CENTRO STUDI IN ECONOMIA E FINANZA

CENTRE FOR STUDIES IN ECONOMICS AND FINANCE

WORKING PAPER no. 52

Tax Incentives and the Demand
for Life Insurance: Evidence from Italy

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February 2001

cSEF Working Paper no. 52

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Tullio Jappelli [*] and Luigi Pistaferri [**]

Abstract

The theoretical literature suggests that taxation can have a large impact on household portfolio selection and allocation. In this paper we consider the tax treatment of life insurance, considering the cancellation of tax incentives in Italian life insurance contracts for investors with high marginal tax rates and the introduction of incentives for those with low rates. Using repeated cross-sectional data from 1989 to 1998, we find that the tax reforms had no effect on the decision to invest in life insurance or the amount invested. The likely explanations are the lack of information and lack of committment to long-term investment..

[*]   CSEF, Università di Salerno, and CEPR.

[**] Stanford University, CSEF, Università di Salerno, and SIEPR

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1 Introduction

The theoretical literature suggests that taxation has a potentially large impact on household portfolio selection and allocation. The theory has two central insights: that what matters for investors is the after-tax return on each asset, and that the differing fiscal treatment of the various assets create wedges in the structure of those returns. The theory can tackle fundamental features of household portfolio choice. For instance, it can account for corner solutions in portfolio selection, i.e. it can explain why in the case of tax-favored assets with a cap on contributions it is optimal to contribute up to the limit before allocating the portfolio to other, unsheltered assets not favored by the tax code.

In this paper we bring fresh evidence to the literature on portfolio taxation by studying the portfolio effect of changes in the tax treatment of life insurance, using repeated cross-sectional data. The change that we consider is the cancellation of tax incentives in Italian life insurance contracts for investors with high marginal tax rates and the introduction of incentives for those with low marginal tax rates. Our sample, a decade of microeconomic data on household assets, income and demographic variables, provides a truly unique setting for spotlighting the effect of taxes on household portfolio selection and allocation.

A study of this kind raises some crucial identification issues. Theory predicts that portfolio choice will be affected by household resources as well as by after-tax interest yields. However, as the after-tax yield on some assets depends on the taxpayer's marginal income tax rate, which is inherently correlated with the level of income, it is difficult to disentangle genuine variation in after-tax interest rates, for given income, from genuine variations in income, for given after-tax interest yields. For some assets this is actually impossible, because at any point in time all households face the same rate of return (Poterba, 2000 and 2001).

Despite the identification problems, some empirical studies do document the existence of a link between marginal tax rates and portfolio choice. In general, applied work in this area has estimated the tax rate elasticity of participation in tax-sheltered assets and their portfolio shares controlling for household income, wealth and other demographic variables. The most recent study is Poterba and Samwick (1999), who build on the seminal contributions of Feldstein (1976) and King and Leape (1998). Poterba and Samwick impute marginal tax rates in the Survey of Consumer Finances and estimate

probit models for eight broad asset categories. Their results support the view that taxes affect asset selection. For instance, controlling for income and wealth, they find that the probability of individuals' investing in tax-deferred accounts, equity and bonds is a positive function of the marginal tax rate. To the best of our knowledge, outside the United States the evidence on the role of taxes in shaping household portfolios is limited to the Netherlands (Alessie, Hochguertel and van Soest, 1997), Sweden (Agell and Edlin, 1991) and the United Kingdom (Banks and Tanner, 2001).[1] Poterba (2001) reviews these empirical studies and concludes that investors take the tax treatment into account when selecting their asset menu. In all countries the evidence of a link between taxes and portfolio allocation (or portfolio shares) is weaker than for asset selection.

Identifying the tax effects on portfolio choice is hard in the Italian case as well. For most financial assets there is no cross-sectional variability in rates of return. For instance, pre-interest income on bank deposits, government bonds, corporate bonds and mutual funds is subject to a flat rate withholding tax in settlement of the tax liability, so the after-tax yields on these assets are identical for all investors. The return on other financial instruments, such as stocks, life insurance and pension funds depends on the marginal tax rate and therefore does display cross-sectional variability. In order to identify the effect of taxes on portfolio choice, however, one needs not only cross-sectional variability in returns but also genuine variation in after-tax yields that is not perfectly correlated with the general income tax rate.

Life insurance contracts provide a good opportunity to test the theory of portfolio taxation in Italy. From 1986 to 1992 life insurance premiums were fully tax-deductible up to 1,300 euro (2.5 million lire), so that after-tax returns increased with the marginal tax rate. In 1992 the deduction was made proportional to premium payment (a flat rate of 27 percent, further reduced to 22 percent in 1994). As a consequence, the extra yield on life insurance policies over non-sheltered financial assets was substantially reduced for the rich, slightly increased for the poor, and unchanged for investors in the intermediate tax brackets. These tax changes provide the ground for our empirical analysis. If the tax reform had an impact on asset selection and portfolio allocation, it should emerge among households in the highest and

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[1] Banks and Tanner (2001) find that in the U.K. the probability of investing in Personal Equity Plans and in Individual Savings Accounts, both of which allow individuals to earn tax-free returns, increases with the marginal tax rate.

lowest tax brackets after the reform.

In our empirical analysis the yield of life insurance policies varies both over time and across households. Before 1992 the deduction was proportional to the marginal income tax rate, so that the return varied across households. After the reforms the deduction was proportional to the premium paid so that the return was constant across households. Tax effects can be identified because the reforms altered the incentives for each investor so that we also have time variability on the after-tax return of life insurance.

The rest of the paper is organized as follows. Section 2 explains how the 1992-94 reforms affected the after-tax return on life insurance. Section 3 presents the data used in the empirical analysis, drawn from the 1989-98 Survey of Household Income and Wealth. Section 4 organizes the results in three parts. First, we present difference-in-difference estimates of the impact of the tax reform. We then control for additional determinants of the demand for life insurance with probit and tobit analyses. Finally, we examine the potential impact of other policy reforms that might have affected the demand for life insurance (mainly the 1992 pension reform) and the effect of the tax reform on other financial assets. There turns out to be no detectable effect of the tax reforms on the demand for life insurance as such or on the amount invested. Section 5 suggests various explanations for these findings, such as the role of information, lack of commitment and minimum investment requirements. Section 6 summarizes the results.

2　The tax reform

Given the very limited role of pension funds and other retirement-oriented financial instruments, life insurance has been the main private vehicle for long-term saving in Italy in the past two decades. In 1986 the Italian tax code introduced substantial incentives for contributions in life insurance. Premiums up to 2.5 million lire per year (about 1,300 euro) were made deductible from the policy-holder's general income tax base. Eligibility required at least 5 years of contributions (the deduction applied to individuals, not households). In the case of early withdrawal, the policy-holder lost all the tax advantages and was entitled to receive only the cumulated nominal premiums.[2]

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[2]Furthermore, the insurance company cannot sell credit contracts to the investor, so the premium cannot be financed by borrowing.

With the reform of 1992, the tax deduction became a flat 27 percent of the premium (the contribution cap and the other tax features were unaffected). As a practical matter, the after-tax return was lowered for those with marginal tax rates above 27 percent and increased for those with tax rates below that threshold. Those with a 27 percent marginal tax rate were unaffected. The 1994 reform further reduced the deduction to 22 percent of the contribution (the cap still remained unchanged).

Since the effect of the reforms depends on the investor's tax bracket, let us briefly describe the personal income tax system in Italy. Table 1 shows the 7 tax brackets in place between 1989 (the first year of our sample) and 1998. Two changes are worth noting. Until 1991 the brackets were indexed to inflation; indexation was then ended in 1993. In 1992 marginal tax rates were raised by one percentage point for all but the bottom two brackets.

The change in incentives was substantial, especially for investors in the top brackets. To illustrate the effect of the 1992-1994 reforms, Figure 1 reports the excess return to life insurance over a non-sheltered saving instrument for an investor contributing an annual premium P for T years. For this computation we need to take into account other features of life insurance contracts, which are also described by Jappelli and Pagano (1994).

Premiums are taxed at the time they are paid at the flat rate of 2.5 percent, and there is a proportional commission. As a result, the actual net amount invested each year is $\frac{P}{1+f}$, where f is the sum of the 2.5 percent tax on premiums plus the commission rate charged by the insurance company (the typical commission rate during the sample period is 7.75 percent). A realistic estimate of f is therefore 10.25 percent. At the expiration of the policy the investor opts between a lump-sum benefit and an annuity. Virtually all choose the former and pay taxes at the rate of $\tau_c = 12.5$ percent on the difference between the lump-sum payment and the sum of premiums paid since the start of the contract, $T \times P$.[3] During the sample period the average nominal return on the net amount invested $\frac{P}{1+f}$ was 10.5 percent, or approximately equal to the average after-tax nominal interest rate on government bonds (r). Denoting by τ the marginal personal income tax rate, Jappelli and Pagano (1994) compute the yearly excess return of the

[3] If one instead opts for an annuity, 60 percent of it is considered taxable income. Because of the different tax treatment between annuities and lump-sum payments, almost invariably life insurance contracts terminate with the client taking the option of collecting the capital, rather than converting it into a stream of yearly income payments. Thus that is the only option that we consider here.

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policy over the interest rate r as:

$$\left\{ \left[\left(\frac{1 - \tau_c}{1 + f} + \tau \right) + \frac{\tau_c T}{\left[\left(\frac{1+r}{r} \right) (1 + r)^T - 1 \right]} \right]^{\frac{1}{T}} - 1 \right\} (1 + r)$$

The diagonal line in Figure 1 shows how excess returns vary with the marginal tax rate in the pre-reform regime for an investor who pays premiums of at most $1,300$ euro and for $T = 5$ years (the minimum). For investors in the first tax bracket, the excess return was actually negative because the commission and the tax on premiums (f) outweighed the tax incentive. But the incentive for the wealthy was substantial. For instance, an investor with a marginal tax rate of 33 percent gained yearly excess returns of 4.4 percentage points (in the top bracket, 7.4). After 1992 the deduction is 350 euro ($0.27 \times 1,300$), further reduced to 286 euro in 1994 ($0.22 \times 1,300$). Since the reforms eliminate the positive relation between excess returns and marginal tax rates, the two curves in Figure 1 become flat.

In Figure 2 we plot the difference between the cash value of the policy before and after the tax reforms. The cash value is defined as the cumulated value of life insurance for an investor who contributes 1,300 euro per year for 5 years. For the lower-income taxpayer the difference is positive, while for the rich it is substantially negative (almost 2,000 euro for the highest tax bracket).

The theory of portfolio taxation suggests that the abrupt cancellation of the tax incentive for the rich and the greater incentive given to the lower-income households should have reduced the former's propensity to contribute to life insurance relatively to the latter's. Our empirical strategy is thus to divide the sample into groups affected and unaffected by the reforms, according to their marginal tax rate, and to test whether the reform had any effect on life insurance purchases by the groups affected.

The validity of the test rests on three identifying assumptions: (1) the tax reform is exogenous with respect to the decision to invest in life insurance, (2) the reform was not anticipated, and (3) it is exogenous with respect to changes in sample composition.

As far as assumptions (1) and (2) are concerned, we believe that the possible endogeneity of the reforms and the presence of anticipated effects can be safely ruled out. The reason is that the reforms were not implemented

in order to offset the different paths of life insurance demand by taxpayer groups (if this had been the case, there would be an obvious problem of policy endogeneity). Rather, the 1992 reform was part of a major deficit-reduction package, prompted by a severe political crisis coupled with the dramatic devaluation of the lira; and it was followed shortly by the deepest recession of the post-war era. For the same reason, the reform is unlikely to have been anticipated by investors.

Assumption (3) posits that shifts in sample composition are exogenous with respect to the decision to purchase life insurance (and to the amount invested). In essence, we require that movements across the tax distribution (into higher or lower brackets) are independent of life insurance decisions, i.e. that investors did not move within the income distribution as a result of the tax reform itself.

3   The data

The 1989-1998 Survey of Household Income and Wealth (SHIW) provides a unique opportunity to test the effect of the tax reform on the demand for life insurance. Conducted by the Bank of Italy in 1989, 1991, 1993, 1995 and 1998, it spans pre-reform and post-reform years. It contains detailed information on life insurance participation and contributions, income, financial wealth, real wealth and other important determinants of portfolio choice.

Sampling is in two stages, first municipalities and then households. Municipalities are divided into 51 strata defined by 17 regions and 3 classes of population size (more than 40,000, 20,000 to 40,000, less than 20,000). Households are randomly selected from registry office records. Each survey collects data on a representative sample of about 8,000 households, defined as groups of individuals related by blood, marriage or adoption and sharing the same dwelling.

To classify households according to life insurance incentives, we need to impute the marginal income tax rate. The SHIW collects data on *after-tax* wages, salaries, self-employment income, income from capital and income from financial assets. In estimating the marginal personal income tax rate one should consider that this might be affected by portfolio choices, a problem pointed out by Poterba and Samwick (1999). Although in Italy income from most financial assets (such as mutual funds and government bonds) is subject to a flat rate withholding tax, dividends and income from capital (e.g., rents)

enter the general income tax base and therefore affect marginal rates. To avoid this potential endogeneity, we impute tax rates on the basis of labor income alone, using the tax brackets and marginal rates reported in Table 1. Since the deduction applies to individual investors, we proxy the individual's marginal tax rate with that of the household head.

In Table 2 we report the proportion of households investing in life insurance and the amount invested from 1989 to 1998 for 5 tax brackets. The rows of the upper panel show that participation in life insurance is correlated with income. For instance, in 1998 only 11 percent of those in the lowest tax brackets had such assets, compared with over 50 percent in the highest brackets. One can also see that the fraction of contributors increased substantially for all income groups over the decade (from 3 to 11 percent in the lowest and from 25 to 54 percent in the highest tax brackets). The lower panel reports average contributions, conditional on participation: the amount invested is positively correlated with income and the average contribution increases over time.

As is explained in Section 3, the reforms enacted in 1992 and 1994 should have reduced the tax incentive to purchase life insurance for the rich and increased it for the poor. Table 2 shows that the demand for life insurance is lower for the poor and higher for the rich, and increasing for all groups over time. But this cannot be taken as evidence either for or against the thesis that taxation affects portfolio choice. The hypothesis implies that following the reform the poor's demand for life insurance should increases *faster* than that of the rich.

4   The results

We now examine the effect of the tax reform on the demand for life insurance using the difference-in-difference estimator. The model is based on a reduced form of the demand for life insurance. In the empirical analysis we identify a group of investors unaffected by the reform and two groups that were affected, in different ways. We call the former the "control" group, and the latter the "treatment" groups. We consider the effect of the 1992 reform and the cumulative impact of the 1992-94 reforms separately.

4.1 Difference-in-difference evidence

For convenience in exposition, we illustrate the difference-in-difference estimator for only one reform affecting the amount invested by only one group. Extension to two treatment groups, to more than one reform or to the decision to invest (rather than the amount) is straightforward.

Denote by $a_{i\in g,t}$ the amount that investor i in group g (the control group) contributes to life insurance in period t. In period t the tax deduction is proportional to the marginal tax rate, but in period t' (where $t < t'$) it is proportional to the contribution. According to the theory of portfolio taxation, the cancellation of the tax incentive should affect investors in the treatment group g' (high tax brackets) but not the control group g (with a marginal tax rate of 0.22 in 1992 and 0.27 in 1994). We assume that before the reform the amount invested by the two groups is:

$$a_{i\in g',t} = \beta_t + f_{g'} + u_{i\in g',t}$$
$$a_{i\in g,t} = \beta_t + f_g + u_{i\in g,t}$$

Both groups are subject to an aggregate shock β_t. Long-term differences between groups are captured by the fixed effects f_g and $f_{g'}$. In the absence of long-run differences and aggregate shocks, the average demand for life insurance is equal for g and g'. After the tax reform the demand shifts for both groups:

$$a_{i\in g',t'} = \beta_{t'} + f_{g'} + \delta + u_{i\in g',t'}$$
$$a_{i\in g,t'} = \beta_{t'} + f_g + u_{i\in g,t'}$$

According to this specification, the reform affects the demand for life insurance by an amount $\delta < 0$ in the treatment group. Given this structure, one can identify the effect of the reform using the difference-in-difference estimator:

$$E\left(a_{i\in g',t'} - a_{i\in g',t}\right) - E\left(a_{i\in g,t'} - a_{i\in g,t}\right) = \delta$$

The identifying assumption, then, is that controlling for group and time effects, the error term u has mean zero.[4]

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[4]This is where we need the assumption that any change in sample composition between the two groups is exogenous with respect to the demand for life insurance.

The table below illustrates how this estimator identifies δ. The inner cells give the conditional means, the column total cells the difference between the demand for life insurance after and before the reform $(t' - t)$ within the same group, the row total cells the difference between the demand of the treatment and the control group $(g' - g)$ in the same period. Finally, the grand total cell estimates the impact of the tax reform (δ).

	g' (treatment group)	g (control group)	$(g' - g)$
t' (after the reform)	$\beta_{t'} + f_{g'} + \delta$	$\beta_{t'} + f_g$	$f_{g'} - f_g + \delta$ $(g'-g)$, after
t (before the reform)	$\beta_t + f_{g'}$	$\beta_t + f_g$	$f_{g'} - f_g$ $(g'-g)$, before
$(t' - t)$	$\beta_{t'} - \beta_t + \delta$ $(t'-t)$, treatment	$\beta_{t'} - \beta_t$ $(t'-t)$, control	δ diff-in-diff

Since time effects are common to both groups, in period t the control and treatment groups differ only in long-run fixed effects, $(f_{g'} - f_g)$. Thus, the model is perfectly consistent with the fact that high-income investors behave differently than those in low brackets, regardless of policy interventions. In period t' the treatment group now differs not only because of fixed effects, but also because of the tax reform $(f_{g'} - f_g + \delta)$. Provided that long-run differences in the demand for life insurance are constant over time, the difference between the difference in the demand between the two groups after the reform and the difference before it identifies the effect of the reform. A finding that δ is negative signals that the reform has reduced the propensity of rich tax-payers to purchase life insurance.[5] By appropriately redefining the dependent variable a or the treatment group g', one can readily extend this framework to examine participation rather than the amount invested and the separate behavior of the low-income group (where theory suggests $\delta > 0$).

Table 3 reports the results of the difference-in-difference estimates for

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[5]This estimation strategy is closely connected with recent work on health insurance. The U.S. Tax Reform Act of 1986 introduced a new tax subsidy for health insurance for the self-employed. Gruber and Poterba (1994) examine the impact, with an identification strategy that relies on an exogenous shift in the after-tax price of health insurance between self-employed and payroll employees after the reform. We instead rely on an exogenous shift in the after-tax return to life insurance.

participation.[6] The first panel looks at the impact of the 1992 reform on the poor, a group whose tax incentive to invest in life insurance was increased. In this experiment the pre-reform period is 1989-91, the post–reform period is just 1993, low-income tax-payers are the treatment group, and those with a 27 percent marginal tax rate are the control group. The first row shows that after the reform the difference between the control and the treatment group is −3.1 percentage points, the second row that before the reform the difference was −8 points. The difference-in-difference estimate is 4.9 percentage points (and statistically different from zero at the 1 percent level), indicating that low income tax payers increased participation more than those who were not affected by the reform. This result therefore supports the theory of portfolio taxation. However, the second panel shows that for high income taxpayers too the difference-in-difference estimate is positive (and statistically different from zero), clashing with the theory. The reason is that participation actually increases in the treatment group (from 25 to 28.1 percent), but is roughly constant in the control group (from 11.5 to 10.9 percent). Thus the difference-in-difference estimate comes entirely from the change in participation of investors in the treatment group.

The difference-in-difference estimates in the second panel of Table 3 refer to the combined effect of the 1992-94 reforms. In this experiment the pre-reform period is again 1989-91, but the post-reform period is now 1995-98 (data for 1993 are excluded). For both low- and high-income taxpayers the difference-in-difference estimate is small, and not statistically different from zero.

Table 4 reports difference-in-difference estimates for the amount invested. The results mirror those for participation. The upper panel indicates that the 1992 reform increases the amount invested by both the rich and the poor compared with the control group. The difference-in-difference estimates for the 1992-94 reforms signal no change for the poor and an increase for the rich. Overall, the results are hard to reconcile with portfolio taxation theory.

There are two main reasons why the difference-in-difference estimates may not pin down the effect of the tax reform. First, the effect could be diluted because other determinants of life insurance account for different behavior across groups. The difference-in-difference approach posits that investors are

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[6]Given that the analysis is cast in the framework of a linear probability model, the difference-in-difference estimator of δ is not fully efficient (see Maddala, 1984). A more efficient estimator is based on a weighted least squares approach.

different only because they belong to different tax brackets. But tax brackets are undoubtedly correlated with other characteristics. In other words, the difference-in-difference estimator summarizes too much information in just two double differences. Second, the difference-in-difference estimator does not handle the analysis of participation properly, because the estimated probabilities of investing in life insurance do not necessarily lie in the $[0, 1]$ range. Thus, we turn to probit and tobit analysis for participation and amount invested, controlling for other household characteristics.

4.2 Regression evidence

In a standard regression framework, we can estimate the effect of the tax reform on the demand for life insurance by pooling data for the years before and after the reform and regressing the demand on year dummies, group dummies, and interaction terms between dummies for the two groups affected by the reform and a dummy for the post-reform period. The interaction terms capture the effect of the reform.

To translate the difference-in-difference approach into a regression equation, we consider two time periods, t and t', and three groups of investors: g_2 is unaffected by the reforms, g_1 and g_3 represent low and high-income taxpayers respectively. The demand for life insurance can be written as:

$$a_{i \in g_j, s} = X'_{i \in g_j, s} \theta + v_{i \in g_j, s}$$

for $j = 1, 2, 3$ and $s = t, t'$. The term $v_{i \in g_j, s}$ captures variability in the demand for life insurance that is not explained by variability in observable characteristics $X_{i \in g_j, s}$. Using the same notation as in Section 4.1, we assume that in the pre-reform period t:

$$v_{i \in g_j, t} = \beta_t + f_{g_j} + u_{i \in g_j, t}$$

while in period t':

$$
\begin{aligned}
v_{i \in g_1, t'} &= \beta_{t'} + f_{g_1} + \delta_{g_1} + u_{i \in g_1, t'} \\
v_{i \in g_2, t'} &= \beta_{t'} + f_{g_2} + u_{i \in g_2, t'} \\
v_{i \in g_3, t'} &= \beta_{t'} + f_{g_3} + \delta_{g_3} + u_{i \in g_3, t'}
\end{aligned}
$$

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The theory of portfolio taxation predicts $\delta_{g_1} > 0$ and $\delta_{g_3} < 0$.

To analyze the impact of the 1992 reform we define the following dummy variables:

$$D_{g_1} = \begin{cases} 1 & \text{for households with } \tau < 0.27 \\ 0 & \text{for households with } \tau \geq 0.27 \end{cases}$$

$$D_{g_3} = \begin{cases} 1 & \text{for households with } \tau > 0.27 \\ 0 & \text{for households with } \tau \leq 0.27 \end{cases}$$

$$D_{t'} = \begin{cases} 1 & \text{in 1993} \\ 0 & \text{in 1989-91} \end{cases}$$

The group dummies D_{g_1} and D_{g_3} single out investors affected by the reform (those either below and above $\tau = 0.27$), and $D_{t'}$ investors observed after the reform.

To estimate the impact of the 1992-94 reforms we define $D_{g_1} = 1$ for investors with $\tau < 0.22$ and $D_{g_3} = 1$ for those with $\tau > 0.22$. In this specification the time dummy $D_{t'}$ takes the value of 1 in 1995-98 and 0 in 1989-91 (the transitional year 1993 is excluded).

Pooling all data from the pre- and post-reform periods, one can write the demand for life insurance of investor i in group g_j at time s (t or t'):

$$
\begin{aligned}
a_{i \in g_j, s} &= X'_{i \in g_j, s} \theta + D_{g_1} \left(1 - D_{t'}\right) v_{i \in g_1, t} + \left(1 - D_{g_1} - D_{g_3}\right) \left(1 - D_{t'}\right) v_{i \in g_2, t} \\
&\quad + D_{g_3} \left(1 - D_{t'}\right) v_{i \in g_3, t} + D_{g_1} D_{t'} v_{i \in g_1, t'} + \left(1 - D_{g_1} - D_{g_3}\right) D_{t'} v_{i \in g_2, t'} \\
&\quad + D_{g_3} D_{t'} v_{i \in g_3, t'} \\
&= \left(\beta_t + f_{g_2}\right) + X'_{i \in g_j, s} \theta + \left(\beta_{t'} - \beta_t\right) D_{t'} + \left(f_{g_1} - f_{g_2}\right) D_{g_1} \\
&\quad + \left(f_{g_3} - f_{g_2}\right) D_{g_3} + \delta_{g_1} D_{g_1} D_{t'} + \delta_{g_3} D_{g_3} D_{t'} + u_{i \in g_j, s} \qquad (1)
\end{aligned}
$$

The second equality is obtained by replacing the expressions for $v_{i \in g_j, t}$ and $v_{i \in g_j, t'}$ defined above. Equation (1) has an immediate regression representation. The group dummies (D_{g_1} and D_{g_3}) and the time dummy ($D_{t'}$) measure, respectively, permanent differences between groups in the demand for life insurance and shifts due to common time effects. The interaction terms $D_{g_1} D_{t'}$ and $D_{g_3} D_{t'}$ identify the impact of the reform for group g_1 and group g_3 (i.e., the parameters δ_{g_1} and δ_{g_3}). In contrast to the difference-in-difference approach of the previous section, this framework allows us to

consider additional explanatory variables that affect the demand for life insurance (the vector of covariates $X'_{i \in g_j, s}$).

To introduce the regression analysis, we report in Table 5 sample averages for contributors and non-contributors in the pooled 1989-98 sample. Contributors and non-contributors differ considerably in resources and demographic characteristics. Contributors' income is about 50 percent higher, and their wealth is about twice as great. Demographically, contributors are younger, have more schooling, are more likely to be married and male; they also have larger households, and larger shares of extended families (adults other than the head and the spouse) and of more than one income recipient. Finally, the propensity to invest in life insurance is considerably greater for people not living in the South and for the self-employed. As we shall see, the regression results broadly confirm the descriptive analysis.

Table 6 reports probit and tobit regressions to analyze, separately, the impact of the 1992 and of the combined 1992-94 reforms. The specification includes indicators for marital status, gender, residence in the South, nuclear and extended households, two dummies for income recipients, a dummy for self-employment, three age dummies (35-50, 51-65, and over 65), three schooling dummies (junior high school, high school, university), and four dummies for income and wealth quartiles. As in equation (1), we test the impact of the reform by introducing dummies for high and low marginal tax rates (D_{g_1} and D_{g_3}), year dummies ($D_{t'}$), and the interaction of the post-reform years with the tax dummies ($D_{g_1} D_{t'}$ and $D_{g_3} D_{t'}$).

Overall, we do not find evidence that tax considerations shape the demand for life insurance, either at the extensive margin (the probit) or at the intensive margin (the tobit). The first two columns refer to the 1992 reform. The estimated probability of investing in life insurance is a concave function of age and an increasing function of disposable income and total assets. The probability is about 6 percentage points higher for households with high school or university education, for extended households and for the self-employed. The year dummies (not reported) show that over the sample period the demand has increased . In the probit regressions the two dummies for the marginal tax rate and the two interaction terms are small in absolute value, not statistically different from zero and not statistically different from each other.

The tobit estimates for the amount invested confirm this pattern. The income and wealth coefficients indicate that households in the top quartiles of those distributions invest almost 1,000 euro more than those at the bottom.

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The year dummies are again increasing over time, but the tax dummies and the interaction terms do not contribute much to explaining the demand (the effect for the rich is statistically different from zero at the 5 percent level, but the sign is opposite to theoretical predictions).

The other two regressions in Table 6 focus on the combined effect of the 1992-94 reforms, skipping the intermediate 1993 survey. The results are qualitatively unchanged. In particular, the interaction terms are not statistically different from zero, and the hypothesis $\delta_{g_1} = \delta_{g_3} = 0$ cannot be rejected.

4.3   Sensitivity analysis

As a check of robustness of the results we consider variables that account for the effect of the pension reforms enacted at about the same time as the tax reforms. In the second half of 1992 the Italian government presented a fiscal package raising social security contributions by 0.6 percent and halting pension indexation for six months. This was followed by a major reform of the social security system in 1992 raising the retirement age and reducing pension wealth for younger households; specifically, workers with less than 15 years of social security contributions were penalized. By reducing public pension wealth, the reform might have spurred the demand for private retirement instruments (such as life insurance), which could have attenuated the impact of the tax incentive reforms on the latter. To control for this, we add a dummy for households where the head has less than fifteen years of social security contributions, the interaction of the latter with post-reform years (1993, or 1995-98), and the expected years to retirement. The latter is the difference between expected retirement age (elicited directly in the survey) and current age. In all specifications the pension reform variables are estimated with large standard errors. The coefficients and standard errors measuring the impact of the tax reform are essentially unchanged.

Since the 1992-94 reforms did not affect the demand for life insurance, we expect no impact of the reform on the demand for other financial assets either. We thus estimate regressions for participation and amount invested for assets other than life insurance.[7] We consider the same specification used for life insurance for the following categories of financial assets: bank

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[7] Given our reduced-form approach, we do not test the restrictions arising from the theory of portfolio choice (such as symmetry or homogeneity).

deposits, certificates of deposit, short-term and long-term government paper, private bonds, stocks, mutual funds and pension funds. In no case do we find a statistically significant effect (at 10 percent or lower) of the tax reform on either participation or amount invested.[8] For brevity, these regressions are not reported.

5   Interpretation

The previous section has shown that the demand for life insurance is not sensitive to exogenous changes in the return to these assets. Our findings are therefore at variance with the theory of portfolio taxation, which suggests that investors select and allocate their wealth on the basis of after-tax returns. It is worth stressing that our results are perfectly consistent with the rapid development of the life insurance market in Italy in the last decade. As is highlighted in Table 2, both poor and rich taxpayers have increased participation and contributions. But the regression analysis shows that the gap in participation and contributions between the two groups has not narrowed, or at least not significantly.

Now let us review various explanations for these findings. In principle, the absence of the taxation effect on the demand for life insurance could be explained by sample misclassification. The imputation procedure for the marginal tax rate uses the net labor income of the head and the tax brackets reported in Table 1. This procedure does not take into account tax deductions that depend on household size and composition, occupation and selected expenditures (such as out-of-pocket medical expenses, charitable donations and home mortgage interest).[9] These deductions reduce investor's actual marginal tax rate, so that our imputed rate may be overestimated. But it is unlikely that such misclassification could account for our results. First of all, we only consider three very broad tax brackets (for instance, $\tau < 0.27$, $\tau = 0.27$ and $\tau > 0.27$). Second, the potential overestimation of the marginal tax rate contaminates only the rich group (which may in fact include some

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[8]There is one exception, namely the probit regression for short-term government paper, where the interaction of post-reform years and the rich taxpayer dummy is negative and statistically different from zero.

[9]As in most other countries, the tax code allows taxpayers to claim deductions for dependent children and spouse. Deductions generally differ by occupation (employees vs. self-employed).

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with $\tau \leq 0.27$), but not the group with $\tau < 0.27$. Thus in Table 6 one should still find a positive effect on the demand for life insurance of poor taxpayers, while in fact there is none. Finally, even when we interact the post-reform period with $\tau > 0.45$ (a rate that is unlikely to be affected by measurement error) the coefficient is still insignificant. The search for explanations must therefore turn to economic, not econometric, problems. From an economic point of view, the results are not so surprising considering that a vast majority of savers did not purchase life insurance even in the pre-reform years, when the excess return was as high as 8 percentage points. In our view, this lack of participation in life insurance and of response to generous tax treatment (even post-reform) can be explained by at least four factors: commitment, borrowing constraints, minimum investment requirements and information costs. We assess the importance of each in turn.[10]

In Section 2 we mentioned that in order to be eligible for the tax deduction the insurance contract must last a minimum of 5 years. If it is terminated earlier the policy-holder loses all tax advantages, and cashes in only the cumulated nominal premiums. That is, if the investor needs to liquidate the policy, he incurs a capital loss proportional to the inflation rate. Therefore, investment in life insurance requires considerable commitment and a relatively long planning horizon. Investors with potential short-term liquidity needs are reluctant to buy because they fear a capital loss. Typically, these are people with limited access to credit markets, with high income risk or health-related hazards or who are planning to purchase a house.[11] Credit rationing and income risk are far more important for low-wealth investors. Wealth therefore represents a key to entry into the life insurance market.

A further reason why many are discouraged from purchasing life insurance are minimum investment requirements. These do not apply universally in the Italian insurance market and are not strictly regulated. Nevertheless, in practice most insurance companies do enforce minimum accumulation plans, for instance requiring yearly contributions of at least 200 or 300 euro. Clearly, minimum investment requirements effectively screen out low-wealth investors.

While commitment and minimum investment requirements may explain why so many of the relatively poor do not purchase life insurance, they

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[10] Vissing-Jorgensen (2000) provides evidence that transaction costs are a significant factor in explaining why about half of all U.S. households do not hold stocks.

[11] Guiso and Jappelli (2000a) advance a similar argument to explain why many investors are unwilling to purchase mutual funds that entail entry or exit costs.

cannot account for the non-participation of the wealthy. Table 2 shows that in 1998 over 60 percent of households with marginal tax rates of 41 percent and almost 50 percent of those with a rate of 46 percent did not invest in life insurance. According to Figure 1 these households would have enjoyed an excess return of about 3 percentage points over an unsheltered asset even in the less favorable post-1994 regime.

The behavior of this group of investors can perhaps be explained by bringing information costs into the picture. While in general financial information is not observed, the 1995 and 1998 SHIW elicit data on the respondents' knowledge about 17 financial assets, asking:

"I will now show you a list of possible ways of saving [a list of 17 financial assets is shown to the respondent]. Do you, or anybody in your family, know this asset, even because you have heard this asset mentioned?".

The list spans several types of checking and saving accounts, private and government bonds, mutual funds and stocks. Even though it does not include life insurance, the survey remains very instructive. Guiso and Jappelli (2000) report that about one third of households did not know about stocks in both 1995 and 1998, and that about 50 percent did not know mutual funds in 1995 and 45 percent in 1998. On average, people had heard of only half of the asset listed. The econometric analysis reveals that education is a very strong predictor of financial information, but wealth and income are not: even rich investors tend to lack basic financial information.[12] Although we do not have direct information, we find it highly plausible that basic information on life insurance policies is also poor. This suggests that a more sophisticated understanding of the tax treatment of life insurance and the 1992-94 tax incentive reforms is even less common among potential investors.

Finally, consider that supply factors are at least as important as demand for financial assets. In Italy, as elsewhere, the placement of "sophisticated" assets such as mutual funds and life insurance is often driven by vendors' initiative rather than investors' active portfolio management. For more than a decade now insurance companies' marketing has pointed out the existence of tax incentives, but has not equally advertised the change in incentives following the 1992-94 reforms. On this ground, it is not surprising that the different tax regimes have not been accompanied by significant changes in the trend of the demand for life insurance.

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[12]For instance, raising wealth from 25,000 to 200,000 euro increases the investors' information set only slightly.

6 Conclusions

Before 1992 premiums on life insurance retirement plans were fully tax deductible up to an amount of 1,300 euro, so that the after-tax return was proportional to the marginal tax rate. In 1992-94 the Italian government implemented a two-step reform whose ultimate effect was to cancel the relation between the after-tax return and the marginal tax rate. In the new regime the tax deduction was proportional to the contribution regardless of the marginal tax rate.

In this paper we study the impact of the reform on the decision to purchase life insurance and on the amount invested. Portfolio taxation theory suggests that investors with high tax rates should have reduced their demand for life insurance plans and those with low rates should have increased it. Using a difference-in-difference approach and regression analysis, we find no evidence for the theory. Among low-income taxpayers, the incidence of life insurance participation and the amount invested do not change after the reform relative to high-income taxpayers. What we find is an across-the-board increase in life insurance participation in the last decade, not tilted towards low-income investors.

This result bears on the substantial literature on the effect of targeted saving incentives, such as those for IRAs and 401(k). Our reading of this literature, as summarized by Poterba, Venti and Wise (1996) and Engen, Gale and Scholz (1996), is that there is broad consensus that in the United States targeted saving incentives have induced portfolio shifts towards tax-favored assets.[13] Contrary to the U.S. evidence, our study of the Italian data finds little or no support for the hypothesis that investors respond to tax changes by adjusting their portfolio at either the intensive or extensive margins.

The most likely explanations for our findings are reluctance to commit to long-term saving, anticipation of future liquidity constraints, minimum investment requirements, and lack of knowledge of the tax incentives. More generally, the paper suggests that information and transaction costs are of paramount importance in shaping portfolio selection and allocation.

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[13] There is some scattered evidence for other countries as well. Engelhardt (1996) presents evidence that the cancellation of the Registered Home Ownership Savings Plan in Canada reduced saving.

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Figure 1
Excess return on life insurance policies
by income tax rates and tax regimes

To compute the excess return on life insurance policies, we assume a yearly contribution of 1,300 euro for 5 years. Before 1992 contributions are fully deductible from taxable income. The tax deduction was 350 euro ($0.27 \times 1,300$) in 1992-93, reduced to 286 euro ($0.22 \times 1,300$) after 1994.

Figure 1:

Figure 2
Differences in the value of life insurance
before and after the tax reform

The figure plots the differences between the cash value of life insurance before and after the reform. we assume a yearly contribution of 1,300 euro for 5 years. Before 1992 contributions are fully deductible from taxable income. The tax deduction was 350 euro (0.27×1,300) in 1992-93, reduced to 286 euro (0.22×1,300) after 1994. Values are expressed in euro.
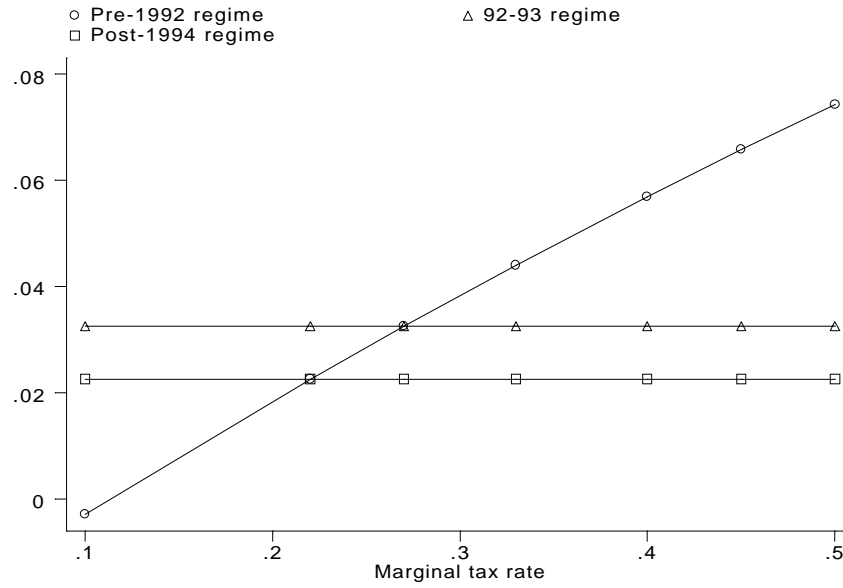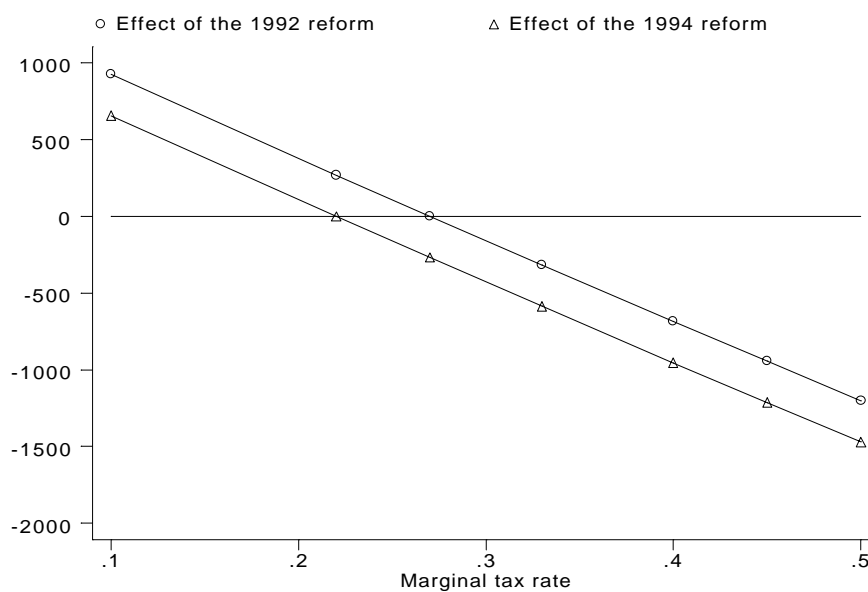

Figure 2:

Table 1
Tax brackets and marginal tax rates, 1989-1998

The table reports the tax brackets and the marginal tax rates (τ) from 1989 to 1998. In 1989-91 tax brackets were indexed to inflation. All figures are in thousands of euro.

1989-90		1991		1992-98	
Tax bracket	τ	Tax bracket	τ	Tax bracket	τ
$\leq$ 3.30	0.10	$\leq$ 3.51	0.10	$\leq$ 3.72	0.10
3.30-6.56	0.22	3.51-6.97	0.22	3.72-7.44	0.22
6.56-16.43	0.26	6.97-17.41	0.27	7.44-15.50	0.27
16.43-32.90	0.33	17.41-34.92	0.34	15.50-30.99	0.34
32.90-82.18	0.40	34.92-87.19	0.41	30.99-77.48	0.41
82.18-164.41	0.45	87.19-174.43	0.46	77.48-154.96	0.46
>164.41	0.50	>174.43	0.51	>154.96	0.51

Table 2
Life insurance participation and contributions in 1989-1998, by marginal tax rates

The table reports the fraction of contributors from 1989 to 1998 and the average amount of contributions conditional on participation. The marginal tax rate refers to the household head. Contributions are deflated by the consumer price index and expressed in euro. In 1989 the true marginal tax rates are 0.22, 0.26, 0.33, 0.40 and 0.45, as in Table 1.

	1989	1991	1993	1995	1998
	Fraction of contributors				
$\tau \leq 0.22$	3.35	1.97	8.73	10.78	11.42
$\tau = 0.27$	10.48	12.60	11.15	12.59	13.61
$\tau = 0.34$	21.92	26.21	22.53	24.98	25.08
$\tau = 0.41$	35.90	39.65	39.16	41.30	38.77
$\tau \geq 0.46$	25.32	47.11	54.97	50.45	54.25
All	13.99	17.08	18.56	21.54	23.35
	Average contribution (conditional on participation)				
$\tau \leq 0.22$	481	587	889	1081	1055
$\tau = 0.27$	679	740	784	939	867
$\tau = 0.34$	785	919	895	1008	1157
$\tau = 0.41$	1110	1179	1224	1307	1375
$\tau \geq 0.46$	1621	2366	1600	1653	2113
All	787	894	982	1103	1217

Table 3
Difference-in-difference for participation

The table reports average participation in life insurance for low- and high-income taxpayers, separately for the 1992 reform and the 1992-94 reforms. The difference-in-difference estimate is reported in the bottom right cell of each panel. Standard errors are reported in parenthesis.

Effect of the 1992 reform

Low-income taxpayers

	$\tau < 0.27$	$\tau = 0.27$	Difference between groups
After the reform	0.078 (0.006)	0.109 (0.006)	−0.031 (0.009)
Before the reform	0.034 (0.005)	0.115 (0.003)	−0.080 (0.006)
Difference within groups	0.043 (0.008)	−0.006 (0.007)	0.049 (0.011)

High-income taxpayers

	$\tau > 0.27$	$\tau = 0.27$	Difference between groups
After the reform	0.281 (0.007)	0.109 (0.006)	0.172 (0.009)
Before the reform	0.252 (0.006)	0.115 (0.003)	0.137 (0.007)
Difference within groups	0.029 (0.009)	−0.006 (0.007)	0.035 (0.012)

Effect of the 1992-94 reforms

Low-income taxpayers

	$\tau < 0.22$	$\tau = 0.22$	Difference between groups
After the reform	0.128 (0.012)	0.102 (0.007)	0.026 (0.014)
Before the reform	0.061 (0.021)	0.031 (0.006)	0.031 (0.022)
Difference within groups	0.067 (0.024)	0.071 (0.009)	−0.004 (0.026)

High-income taxpayers

	$\tau > 0.22$	$\tau = 0.22$	Difference between groups
After the reform	0.252 (0.004)	0.102 (0.007)	0.150 (0.007)
Before the reform	0.168 (0.003)	0.031 (0.006)	0.137 (0.007)
Difference within groups	0.085 (0.005)	0.071 (0.009)	0.014 (0.010)

Table 4
Difference-in-difference for amount invested

The table reports average amount invested in life insurance for low- and high-income taxpayers, separately for the 1992 reform and the 1992-94 reforms. The difference-in-difference estimate is reported in the bottom right cell of each panel. Standard errors are reported in parenthesis.

Effect of the 1992 reform

Low-income taxpayers

	$\tau < 0.27$	$\tau = 0.27$	Difference between groups
After the reform	64.48 (6.29)	85.67 (5.95)	−21.20 (8.66)
Before the reform	21.20 (5.62)	76.06 (3.19)	−54.86 (6.46)
Difference within groups	43.28 (8.43)	9.61 (6.75)	33.67 (10.80)

High-income taxpayers

	$\tau > 0.27$	$\tau = 0.27$	Difference between groups
After the reform	298.05 (10.01)	85.67 (5.95)	212.38 (11.65)
Before the reform	238.90 (8.49)	76.06 (3.19)	162.84 (9.07)
Difference between groups	59.15 (13.13)	9.61 (6.75)	49.54 (14.76)

Effect of the 1992-94 reforms

Low-income taxpayers

	$\tau < 0.22$	$\tau = 0.22$	Difference between groups
After the reform	117.60 (14.36)	112.27 (10.02)	5.33 (17.51)
Before the reform	60.59 (24.77)	15.56 (9.21)	45.03 (26.42)
Difference within groups	57.01 (28.63)	96.62 (13.61)	−39.70 (31.70)

High-income taxpayers

	$\tau > 0.22$	$\tau = 0.22$	Difference between groups
After the reform	302.54 (5.42)	112.28 (10.02)	190.26 (11.39)
Before the reform	138.69 (5.16)	15.56 (9.21)	123.14 (10.55)
Difference between groups	163.84 (7.48)	96.72 (13.61)	67.13 (15.53)

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Table 5
Sample means for contributors and non-contributors

The sample is the pooled 1989-98 SHIW. Demographic variables refer to the household head. Income, wealth and amount invested are deflated by the consumer price index and expressed in euro. All statistics are computed using sample weights.

	Contributors	Non-contributors	Total sample
Age	46.44	54.98	53.38
Years of schooling	10.28	7.62	8.12
Married	0.85	0.69	0.72
Male	0.86	0.74	0.76
Resident in the South	0.25	0.34	0.32
Nuclear family	0.81	0.71	0.73
Extended family	0.14	0.10	0.11
Two income recipients	0.49	0.41	0.43
More than two income recipients	0.19	0.13	0.14
Self-employed	0.29	0.12	0.15
Family size	3.43	2.80	2.92
Disposable income	32,049	21,288	23,308
Total assets	228,422	119,737	140,122
Amount invested	1,016	0.00	191
Number of observations	7,623	32,210	39,833

Table 6
Probit and tobit regressions for participation and amount invested

The table reports probit regressions for the probability of investing in life insurance and tobit regressions for the amount invested. In the probit regressions we report the probability of a discrete change from 0 to 1 in the independent variable. Standard errors are in parenthesis. Each regression also includes time dummies. The regressions for the 1992 reform use the 1989-1993 sample. The regressions for the 1992-94 reforms include the 1989-98 sample omitting 1993.

	1992 reform		1992-94 reforms	
	Probit	Tobit	Probit	Tobit
35 <Age≤ 50	0.008	24.33	0.013	72.52
	(0.006)	(42.74)	(0.006)	(42.22)
50 <Age≤ 65	−0.046	−328.56	−0.050	−334.79
	(0.006)	(47.60)	(0.006)	(46.70)
Age> 65	−0.117	−1048.51	−0.143	−1294.01
	(0.005)	(66.03)	(0.005)	(63.43)
Junior high school	0.033	225.70	0.041	283.02
	(0.006)	(41.61)	(0.006)	(40.50)
High school	0.068	474.00	0.062	446.77
	(0.007)	(44.11)	(0.007)	(42.25)
University	0.061	498.61	0.056	473.07
	(0.011)	(59.88)	(0.010)	(57.36)
Married	0.013	100.05	0.016	131.05
	(0.008)	(59.86)	(0.008)	(55.93)
Male	−0.003	−13.84	0.001	0.72
	(0.008)	(56.39)	(0.007)	(50.79)
Resident in the South	−0.024	−163.11	−0.021	−150.48
	(0.005)	(33.35)	(0.004)	(32.11)
Nuclear household	0.038	285.85	0.036	278.98
	(0.010)	(76.64)	(0.009)	(72.90)
Extended household	0.064	380.88	0.058	374.23
	(0.016)	(88.39)	(0.014)	(84.69)
Two income recipients	0.008	37.19	−0.001	13.06
	(0.006)	(40.79)	(0.005)	(37.58)
More than two income recipients	0.016	101.04	0.006	93.51
	(0.009)	(59.41)	(0.008)	(52.76)

(continued)

	1992 reform		1992-94 reforms	
	Probit	Tobit	Probit	Tobit
Self-employed	0.065	490.30	0.067	505.00
	(0.007)	(36.93)	(0.006)	(32.25)
Second income bracket	0.062	422.20	0.069	435.11
	(0.013)	(83.44)	(0.011)	(73.60)
Third income bracket	0.086	575.48	0.108	652.99
	(0.016)	(93.96)	(0.014)	(81.64)
Fourth income bracket	0.100	658.41	0.133	774.20
	(0.020)	(103.65)	(0.017)	(89.31)
Fifth income bracket	0.157	1000.85	0.194	1146.93
	(0.024)	(110.81)	(0.020)	(94.74)
Second wealth bracket	0.094	604.52	0.110	714.80
	(0.011)	(61.22)	(0.011)	(60.85)
Third wealth bracket	0.064	447.89	0.089	606.84
	(0.010)	(59.46)	(0.010)	(58.53)
Fourth wealth bracket	0.081	545.85	0.119	790.38
	(0.010)	(59.05)	(0.010)	(57.28)
Fifth wealth bracket	0.138	900.22	0.186	1235.66
	(0.013)	(65.91)	(0.012)	(67.62)
τ_{low}	−0.011	−47.48	0.024	261.09
	(0.013)	(101.86)	(0.040)	(263.69)
τ_{high}	0.009	25.76	0.006	26.95
	(0.007)	(46.37)	(0.016)	(124.01)
$\tau_{low} * after$	0.017	110.19	−0.034	−393.48
	(0.020)	(133.55)	(0.034)	(295.87)
$\tau_{high} * after$	0.018	140.66	−0.012	−104.05
	(0.011)	(70.22)	(0.020)	(148.24)
Number of observations	24,162	24,162	31,401	31,401