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## Tax incentives and the demand for life insurance: evidence from Italy

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### Abstract

The theoretical literature suggests that taxation can have a large impact on household portfolio selection and allocation. In this paper we analyze 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 commitment to long-term investment.

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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 creates wedges in the structure of

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those returns. In this paper we bring fresh evidence to this literature 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 crucial identification issues. Theory predicts that portfolio choice is affected by household resources and 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 investors face the same rate of return.

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. 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 et al., 1997), Sweden (Agell and Edlin, 1991) and the United Kingdom (Banks and Tanner, 2001). 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 shares is weaker than for asset selection.

Identifying the tax effects on portfolio choice is hard in the Italian case as well. 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 stocks, on the other hand, 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 1300 euro (2.5 million lire), so that after-tax returns increased with the marginal tax rate. In 1992 the tax incentive for those with marginal tax rates of 27 percent and higher became a flat rate of 27 percent (the previous regime still applied to low-income taxpayers). In 1994 any link with the marginal tax rates was eliminated, and the incentive made proportional to premium payment (a flat rate of 22 percent, lowered to 19 percent in 1998). As a consequence, the extra yield on life insurance policies over non-sheltered financial assets was substantially reduced for the rich in 1992, while in 1994 it was slightly increased for the poor, slightly reduced for the rich, and unchanged for investors in the intermediate tax brackets. These group-specific tax changes provide the ground for our empirical analysis and for the identification of the effect of the tax reform. If the tax reform had an impact on asset selection and portfolio allocation, it should emerge among households in the highest tax brackets in 1992, and among both the lowest and the highest tax brackets after the 1994 reform.

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 presents the empirical analysis. 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 concludes.

## **2. Institutional background**

Table 1 reports the composition of household financial wealth in Italy from 1990 to 1998. The data, drawn from the aggregate financial accounts, show considerable changes. Transaction accounts and government bonds declined sharply, while stocks and mutual funds increased substantially. Part of the increment reflects the increased stock market valuation of the second half of the 1990s, but this is not the whole story. Guiso and Jappelli (2001) list three other factors that contribute to explain the portfolio shift. First, over the 1990s the yield on transaction accounts and on short-term government bonds has declined significantly in comparison to that on equities. Second, the massive privatization of state-owned firms and public utilities has increased stock market capitalization and helped households to become acquainted with stocks and their return and risk characteristics. Finally, the reform of the social security system and the diminished expectations of pension benefits are urging households to rely increasingly on their own savings for retirement.

The growth of life insurance in Italy is part of this broader portfolio shift away

Table 1  
Composition of household financial wealth

Financial asset share	1990	1995	1998
Currency, transaction accounts and saving accounts	36.80	36.57	22.69
Government bonds	27.42	25.92	10.35
Corporate and foreign bonds	3.16	5.85	9.53
Stocks	20.87	16.62	30.53
Mutual funds and managed investment accounts	2.30	4.07	16.42
Defined-contribution pension funds	5.93	5.74	4.54
Life insurance	3.09	4.85	5.92
Other financial assets	0.43	0.37	0.02
Total financial assets	100.00	100.00	100.00
Debt (mortgage loans, consumer credit, other debt)	6.41	6.83	8.71

Transaction accounts include certificates of deposit. Corporate and foreign bonds include also bonds issued by Special Credit Institutions. Life insurance includes assets held by domestic and foreign insurance companies as a counterpart to life insurance policies sold to residents. Financial assets are reported as a percentage of total financial assets. Data are drawn from the Annual Report of the Bank of Italy, various years.

from transaction accounts and short-term government bonds towards stocks and mutual funds. Even though the GDP-ratio of life insurance premiums is smaller than that of other major OECD countries, as a result of portfolio reallocations, financial innovation, and the regulatory changes described below, between 1990 and 1998 the share of life insurance in total financial assets has doubled (from 3 to 6 percent).

Over the last decade the life insurance industry has witnessed important developments. Competition has increased due to the implementation of the third EU directive, according to which insurance companies need only the authorization of the relevant authorities in their home jurisdictions in order to operate in other EU member countries. As a result, European insurance companies are increasing the competitive pressure on companies operating in the Italian market.<sup>1</sup> In recent years insurance companies started to replace the traditional contracts indexed to government bonds and other fixed income securities with contracts yielding returns indexed to mutual funds, stocks and financial indexes (currently, about 50 percent of the policies are of the indexed type). Finally, the lifting of regulatory controls has eased the integration of the life insurance industry with the banking sector and the distribution of the policies through the bank-assurance network, currently covering more than 50 percent of the market.

In 1998 the majority of policies (85.3 percent) were whole life insurance policies; the residual 14.7 percent were term policies (only in case of death a capital is transferred to the heirs). Virtually all of the whole life policies do not

<sup>1</sup>Prior to 1985 licensing was at the discretion of the Ministry of Industry, resulting in severe barriers to entry the Italian insurance sector. In 1986 licensing became subject to specified requisites, allowing more than 30 companies to enter the insurance market in the years following the regulatory change.

provide an annuity but rather terminate with a lump sum payment. This suggests that the vast majority of life insurance policies sold in Italy are essentially financial instruments, much like tax-favored saving accounts, competing with mutual funds and other managed investment accounts.<sup>2</sup> Group policies in Italy are limited, representing only 7 percent of the total.

In this paper we do not attempt at explaining the broad trends in household portfolios in Italy; rather, we study if investors have perceived the changes in the specific tax features of life insurance over the past 15 years. In 1986 the tax code introduced substantial incentives for contributions to all types of life insurance policies. Premiums up to 2.5 million lire per year (about 1300 euro) were made deductible from the policy-holder's general income tax base. Eligibility required at least 5 years of contributions and applied to each individual tax-payer. In case of early withdrawal, the policy-holder lost all the tax advantages and was entitled to receive only the cumulated nominal premiums.<sup>3</sup>

In 1992 the tax incentive became a flat 27 percent of the premium for those with marginal tax rates of 27 percent and higher (the contribution cap and the other tax features were unaffected). For those with marginal tax rates below 27 percent the previous regime still applied. In practice, the after-tax return was lowered for those with marginal tax rates above 27 percent, and unchanged for those with tax rates below that threshold. In 1994, the tax incentive became a flat 22 percent of the premium (19 percent after 1998), regardless of tax rate. As a consequence, the incentive was raised for investors with the lowest marginal tax rate, unaffected for those with marginal tax rate of 22 percent, and further lowered for investors above that threshold.<sup>4</sup>

Since the effect of the reforms depends on the investor's tax bracket, Table 2

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<sup>2</sup>Brown (1999), using the US AHEAD Survey, is able to examine separately the demand for whole-life and term insurance of the elderly. The distinction is quite important because whole life policies primarily consist of tax deferred saving accounts, while term policies can be purchased to reduce excessive annuitization. By examining separately the demand for the two types of insurance, Brown is able to test the hypothesis that the elderly are over-annuitized, i.e. that Social Security benefits and term insurance are positively correlated. Prior to 1995 our sample does not distinguish between the two forms of insurance. However, the tax treatment of whole-life and term contracts is the same, both before and after the reform.

<sup>3</sup>A further restriction is that the insurance company cannot sell credit contracts to the investor, so the premium cannot be financed by borrowing.

<sup>4</sup>The taxation of life insurance products has been drastically changed in January 2001. The new regime aims at stimulating retirement saving and provides incentives for defined contribution pension funds and for life insurance products specifically designed to supplement social security pensions. The new law distinguishes sharply between contracts designed to provide an annuity and contracts that are essentially financial products. In the latter case, all tax incentives have been cancelled. On the other hand, incentives have been raised on policies that provide an annuity after reaching a certain age (statutory pension age for the employees, 57 years for the self-employed, in no case less than 50 years for women and 55 for men). For these policies, the 2.5 percent tax on premiums has been cancelled and premiums up to 12.5 percent of earnings (with a maximum of 5000 euro) are tax deductible. Eligibility also requires that at the expiration of the policy 2/3 of the capital is converted in an annuity. The old tax regime still applies to all contracts signed before January 1, 2001 and to whole-life policies.

Table 2  
Tax brackets and marginal tax rates, 1989–1998

1989–90		1991		1992–98	
Tax bracket	$\tau$	Tax bracket	$\tau$	Tax bracket	$\tau$
$\leq 3.30$	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

The table reports the tax brackets and the marginal tax rates ( $\tau$ ) from 1989 to 1998. In 1989–91 tax brackets were indexed to inflation. Tax bracket figures are in thousands of euro.

reports 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 induced by the 1992–94 tax reforms was substantial, especially for investors in the top brackets. To illustrate the effect of the reforms, in Fig. 1 we plot the yearly excess return of a standard policy over a non-sheltered saving instrument (e.g. government bonds) for an investor contributing an annual premium of 1,300 euro for 5 years. For this computation we need to take into account other features of life insurance contracts (taxation of premiums, commission rate, return on premiums invested in life insurance and on government bonds). These features of the standard life insurance policy form the basis of the calculation by Jappelli and Pagano (1994) of the excess return of life insurance over government bonds; the details are reported in Appendix A.<sup>5</sup>

The diagonal line in Fig. 1 shows how the excess return of the policy over government bonds varies with the marginal tax rate in the pre-reform regime. For investors in the first tax bracket, the excess return was actually negative because the commission and the tax on premiums 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 tax incentive is unchanged for the lowest marginal tax rates, and equal to a flat 350 euro ( $0.27 \times 1300$ ) for those with marginal tax rate above 27 percent. The line in Fig. 1 therefore overlaps with the 1992 line for low tax rates, and has a kink at the marginal tax rate of 0.27. The

<sup>5</sup>At the expiration of the policy the investor must opt between a lump-sum payment and an annuity. 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.

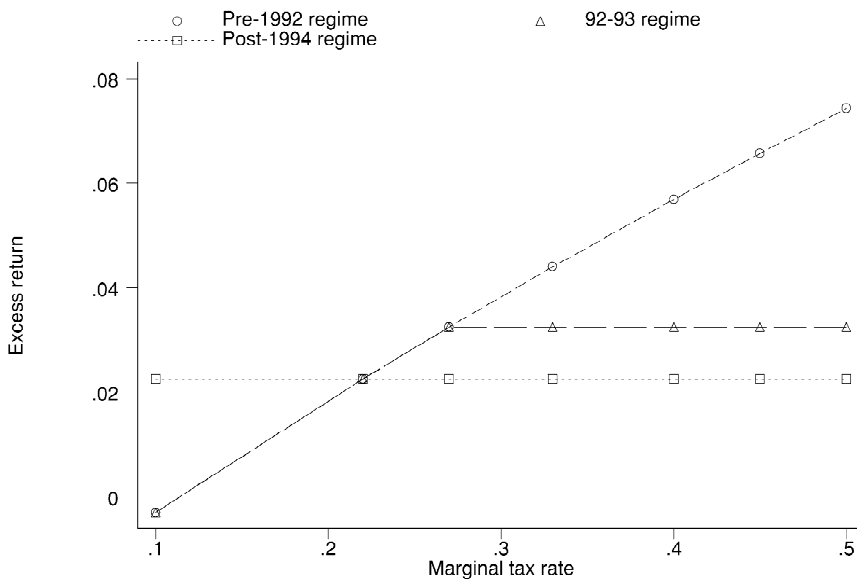


Fig. 1. Excess return on life insurance policies by income tax rates and tax regimes. The figure plots the excess return on a life insurance policy over the return on government bonds by the marginal tax rate. Eq. (A.2) in Appendix A defines the excess return of life insurance. We assume a yearly contribution of 1300 euro for 5 years. Before 1992 contributions are fully deductible from taxable income. In 1992–93 the tax incentive is 350 euro ( $0.27 \times 1300$ ) for  $\tau \geq 0.27$ . In 1994 the incentive is 286 euro ( $0.22 \times 1300$ ), regardless of the tax rate.

1994 reform reduced the incentive for rich taxpayers to 286 euro ( $0.22 \times 1300$ ), further lowered to 247 euro in 1998 ( $0.19 \times 1300$ ). Since the 1994 reform eliminates any link between excess returns and marginal tax rates, the line in Fig. 1 becomes horizontal.

The theory of portfolio taxation suggests that the abrupt cancellation of the tax incentive for the rich in 1992 and the greater incentive given to the lower-income households in 1994 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) it is exogenous with respect to changes in sample composition, and (3) there are no group-specific trends in life insurance participation.

As far as assumption (1) is concerned, we believe that the possible endogeneity of the reforms can be safely ruled out. 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 a 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. Assumption (2) 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. Assumption (3) avoids attributing to the tax reform the effect of underlying trends in the decision to purchase life insurance that differ across groups. Several checks on the validity of this assumption have no detectable effect on our estimates.

### 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- 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. Each survey collects data on a representative sample of about 8000 households.

To classify households according to life insurance incentives, we need to impute the marginal income tax rate. 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 tax rates. Since the tax incentive applies to individual investors, we proxy the investor's marginal tax rate with that of the household head's labor income, using the tax brackets and marginal rates reported in Table 2. The SHIW collects data on after-tax wages, salaries, self-employment income, income from capital and income from financial assets so imputation of tax brackets is straightforward.

In Table 3 we report the proportion of households investing in life insurance and the amount invested (in the whole sample and conditional on participation) from 1989 to 1998 for 4 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 40 percent in the highest brackets. The table also shows that the fraction of contributors increased substantially for all income groups over the decade (from 3 to 11 percent in the lowest and from 35 to 41 percent in the highest tax brackets).



Table 3  
Life insurance participation and contributions in 1989–1998, by marginal tax rates

	1989	1991	1993	1995	1998
Fraction of contributors					
$\tau \leq 0.22$	0.034	0.020	0.087	0.108	0.114
$\tau = 0.27$	0.105	0.126	0.111	0.126	0.136
$\tau = 0.34$	0.219	0.262	0.225	0.250	0.251
$\tau \geq 0.41$	0.352	0.401	0.408	0.424	0.405
All	0.140	0.171	0.186	0.215	0.233
Average contribution					
$\tau \leq 0.22$	16	12	78	117	120
$\tau = 0.27$	71	93	87	118	118
$\tau = 0.34$	172	241	202	252	290
$\tau \geq 0.41$	399	504	522	574	603
All	110	153	182	237	284
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
$\tau \geq 0.41$	1134	1259	1277	1354	1487
All	787	894	982	1103	1217

The table reports the fraction of contributors from 1989 to 1998 in each tax bracket, the average contributions in the whole sample, and the average contribution 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.

The intermediate panel of Table 3 reports average contributions in the whole sample. Two features are notable: the amount invested is positively correlated with income and the average contribution increases over time. These patterns are confirmed in the lower panel, reporting contributions in the sample of those that invest in life insurance.<sup>6</sup>

As is explained in Section 3, the 1992–94 reforms reduce the tax incentive to purchase life insurance for the rich and increased it for the poor. Table 3 shows that the demand for life insurance is lower for the poor and higher for the rich, and increases for all groups over time. But this cannot be taken as evidence either for or against the thesis that taxation affects portfolio choice. The thesis requires that

<sup>6</sup>It is interesting to note that some investors contribute above the 1300 euro limit. This cannot be inferred from Table 3, which is based on total contributions *per* household, not *per* individual taxpayers. As we note in Section 2, each taxpayer is eligible for the contribution, not each household. In 1995 and 1998 the SHIW provides information on individual policies. This information can be used to establish that the number of policies above the limit is around 7 percent, and that 2 percent contribute more than 2500 euro. The reason for focusing on households rather than individuals in the analysis that follows, is that prior to 1995 detailed information on individual contributors is missing.

following the reform the poor's demand for life insurance should increase *faster* than that of the rich.

#### 4. Econometric results

##### 4.1. Difference-in-difference evidence

We now examine the effect of the tax reform on the demand for life insurance using a difference-in-difference estimator on repeated cross-sectional data. The model is based on a reduced form of the demand for life insurance. We identify a group of investors unaffected by the reform and one or more groups affected by the new tax regime. We call the former the “control” group, and the latter the “treatment” groups. One can study the effect of the 1992 reform (comparing investors' behavior in the pre-reform 1989–1991 years with that in the post-reform year 1993), the effect of the 1994 reform (comparing 1993 with 1995–1998), and the cumulative effect of the 1992–1994 reforms (comparing 1989–1991 with 1995–1998). For simplicity, we illustrate the difference-in-difference estimator for the 1992 reform which should affect the amount invested by the group of rich tax-payers. Extension to two treatment groups, to more than one reform or to the decision to invest (rather than the amount) is straightforward.

Denote by  $a_{i \in g, t}$  ( $a_{i \in g', t}$ ) the amount that investor  $i$  in the control group  $g$  (treatment group  $g'$ ) contributes to life insurance in period  $t$ . Between period  $t$  and  $t'$  ( $t' > t$ ) a tax reform takes place that changes the nature of the tax incentive for the investors in the treatment group. For instance, the 1992 reform affects the treatment group of rich tax-payers (with a marginal tax rate above 0.27) by eliminating the link between after-tax returns and marginal tax rates, but not the control group  $g$  (with a marginal tax rate of 0.27 or less). We assume that before the reform the amount invested is:

$$a_{i \in j, t} = \beta_t + f_j + u_{i \in j, t}$$

for  $j = g, g'$ . Both groups are subject to an aggregate shock  $\beta_t$ . Long-term differences between groups are captured by the fixed effects  $f_g$  and  $f_{g'}$ . After the tax reform the demand shifts for both groups:

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

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

According to this specification, the 1992 reform affects the demand for life insurance by an amount  $\delta_g < 0$  in the treatment group. Given this structure, one can identify the effect of the reform using the difference-in-difference estimator:

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

The identifying assumption, then, is that controlling for group and time effects, the error term  $u$  has mean zero. Note that panel data are not required to compute the conditional means that form the basis of the difference-in-difference estimator. What we need to observe is a representative sample of the two groups  $g$  and  $g'$  in each of the two periods  $t$  and  $t'$ . For our purposes therefore one can rely on repeated cross-sectional data.

Since time effects are common to both groups, in the pre-reform 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 the post-reform period  $t'$  the treatment group now differs not only because of fixed effects, but also because of the tax reform  $(f_{g'} - f_g + \delta_{g'})$ . A finding that  $\delta_{g'}$  is negative signals that the reform has reduced the propensity of rich tax-payers to purchase life insurance relatively to the control group.<sup>7</sup> 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 after 1992 (where theory suggests  $\delta_{g'} > 0$ ).

Table 4 reports the results of the difference-in-difference estimates of the effect of the 1992 tax reform. The upper panel looks at the impact on participation rates. The lower panel reports the results for the amount invested. The pre-reform period is 1989–91, the post-reform period is just 1993; high-income tax-payers are the treatment group (those with a marginal tax rate above 27 percent), and those with a marginal tax rate of the 27 percent or less are the control group.

The upper panel shows that the difference-in-difference estimate is 3.3 percentage points (and statistically different from zero at the 1 percent level), indicating that for this group participation increases more than for those who were not affected by the reform. This result therefore clashes with the theory, because this group should have reduced participation relative to the control group. The lower panel reports difference-in-difference estimates for the amount invested. The results indicate that the 1992 reform increases the amount invested by the rich (about 48 Euro) compared with the control group. Overall, the results are hard to reconcile with portfolio taxation theory.<sup>8</sup>

<sup>7</sup>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.

<sup>8</sup>Results are similar when we examine the effect of the 1994 reform and the cumulative effect of the 1992–94 reforms. In both experiments the control group includes taxpayers with a marginal tax rate of 22 percent and there are two treatment groups, rich tax-payers, with a marginal tax rate above 22 percent, and poor tax-payers, with a marginal tax rate below that threshold. These results are available on request.

Table 4  
Difference-in-difference results

	$\tau > 0.27$	$\tau \leq 0.27$	Difference between groups
Effect of the 1992 reform on participation rates			
After the reform	0.281 (0.007)	0.098 (0.005)	0.183 (0.008)
Before the reform	0.252 (0.006)	0.102 (0.003)	0.150 (0.007)
Difference within groups	0.029 (0.009)	−0.004 (0.006)	0.033 (0.011)
Effect of the 1992 reform on the amounts invested			
After the reform	298.05 (10.1)	78.06 (4.57)	219.99 (11.01)
Before the reform	238.90 (8.49)	66.85 (2.79)	172.05 (8.94)
Difference between groups	59.15 (13.13)	11.21 (5.36)	47.94 (14.18)

The upper panel reports average participation in life insurance. The lower panel repeats the exercise for the amount invested. The difference-in-difference estimate is reported in the bottom right cell of each panel. Standard errors are reported in parenthesis

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. 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

To translate the difference-in-difference approach into a regression equation, we consider two time periods,  $t$  and  $t'$ , and two groups of investors:  $g$  is unaffected by the reforms,  $g'$  represents the group of affected investor. The demand for life insurance can be written as:

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

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

$$v_{i \in j, t} = \beta_t + f_j + u_{i \in j, t}$$

while in period  $t'$ :

$$v_{i \in g', t'} = \beta_{t'} + f_{g'} + \delta_{g'} + u_{i \in g', t'}$$

$$v_{i \in g, t'} = \beta_{t'} + f_g + u_{i \in g, t'}$$

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

$$a_{i \in j, s} = (\beta_t + f_g) + X'_{i \in g, j, s} \theta + (\beta_{t'} - \beta_t) D_{t'} + (f_{g'} - f_g) D_{g'} + \delta_{g'} D_{g'} D_{t'} + u_{i \in j, s} \quad (1)$$

Eq. (1) has an immediate regression representation. The group dummy  $D_{g'}$  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 term  $D_{g'} D_{t'}$  identifies the impact of the reform (i.e., the parameter  $\delta_{g'}$ ). In contrast to the difference-in-difference approach, 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 estimate the effect of 1992 tax reform (when only rich investors are affected), we single out the 1989–93 sample and define  $D_{g'} = \mathbf{1}\{\tau > 0.27\}$ , and  $D_{t'} = \mathbf{1}\{1993\}$ , where  $\mathbf{1}\{\cdot\}$  is an indicator function that equals one if the statement in brackets is true and  $\tau$  the investor's marginal tax rate. The theory predicts  $\delta_{g'} < 0$ .

This framework can be extended to the case where the reform affects multiple groups in different ways. Let us indicate with  $g$  investors unaffected by the reform, and with  $g'$  and  $g''$  rich and poor investors, respectively. Pooling all data from the pre- and post-reform periods, one can write the demand for life insurance of investor  $i$  in group  $j$  ( $j = g, g', g''$ ) at time  $s$  ( $s = t, t'$ ):

$$a_{i \in j, s} = (\beta_t + f_g) + X'_{i \in j, s} \theta + (\beta_{t'} - \beta_t) D_{t'} + (f_{g''} - f_g) D_{g''} + (f_{g'} - f_g) D_{g'} + \delta_{g''} D_{g''} D_{t'} + \delta_{g'} D_{g'} D_{t'} + u_{i \in j, s}$$

To estimate the cumulative impact of the 1992–94 reforms we exclude the transitional year 1993 and define the following dummy variables:  $D_{g'} = \mathbf{1}\{\tau > 0.22\}$ ,  $D_{g''} = \mathbf{1}\{\tau < 0.22\}$ , and  $D_{t'} = \mathbf{1}\{1995, 1998\}$ . The group dummies  $D_{g'}$  and  $D_{g''}$  single out investors affected by the reform (those either above or below  $\tau = 0.22$ ), and  $D_{t'}$  investors observed after the reforms. To estimate the effect of the 1994 reform, we leave unchanged the definition of the groups, but skip data before 1993. In both cases, the theory of portfolio taxation predicts  $\delta_{g'} < 0$  and  $\delta_{g''} > 0$ .

To introduce the regression analysis, we report in Table 5 sample averages for contributors and non-contributors in the pooled 1989–98 sample. Contributors'

Table 5  
Sample means for contributors and non-contributors

	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
Family size	3.43	2.80	2.92
Number of children	0.90	0.56	0.62
Number of income recipients	1.94	1.71	1.75
Self-employed	0.29	0.12	0.15
Disposable income	32,049	21,288	23,308
Total assets	228,422	119,737	140,122
Amount invested in life insurance	1,016	0.00	191
Number of observations	7,623	32,210	39,833

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.

income is about 50 percent higher than non-contributors, 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, more children and more income recipients. 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 reform, the 1994 reform, and the combined 1992–94 reforms.<sup>9</sup> The coefficients indicate the marginal effects of probit and tobit, respectively. The specification includes five age dummies (31–40, 41–50, 51–60, 61–70, and over 70), three schooling dummies (junior high school, high school, university), indicators for marital status, gender, residence in the South, two dummies for family size (2–4 and greater than 4), an indicator for the presence of children, two dummies for the number of income recipients, a self-employment indicator, and four dummies for income and wealth quintiles.

The first two columns refer to the 1992 reform. We test the impact of this reform by introducing dummies for high marginal tax rates ( $D_g$ ), year dummies and the interaction of the post-reform years with the tax dummy ( $D_g D_t$ ). 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

<sup>9</sup>The analysis does not consider the 1998 reform, which reduced the incentive from 22 to 19 percent. For robustness, we drop 1998 data from the analysis; the results are confirmed.

Table 6  
 Probit and tobit regressions for participation and amount invested

	1992 reform		1994 reform		1992–1994 reforms	
	Probit	Tobit	Probit	Tobit	Probit	Tobit
30 < Age ≤ 40	0.010 (0.009)	23.54 (62.23)	0.026 (0.013)	168.80 (79.66)	0.032 (0.010)	187.05 (64.17)
40 < Age ≤ 50	0.007 (0.009)	10.12 (61.94)	0.019 (0.012)	112.02 (78.93)	0.021 (0.009)	122.28 (63.72)
50 < Age ≤ 60	−0.020 (0.009)	−162.09 (65.31)	−0.014 (0.012)	−72.81 (65.31)	−0.012 (0.009)	−83.45 (66.62)
60 < Age ≤ 70	−0.071 (0.007)	−610.78 (72.88)	−0.100 (0.010)	−771.53 (90.04)	−0.080 (0.008)	−657.88 (73.80)
Age > 70	−0.109 (0.006)	−1108.86 (95.63)	−0.155 (0.007)	−1446.36 (107.31)	−0.132 (0.006)	−1355.19 (92.65)
Junior high sch.	0.032 (0.006)	215.78 (41.66)	0.041 (0.008)	271.41 (47.98)	0.037 (0.006)	260.97 (40.68)
High school	0.066 (0.007)	465.46 (44.21)	0.063 (0.008)	443.07 (50.51)	0.058 (0.007)	423.94 (42.48)
University	0.060 (0.011)	495.72 (60.09)	0.052 (0.012)	466.94 (69.67)	0.051 (0.010)	449.59 (57.60)
Married	0.006 (0.008)	54.65 (60.44)	0.008 (0.009)	90.85 (61.96)	0.008 (0.008)	82.33 (56.63)
Male	−0.002 (0.008)	−10.16 (55.88)	0.005 (0.008)	38.95 (53.70)	0.003 (0.007)	12.19 (50.89)
South	−0.026 (0.005)	−170.42 (33.40)	−0.009 (0.006)	−61.18 (38.13)	−0.022 (0.004)	−155.20 (32.18)
2 ≤ Fam.size ≤ 4	0.026 (0.010)	208.72 (77.60)	0.025 (0.012)	163.99 (86.14)	0.026 (0.010)	222.01 (73.80)
Fam.size > 4	0.036 (0.015)	231.00 (91.68)	0.037 (0.017)	222.57 (102.77)	0.034 (0.014)	255.60 (87.79)
Children present	0.033 (0.006)	199.78 (39.40)	0.036 (0.007)	177.32 (44.96)	0.029 (0.006)	161.13 (38.03)
Two earners	0.011 (0.006)	58.40 (40.44)	0.003 (0.012)	51.76 (45.00)	0.002 (0.005)	25.64 (37.73)
> Two earners	0.025 (0.009)	156.88 (59.25)	0.022 (0.010)	211.66 (61.32)	0.014 (0.008)	138.40 (53.33)
Self-employed	0.063 (0.007)	480.41 (36.91)	0.066 (0.008)	481.22 (42.88)	0.064 (0.006)	491.05 (35.29)
2nd income bracket	0.063 (0.011)	416.85 (76.71)	0.068 (0.012)	399.33 (77.40)	0.069 (0.011)	435.30 (73.78)
3rd income bracket	0.086 (0.015)	560.91 (86.36)	0.104 (0.015)	595.35 (87.51)	0.107 (0.014)	648.25 (81.85)
4th income bracket	0.098 (0.018)	633.75 (96.12)	0.146 (0.019)	795.87 (96.87)	0.131 (0.017)	764.90 (89.50)
5th income bracket	0.156 (0.022)	976.08 (103.34)	0.210 (0.022)	1199.06 (102.98)	0.192 (0.020)	1140.55 (94.99)
2nd wealth bracket	0.094 (0.011)	606.15 (61.22)	0.146 (0.014)	866.81 (73.96)	0.111 (0.011)	719.35 (60.92)
3rd wealth bracket	0.066 (0.010)	460.82 (59.43)	0.125 (0.013)	780.33 (70.70)	0.090 (0.010)	616.56 (58.59)

Table 6. Continued

	1992 reform		1994 reform		1992–1994 reforms	
	Probit	Tobit	Probit	Tobit	Probit	Tobit
4th wealth bracket	0.083 (0.010)	556.86 (59.00)	0.170 (0.012)	1032.63 (68.47)	0.121 (0.010)	798.96 (57.36)
5th wealth bracket	0.144 (0.013)	928.53 (65.97)	0.234 (0.014)	1461.56 (73.73)	0.191 (0.012)	1256.42 (62.83)
$\tau_{low}$			0.006 (0.028)	66.51 (191.40)	0.020 (0.039)	239.00 (263.22)
$\tau_{high}$	0.009 (0.007)	27.90 (46.21)	–0.001 (0.019)	–18.67 (131.79)	0.003 (0.017)	7.44 (124.63)
$\tau^*_{low}$ after			–0.023 (0.031)	–219.42 (237.40)	–0.031 (0.034)	–380.60 (295.50)
$\tau^*_{high}$ after	0.013 (0.010)	107.40 (64.87)	–0.011 (0.023)	–94.34 (156.21)	–0.010 (0.020)	–91.20 (148.82)
No. of obs.	24,162	24,162	23,325	23,325	31,401	31,401

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. Regressions for the 1992 reform use the 1989–1993 sample. Regressions for the 1994 reform use the 1993–1998 sample. Regressions for the 1992–94 reforms include the 1989–98 sample omitting 1993.

6 percentage points higher for households with high school or university education, and for the self-employed. The year dummies (not reported) show that over the sample period the demand has increased. In the probit regression the dummy for the marginal tax rate and the interaction term are small in absolute value and not statistically different from zero.

The tobit estimates for the amount invested confirm this pattern. The income and wealth coefficients indicate that households in the top quintiles of those distributions invest almost 1000 euro more than those at the bottom. 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 other four regressions in Table 6 focus on the effect of the 1994 reform (skipping pre-1993 data), and the combined effect of the 1992–94 reforms (skipping the intermediate 1993 survey). In these specifications we introduce dummies for high and low marginal tax rates ( $D_{g^h}$  and  $D_{g^l}$ ), year dummies ( $D_t$ ), and the interaction of the post-reform years with the tax dummies ( $D_{g^h}D_t$  and  $D_{g^l}D_t$ ). The results are qualitatively unchanged. In particular, the interaction terms are not statistically different from zero, and the hypothesis  $\delta_{g^h} = \delta_{g^l} = 0$  cannot be rejected.

To summarize, 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). We performed various sensitivity checks. First, we ran



OLS and two-step Heckman regressions to relax the restrictions implied by the Tobit specification. Second, we examined the validity of our identifying assumption that once group fixed effects and time effects are considered, the group-time interaction terms capture the effect of the tax reform. Third, we considered variables that account for the effect of the pension reforms enacted at about the same time as the tax reforms. By reducing social security wealth, the pension reforms 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. Finally, we analyzed the possibility that the demand for life insurance has a term policy component by controlling for health-related variables. The results of these checks (available on request) did not change our main conclusions.

## 5. Interpretation

Our findings are 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 3, 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 2. 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). 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 few broad tax brackets (for instance,  $\tau < 0.22$ ,  $\tau = 0.22$  and  $\tau > 0.22$ , or just  $\tau \leq 0.27$  and  $\tau > 0.27$ ). Second, the potential overestimation of the marginal tax rate contaminates only the rich group (which may in fact include some with  $\tau \leq 0.27$  or some with  $\tau \leq 0.22$ ), but not the group of low marginal tax rates. 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  $\tau > 0.41$  (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. 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.

In Section 2 we mentioned that in order to be eligible for the tax incentive 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. Since the 5-year limit may act in the sense of implying a much less quick response to tax changes than in a market with “spot” tax deductions, the empirical analysis might not be able to detect an effect of the reform. For the same reason, 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.<sup>10</sup> 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 second reason why many are discouraged from purchasing life insurance are minimum investment requirements. Even though these are not regulated, in practice most insurance companies do propose 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 cannot account for the non-participation of the wealthy. Table 3 shows that in 1998 about 60 percent of households with marginal tax rates of 41 percent did not invest in life insurance. According to Fig. 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 elicited data on the respondents' knowledge about 17 financial assets. Guiso and Jappelli (2002) 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 assets listed. The econometric analysis reveals that education is a very strong predictor of financial information, but wealth and

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<sup>10</sup>Guiso and Jappelli (2002) advance a similar argument to explain why many investors are unwilling to purchase mutual funds that entail entry or exit costs.

income are not: even rich investors tend to lack basic financial information. Although the questions do not include life insurance, we find it highly plausible that basic information on life insurance policies is also poor, and that 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.

## 6. Conclusions

Before 1992 premiums on life insurance retirement plans were fully tax deductible up to an amount of 1300 euro, so that the after-tax return was proportional to the marginal tax rate. In 1992–94 the Italian government implemented a series of reforms whose ultimate effect was to cancel the relation between the after-tax return and the marginal tax rate. In the new regime the tax incentive 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. 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 et al. (1996) and Engen et al. (1996), is that there is broad consensus that in the United States targeted saving incentives have induced portfolio shifts towards tax-favored assets. Contrary to the US evidence, our study of the Italian data finds little 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. In this respect, the

paper suggests that information and transaction costs are of paramount importance in shaping portfolio selection and allocation.

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### Appendix A

A life insurance contract is a combination of a savings account accumulating with after-tax interest and a declining term life insurance contract (Warshawsky, 1985). The focus of this paper is on the savings account component, and therefore in the example below we abstract from the insurance component of the contract. In order to compare the return on tax-favored life insurance contracts with that provided by an alternative financial asset, we consider a typical life insurance policy where the premium is a constant nominal amount  $P$ , equal to 1300 euro so that it is fully tax-deductible and is paid for a number of years  $T \geq 5$ . Insurance premiums are taxed at the time they are paid at the flat rate of 2.5 percent. Since also the commission charged by the insurance company is proportional to the contribution, the net amount invested each year is  $P/(1+f)$ , where  $f$  is the sum of the tax rate on premiums and the commission rate.

We assume that at the end of each year the net amount invested per year,  $P/(1+f)$ , is rewarded at a rate that equals the after-tax rate of interest  $r$  paid by long-term government bonds. At the expiration of the policy the investor pays taxes at the rate of  $\tau_c$  on the difference between the lump-sum payment received and the sum of premiums paid since the start of the contract,  $T \times P$ . The present discounted value of  $P$  euro invested each year in conventional, non-sheltered saving (e.g., government bonds) is:  $P\rho(1+r)^{-T}$ , where  $\rho = (1+r)/r[(1+r)^T - 1]$  is the return on conventional saving between year 1 and year  $T$ .

In year  $T$  the after-tax balance of  $P$  euro placed each year in life insurance is the sum of the value of the lump-sum collected in year  $T$ , minus the tax liability on the difference between the lump-sum payment and the sum of premiums  $TP$ , plus the tax saving due to the deductibility of premiums

$$\frac{P\rho}{1+f} - \tau_c \left( \frac{P\rho}{1+f} - TP \right) + \tau P\rho = P\rho \left( \frac{1-\tau_c}{1+f} + \tau \right) + \tau_c TP \quad (\text{A.1})$$

where  $\tau$  is the marginal personal income tax rate. The yearly excess return of life insurance over conventional saving can be defined as:

$$\left(\frac{V}{PV}\right)^{1/T} - (1+r) = \left\{ \left[ \left( \frac{1-\tau_c}{1+f} + \tau \right) + \frac{\tau_c T}{\rho} \right]^{1/T} - 1 \right\} (1+r) \quad (\text{A.2})$$

where  $V$  is the end-of-period value of life insurance and  $PV$  the present value of the balance invested in conventional saving. Clearly, the excess return increases with  $\tau$ . After the 1992 reform the excess return depends on the income marginal tax rate only for  $\tau < 0.27$ . In 1994 the excess return is constant irrespective of  $\tau$ . In the example of Fig. 1 we set  $P = 1300$  euro,  $r = 0.1$ ,  $\tau_c = 0.125$ ,  $f = 0.1025$ . We then compute the value of the life insurance policy (A.1) and the excess return (A.2) before and after the two reforms.

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