the growth rate of pension benefits during retirement – assumed to be the same for all groups.

In the survey we observe σ_t and N_t for each individual. In the empirical estimates we check the sensitivity of the results with respect to the assumption of point expectations for N_t, allowing for some dispersion around the reported expected retirement age. Survival probabilities are taken from the Italian life tables, by age and gender, for the years 1990 and 2000, so that the change in life expectancy over time, and in particular before and after the reform, is accounted for.[16] The growth rate of earnings (g_u) is estimated from our data at 0.015 for individuals with university degree and at 0.008 for individuals with less than university degree.[17] We assume that after retirement pensions are constant in real terms (g_N=0) and that the real interest rate is equal to 2 percent.

2. The adjustment factor for expected social security wealth

As in Gale (1998), we adjust pension wealth multiplying each individual's expected pension wealth by a factor that takes into account people's position in the life cycle and years of service in the pension as well as the position in people's life cycle when a change in pension benefits takes place (the reforms, in our case). The underlying idea for the simplest theoretical model is that people plan their consumption at the beginning of their working career, and consumption is a function of total lifetime resources, that is earnings and pension benefits. Since decisions are based on total lifetime resources, the true offset between pension wealth and private wealth is 100

[15] t is equal to 1989, 1991, 2004, 2006, the survey years in which the expected replacement rate is elicited.
[16] Data source: *Italian Statistical Annex* (Rome: ISTAT, 1990 and 2000).
[17] The growth rates were obtained from a median regression of log-earnings on sex and employment dummies and full interaction of age with a college dummy. Data source: SHIW, years 1989-2006, individuals aged 20-60.

percent (coefficient of -1). However, as pointed out by Gale (1998, pp. 708-710) an estimate of the coefficient of pension wealth in a regression of private wealth on earnings to date, lifetime earnings and pension benefits, would not produce the true offset. The pension wealth coefficient would instead be between –1 and 0, and a function of the years of service in the pension and of the expected life horizon. In particular, in the case of a CRRA utility function, the coefficient would be as follows:

$$Q = \frac{\exp(xS-1)}{\exp(xT-1)} = \frac{\exp(xS-1)}{\exp(x(le+S)-1)}$$

where $x = \frac{r-\delta}{\rho} - r$, and r =interest rate, δ=time preference rate, ρ=coefficient of relative risk aversion, S =years of service in the pension, T =life span, and le =life expectancy.

Therefore, one would need to adjust pension wealth by this factor in order to recover the true offset in the regression. Intuitively, this factor adjusts pension wealth to account for the fact that a change in pension wealth that takes place at the beginning of one's career translates into a change in the consumption plan (and therefore in non-pension wealth) over the life span. At time S, the reduction in non-pension wealth is captured by Q, and Q increases with S to reflect the fact that the later in life we observe individual's decisions, the more of the initial plan has already taken place.

A further aspect to be taken into account is given by the time at which the change in pension benefit is realized. For a generic time t^*, Gale's adjustment factor is:

$$Q^* = \frac{\exp[x(S-t^*)-1]}{\exp[x(le+S-t^*)-1]}$$

This accounts for the fact that individuals had to revise their plans at time t^* and the remaining horizon over which they can realize their plans is shorter.

In our setting, we assume that $r = \delta = 0.02$ and apply different adjustment factors according to which group the individual belongs to. In particular, the so-called "Old" group is not affected by the reform, and therefore we apply a version of Q, corrected for the fact that individuals start contributing to the pension system at different ages (we observe this in the data), i.e.:

$$G = \frac{\exp[-r(age-agew)-1]}{\exp[-r(le+age-agew)-1]}$$

where age = age at which observed and $agew$ = age at which started working.[18] The adjustment factor for the group affected by the reform ("Middle-aged") instead needs to take into account of the year in which the reform took place and is therefore a version of Q^*. We assume that the year

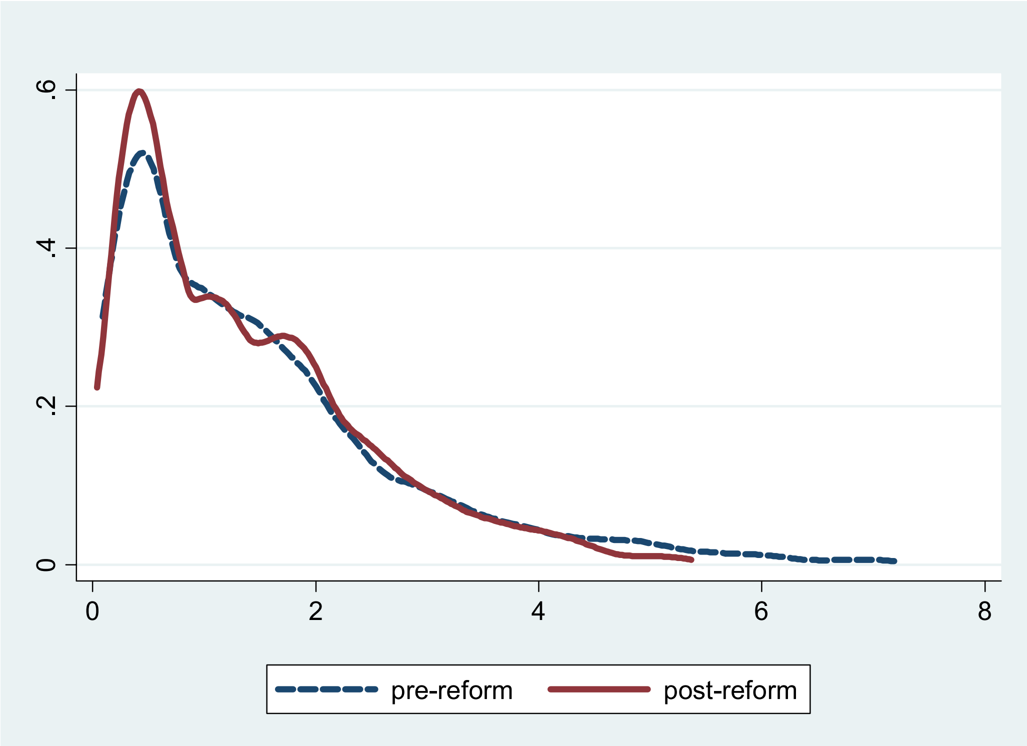
[18] We use the Italian life tables by age and gender to recover le (life expectancy).

of the reform is 1995 and adjust pension wealth of individuals belonging to this group, and observed after the reform, by the following factor:

$$G^* = \frac{\exp[-r(age - ageref) - 1]}{\exp[-r(le + age - ageref) - 1]}$$

where *ageref* = age at which the individual faced the reform.

Figure 1
Expectation error distribution of social security wealth before and after the reform



Note. The figure plots the absolute value of the expectation error in the pre-reform (1989-91) and post-reform (2004-06) regimes. The expectation error is defined as the difference between the expected and the statutory social security wealth-income ratio.

Table 1
Retirement age and pension award formula before and after the pension reforms

		Retirement age						
		Old age pensions				*Seniority pensions*		
		Minimum retirement age			*Minimum years of contributions*	*Minimum years of contributions*		
		Private sector	Public sector	Self-employed		Private sector	Public sector	Self-employed
Pre-1992 regime	**All workers**	60(55)	65(60)	65(60)	15	35	20	35
2004-06 regime	**Old**	Progressively rising to 65(60)	65(60)	65(60)	Progressively rising to 20	40 before age 57 35 after age 57		40 before age 58; 35 after age 58
	Middle-aged	Progressively rising to 65(60)	65(60)	65(60)	Progressively rising to 20	40 before age 57 35 after age 57		40 before age 58; 35 after age 58
	Young	Subject to incentives: 57-65			5	Abolished		

		Pension award formula		
		Private sector	*Public sector*	*Self-employed*
Pre-1992 regime	**All workers** *Earnings model*	2% × years of contributions × average of the last 5 years of earnings	2.33% × years of contribution × last year of earnings	2% × years of contributions × times average of the last 10 years of earnings
2004-06 regime	**Old** *Earnings model*	Gradually to 2% × years of contribution × average of last 10 years of earnings	Gradually to 2% × years of contribution × average of last 10 years of earnings	Gradually to 2% × years of contribution × average of last 15 years of earnings
	Middle-aged *Pro rata model*	Earnings model before 1995, contribution model after 1995.		
	Young *Contribution model*	Contributions (33% of gross wage for employees and 20% for self-employed) are capitalized on the basis of 5-years moving average of GDP growth. The capitalized sum is then multiplied by a coefficient that varies by retirement age, taking into account life expectancy.		

Note. Old, middle-aged and young refer, respectively, to workers with more than 18 years of contributions in 1995, less than 18 years of contributions in 1995, and who start working after 1995. In the top panel female retirement age is reported in parenthesis when different from males.

Table 2
Expected and statutory social security wealth before and after the pension reforms

Expected social security wealth	*Pre-reform*	*Post-reform*	**Change after the reform**
Private employees			
Old	10.67	8.89	-1.78
Middle-aged	8.30	6.92	-1.38
Young		5.46	
Public employees			
Old	10.75	10.09	-0.66
Middle-aged	9.16	7.97	-1.19
Young		6.17	
Self-employed			
Old	7.58	6.42	-1.16
Middle-aged	7.00	5.62	-1.38
Young		5.04	
Statutory social security wealth			
Private employees			
Old	9.36	9.05	-0.30
Middle-aged	7.37	7.06	-0.30
Young		5.81	
Public employees			
Old	10.87	10.32	-0.55
Middle-aged	9.03	7.58	-1.45
Young		6.10	
Self-employed			
Old	7.69	7.91	0.22
Middle-aged	6.57	4.97	-1.60
Young		3.62	

Note. The statutory social security wealth, normalized by (annual) disposable income, is computed on the basis of legislation and a given retirement age. Both the expected and statutory replacement rates refer to male workers. The pre-reform and post-reforms periods are, respectively, 1989-1991, and 2004-2006. Old, middle-aged and young refer, respectively, to workers with more than 18 years of contributions in 1995, less than 18 years of contributions in 1995, and who start working after 1995.

Table 3
Financial and real wealth before and after the pension reforms

Financial wealth	*Pre-reform*	*Post-reform*	*Change after the reform*
Private employees			
Old	0.50	0.62	0.12
Middle-aged	0.42	0.46	0.04
Young		0.39	
Public employees			
Old	0.49	0.54	0.05
Middle-aged	0.41	0.54	0.13
Young		0.40	
Self-employed			
Old	0.61	0.70	0.09
Middle-aged	0.49	0.74	0.25
Young		0.55	
Real wealth			
Private employees			
Old	2.70	4.71	2.01
Middle-aged	1.80	4.32	2.53
Young		2.95	
Public employees			
Old	3.15	5.50	2.35
Middle-aged	2.30	5.36	3.05
Young		4.02	
Self-employed			
Old	5.03	9.36	4.33
Middle-aged	3.64	9.22	5.58
Young		6.51	

Note. Financial and real wealth are divided by annual disposable income. The pre-reform and post-reforms periods are, respectively, 1989-1991, and 2004-2006. Old, middle-aged and young refer, respectively, to workers with more than 18 years of contributions in 1995, less than 18 years of contributions in 1995, and who start working after 1995.

Table 4
Displacement effect for financial and real wealth - IV estimates.

	Financial wealth / Disposable income			*Real wealth / Disposable income*		
	Total sample	*Informed*	*Uninfor-med*	*Total sample*	*Informed*	*Uninfor-med*
SSW/Disposable Income	-0.082	-0.128	-0.055	-0.478	-0.761	-0.318
	(0.011)***	(0.019)***	(0.013)***	(0.070)***	(0.080)***	(0.131)*
Year 1991	-0.044	-0.008	-0.079	0.902	1.039	0.778
	(0.033)	(0.054)	(0.036)*	(0.207)***	(0.223)***	(0.353)*
Year 2004	-0.119	-0.082	-0.131	1.552	1.898	1.329
	(0.051)*	(0.083)	(0.058)*	(0.324)***	(0.344)***	(0.574)*
Year 2006	-0.108	-0.040	-0.155	1.950	2.297	1.725
	(0.054)*	(0.088)	(0.060)**	(0.341)***	(0.368)***	(0.594)**
Age	0.014	0.020	0.007	0.107	0.115	0.103
	(0.003)***	(0.004)***	(0.003)*	(0.016)***	(0.018)***	(0.029)***
Public employee	-0.059	-0.005	-0.098	0.056	0.168	0.109
	(0.041)	(0.066)	(0.045)*	(0.257)	(0.276)	(0.447)
Self-employed	-0.037	0.006	-0.064	1.569	1.661	1.562
	(0.053)	(0.084)	(0.061)	(0.333)***	(0.348)***	(0.598)**
Middle-aged	-0.159	-0.168	-0.163	-0.755	-1.132	-0.455
	(0.051)**	(0.083)*	(0.059)**	(0.326)*	(0.347)**	(0.581)
Public employee, middle-aged	0.042	-0.016	0.089	-0.016	-0.284	0.173
	(0.062)	(0.100)	(0.070)	(0.394)	(0.419)	(0.690)
Self-employed, middle-aged	0.099	0.130	0.061	-0.125	0.124	-0.443
	(0.076)	(0.126)	(0.083)	(0.480)	(0.523)	(0.820)
Public employee, after the reform	0.040	-0.033	0.105	0.474	0.551	0.252
	(0.062)	(0.101)	(0.068)	(0.392)	(0.420)	(0.676)
Self-employed, after the reform	0.117	-0.012	0.221	2.849	1.984	3.490
	(0.074)	(0.124)	(0.080)**	(0.468)***	(0.518)***	(0.787)***
Central Italy	-0.149	-0.257	-0.037	0.911	0.544	1.276
	(0.030)***	(0.050)***	(0.033)	(0.192)***	(0.208)**	(0.327)***
Southern Italy	-0.267	-0.314	-0.212	0.072	0.070	0.111
	(0.026)***	(0.044)***	(0.028)***	(0.165)	(0.182)	(0.276)
Income	0.002	0.001	0.003	0.004	-0.002	0.010
	(0.001)***	(0.001)	(0.001)***	(0.003)	(0.003)	(0.006)
High-school degree	0.177	0.251	0.095	0.997	1.247	0.737
	(0.025)***	(0.041)***	(0.027)***	(0.156)***	(0.172)***	(0.263)**
College degree	0.255	0.351	0.166	1.684	2.024	1.360
	(0.039)***	(0.067)***	(0.042)***	(0.249)***	(0.280)***	(0.411)***
Constant	0.273	0.141	0.438	-1.059	-0.610	-1.532
	(0.109)*	(0.182)	(0.117)***	(0.687)	(0.757)	(1.152)
Observation	9,123	4,598	4,525	9,123	4,598	4,525

Note. All regressions are estimated by IV; the instrument is statutory social security wealth. Data are drawn from 1989-91 and 2004-06 SHIW.. Standard errors are reported in parenthesis. Three stars indicate statistical significance at 0.1% confidence level; two stars at the 1%; one star at the 5% level.

Table 5
Displacement effect for financial and real wealth components - IV estimates.

	Risky financial assets (including mutual funds)	*Risky financial assets (excluding mutual funds)*	*Safe financial assets*	*Real estate*	*Business wealth*
SSW/Disposable Income	-0.006	-0.005	-0.076	-0.597	0.118
	(0.003)*	(0.002)*	(0.011)***	(0.044)***	(0.052)*
Year 1991	0.018	0.018	-0.062	0.764	0.087
	(0.009)*	(0.006)**	(0.031)*	(0.131)***	(0.153)
Year 2004	0.042	0.017	-0.161	1.365	0.163
	(0.014)**	(0.010)	(0.048)***	(0.205)***	(0.239)
Year 2006	0.059	0.023	-0.167	1.712	0.257
	(0.015)***	(0.010)*	(0.051)**	(0.216)***	(0.252)
Age	0.001	0.000	0.013	0.115	-0.009
	(0.001)	(0.000)	(0.002)***	(0.010)***	(0.012)
Public employee	-0.016	-0.014	-0.043	-0.009	0.049
	(0.011)	(0.008)	(0.038)	(0.163)	(0.190)
Self-employed	0.031	0.027	-0.068	-0.005	1.561
	(0.014)*	(0.010)**	(0.050)	(0.211)	(0.246)***
Middle-aged	-0.027	-0.021	-0.133	-0.905	0.133
	(0.014)	(0.010)*	(0.049)**	(0.206)***	(0.241)
Public employee, middle-aged	-0.005	0.002	0.047	0.088	-0.098
	(0.017)	(0.012)	(0.059)	(0.249)	(0.291)
Self-employed, middle-aged	0.021	0.010	0.078	-0.162	0.020
	(0.021)	(0.014)	(0.072)	(0.304)	(0.354)
Public employee, after the reform	0.021	0.015	0.019	0.439	0.042
	(0.017)	(0.012)	(0.059)	(0.248)	(0.289)
Self-employed, after the reform	-0.008	-0.023	0.125	1.191	1.639
	(0.020)	(0.014)	(0.070)	(0.296)***	(0.346)***
Central Italy	-0.038	-0.023	-0.111	0.787	0.121
	(0.008)***	(0.006)***	(0.029)***	(0.121)***	(0.142)
Southern Italy	-0.055	-0.021	-0.212	0.184	-0.126
	(0.007)***	(0.005)***	(0.025)***	(0.104)	(0.122)
Income	0.001	0.001	0.001	0.002	0.003
	(0.000)***	(0.000)***	(0.000)	(0.002)	(0.002)
High-school degree	0.040	0.017	0.136	0.971	-0.015
	(0.007)***	(0.005)***	(0.023)***	(0.099)***	(0.115)
College degree	0.041	0.023	0.215	1.122	0.518
	(0.011)***	(0.007)**	(0.037)***	(0.158)***	(0.184)**
Constant	-0.016	0.011	0.289	-0.906	-0.201
	(0.029)	(0.020)	(0.103)**	(0.435)*	(0.507)

Note. All regressions are estimated by IV; the instrument is statutory social security wealth. Data are drawn from 1989-91 and 2004-06 SHIW (9,123 observations). Standard errors are reported in parenthesis. Three stars indicate statistical significance at 0.1% confidence level; two stars at the 1%; one star at the 5% level.

Table 6
Displacement effect for financial and real wealth components - IV estimates.
Sample splits for Informed and Uniformed households

Dependent variable	*Coefficient of SSW / Disposable Income*	
	Informed	*Uninformed*
Risky financial assets (including mutual funds)	-0.007 (0.005)	-0.009 (0.004)*
Risky financial assets (excluding mutual funds)	-0.007 (0.003)*	-0.005 (0.003)
Safe financial assets	-0.120 (0.018)***	-0.046 (0.012)***
Real estate	-0.676 (0.064)***	-0.637 (0.071)***
Business wealth	-0.086 (0.045)	0.320 (0.105)**

Note. The "Informed" group includes household where the expectation error in social security wealth is less than the median. The "Uninformed" group includes those for which the expectation error is greater then the median. Each regression also includes time effects, age, and dummies for employment, cohort, interactions of employment cohort and post-reform, area of residence, income and education. All regressions are estimated by IV; the instrument is statutory social security wealth. Data are drawn from 1989-91 and 2004-06 SHIW (4,598 in the Informed group and 4,525 observations in the Uninformed group). Standard errors are reported in parenthesis. Three stars indicate statistical significance at 0.1% confidence level; two stars at the 1%; one star at the 5% level.

Table 7
Ownership of financial and real assets - IV Probit estimates.

	Risky financial assets (including mutual funds)	*Risky financial assets (excluding mutual funds*	*Safe financial assets*	*Real estate*	*Business wealth*
SSW/Disposable Income	-0.081	-0.096	0.017	-0.178	-0.084
	(0.020)***	(0.023)***	(0.018)	(0.015)***	(0.019)***
Year 1991	-0.009	-0.022	0.439	0.257	-0.031
	(0.062)	(0.069)	(0.049)***	(0.041)***	(0.059)
Year 2004	0.382	0.126	0.480	0.272	-0.023
	(0.091)***	(0.104)	(0.078)***	(0.066)***	(0.103)
Year 2006	0.491	0.201	0.517	0.297	-0.079
	(0.095)***	(0.108)	(0.083)***	(0.070)***	(0.108)
Age	0.024	0.026	-0.004	0.034	0.004
	(0.004)***	(0.005)***	(0.004)	(0.003)***	(0.005)
Public employee	-0.021	-0.189	0.125	0.024	0.128
	(0.076)	(0.086)*	(0.061)*	(0.052)	(0.080)
Self-employed	0.247	0.271	-0.044	-0.052	2.072
	(0.091)**	(0.098)**	(0.076)	(0.069)	(0.081)***
Middle-aged	-0.262	-0.279	-0.054	-0.431	-0.207
	(0.089)**	(0.103)**	(0.080)	(0.066)***	(0.104)*
Public employee, middle-aged	0.112	0.108	0.092	0.150	0.035
	(0.112)	(0.132)	(0.098)	(0.080)	(0.124)
Self-employed, middle-aged	0.398	0.349	0.189	0.034	0.019
	(0.126)**	(0.142)*	(0.115)	(0.102)	(0.124)
Public employee, after the reform	-0.220	-0.030	0.005	0.007	0.179
	(0.114)	(0.133)	(0.099)	(0.080)	(0.124)
Self-employed, after the reform	-0.613	-0.632	-0.024	0.148	0.745
	(0.125)***	(0.139)***	(0.114)	(0.099)	(0.121)***
Central Italy	-0.236	-0.256	-0.325	0.278	-0.030
	(0.048)***	(0.058)***	(0.050)***	(0.040)***	(0.056)
Southern Italy	-0.659	-0.508	-0.706	0.220	0.053
	(0.050)***	(0.057)***	(0.040)***	(0.034)***	(0.048)
Income	0.008	0.007	0.010	0.030	0.013
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
High-school degree	0.585	0.667	0.273	0.176	-0.036
	(0.044)***	(0.054)***	(0.039)***	(0.032)***	(0.046)
College degree	0.761	0.816	0.166	0.081	-0.208
	(0.061)***	(0.071)***	(0.064)**	(0.055)	(0.072)**
Constant	-2.548	-2.774	0.777	-1.603	-1.914
	(0.191)***	(0.222)***	(0.168)***	(0.141)***	(0.200)***
Marginal effect of	-0.012	-0.009	0.003	-0.063	-0.017
SSW/Disposable Income	(0.003)***	(0.0022)***	(0.003)	(0.005)***	(0.004)***

Note. All probit regressions are estimated by IV; the instrument is statutory social security wealth. Data are drawn from 1989-91 and 2004-06 SHIW (9,123 observations). Standard errors are reported in parenthesis. Three stars indicate statistical significance at 0.1% confidence level; two stars at the 1%; one star at the 5% level. The bottom two rows report marginal effects of the Social Security Wealth to disposable income ratio and the standard error.

Table 8
Ownership of financial assets (IV Probit estimates).
Sample splits for Informed and Uniformed households.

Dependent variable	*Marginal effects and standard errors of SSW/Disposable Income*	
	Informed	Uninformed
Risky financial assets (including mutual funds)	-0.011 (0.004)***	-0.018 (0.005)***
Risky financial assets (excluding mutual funds)	-0.010 (0.003)***	-0.011 (0.003)***
Safe financial assets	-0.006 (0.005)***	0.013 (0.006)*
Real estate	-0.069 (0.007)***	-0.072 (0.009)***
Business wealth	-0.033 (0.006)***	-0.008 (0.005)***

Note. The "Informed" group includes household where the expectation error in social security wealth is less than the median. The "Uninformed" group includes those for which the expectation error is greater then the median. Each regression also includes time effects, age, and dummies for employment, cohort, interactions of employment cohort and post-reform, area of residence, income and education. All models are estimated by IV; the instrument is statutory social security wealth. Data are drawn from 1989-91 and 2004-06 SHIW 4,598 in the Informed group and 4,525 observations in the Uninformed group). Standard errors are reported in parenthesis. Three stars indicate statistical significance at 0.1% confidence level; two stars at the 1%; one star at the 5% level.

Table 9
Ownership of pension plans and life-insurance – IV probit estimates.

	Pension plans			*Life-insurance policies*		
	Total sample	*Informed*	*Uninformed*	*Total sample*	*Informed*	*Uninformed*
SSW/Disposable Income	-0.007	-0.012	0.001	-0.017	-0.020	-0.022
	(0.018)	(0.026)	(0.027)	(0.015)	(0.021)	(0.025)
Year 1991	-0.039	0.073	-0.165	0.218	0.204	0.243
	(0.057)	(0.079)	(0.085)	(0.043)***	(0.059)***	(0.063)***
Year 2004	0.368	0.408	0.345	-0.061	0.012	-0.114
	(0.084)***	(0.116)***	(0.125)**	(0.070)	(0.095)	(0.106)
Year 2006	0.333	0.443	0.241	0.003	0.062	-0.043
	(0.088)***	(0.123)***	(0.129)	(0.073)	(0.101)	(0.109)
Age	0.005	0.002	0.007	-0.002	-0.001	-0.003
	(0.004)	(0.006)	(0.006)	(0.003)	(0.005)	(0.005)
Public employee	-0.050	-0.056	-0.039	-0.028	0.086	-0.153
	(0.072)	(0.098)	(0.109)	(0.054)	(0.074)	(0.081)
Self-employed	0.357	0.367	0.365	0.310	0.403	0.204
	(0.085)***	(0.113)**	(0.129)**	(0.067)***	(0.089)***	(0.104)*
Middle-aged	-0.044	-0.086	0.006	-0.074	-0.014	-0.156
	(0.083)	(0.113)	(0.128)	(0.070)	(0.095)	(0.106)
Public employee, middle-aged	-0.067	-0.117	-0.019	-0.039	-0.060	-0.012
	(0.106)	(0.144)	(0.158)	(0.085)	(0.114)	(0.128)
Self-employed, middle-aged	0.178	0.138	0.226	0.076	-0.116	0.293
	(0.118)	(0.163)	(0.172)	(0.097)	(0.135)	(0.143)*
Public employee, after the reform	-0.041	-0.032	-0.052	0.078	-0.066	0.236
	(0.106)	(0.146)	(0.155)	(0.084)	(0.115)	(0.126)
Self-employed, after the reform	-0.448	-0.408	-0.509	0.014	0.020	-0.024
	(0.115)***	(0.163)*	(0.163)**	(0.095)	(0.134)	(0.136)
Central Italy	-0.112	-0.039	-0.190	0.031	0.046	0.014
	(0.045)*	(0.062)	(0.066)**	(0.040)	(0.055)	(0.057)
Southern Italy	-0.599	-0.573	-0.627	-0.104	-0.029	-0.177
	(0.047)***	(0.068)***	(0.066)***	(0.035)**	(0.049)	(0.051)***
Income	0.004	0.005	0.004	0.007	0.006	0.008
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
High-school degree	0.313	0.345	0.280	0.224	0.267	0.170
	(0.040)***	(0.057)***	(0.057)***	(0.033)***	(0.046)***	(0.048)***
College degree	0.479	0.593	0.367	0.288	0.347	0.215
	(0.059)***	(0.085)***	(0.083)***	(0.051)***	(0.072)***	(0.072)**
Constant	-1.718	-1.721	-1.749	-1.030	-1.173	-0.882
	(0.177)***	(0.250)***	(0.255)***	(0.145)***	(0.204)***	(0.209)***
Marginal effect of the	-0.001	-0.002	0.001	-0.005	-0.006	-0.006
SSW/Disposable Income	(0.001)	(0.004)	(0.005)	(0.004)	(0.006)	(0.007)
Observations	9,120	4,597	4,523	9,104	4,586	4,518

Note. The "Informed" group includes household where the expectation error in social security wealth is less than the median. The "Uninformed" group includes those for which the expectation error is greater then the median. All probit regressions are estimated by IV; the instrument is statutory social security wealth. Data are drawn from 1989-91 and 2004-06 SHIW. Standard errors are reported in parenthesis. Three stars indicate statistical significance at 0.1% confidence level; two stars at the 1%; one star at the 5% level. The marginal effects of the Social Security Wealth to disposable income ratio and the standard error is reported in the third and second row from the bottom.