The effects of the introduction of tax incentives on retirement saving. *

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Abstract

In this paper we examine the incidence of the introduction in Spain in 1988 of tax incentives to retirement saving. We first identify the population cohorts who most used these incentives using data from a panel of tax returns. Then we use data from a consumption survey to find that there is substantial heterogeneity in the response of household saving to tax incentives. Most contributions to pension funds are by older/high income individuals. While the overall amount of new saving we estimate is limited (at most 19 cents per euro contributed on average), saving responses differ substantially across age groups. In particular, we document very small consumption drops among the group of households between 56 and 65 years of age, the group that most actively contributed to the plan, while we find instead a larger decrease in consumption expenditures of the group of households between 46 and 55 years of age.

Keywords: Pension funds, tax incentives, saving

JEL Codes: D14, H24, H55.

1 Introduction

Tax incentives of retirement saving are present in many countries. They could be rationalized as a mean to achieve that individuals accumulate more wealth for retirement. This could happen through two channels: i) the existence of these tax incentives makes individuals save more during their working lives, and

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ii) they change the composition of wealth portfolios by increasing the weight of "long-run" savings, as, for instance, contributions to pension plans, which are less liquid and, thus, less likely to be used before retirement. This study uses the introduction in 1987 of tax-preferred saving vehicles in Spain to analyze their impact on the first of the channels: do tax incentives lead households to increase the flow of saving during their working life?

Indeed, contributions to pension funds increase with tax incentives, particularly among individuals with age close to retirement and facing high income tax rates, a fact that we document extensively in this paper for the Spanish case (see Duflo et al. 2006, and Engelhardt and Kumar, 2007, for recent evidence for the US). However, the extent to which tax incentives rise retirement saving is a controversial issue. In this regards, there are dissenting sets of results in the empirical literature (see the recent surveys of Hawksworth 2006 or Bernheim, 2002). In the US, contributions to IRAs and 401(k) plans are considered as net additions to saving for some authors (see, for instance, Poterba, Venti and Wise, 1995 and 1996), while others conclude that tax incentives of retirement savings have a strong effect on the allocation of saving and wealth, but little or not effect on the level (see, for instance, Gale and Scholz, 1994, Engen, Gale and Scholz, 1996, and Attanasio, Banks and Wakefield, 2004). Outside the US, there is not much evidence for other countries on this issue.[1]

This unsatisfying state of affairs is, to a large extent, due to three substantive problems that make it very difficult to identify the effects of tax incentives on saving: i) the *wide heterogeneity in the individual responses* to tax incentives, as these responses depend on age, the existence of liquidity constraints, the relevance of bequest motives, the difference between the time discount factor and rates of return, and plausible distortionary effects on labour supply, ii) the *lack of microeconomic data on consumption, saving, and wealth* to observe the wide range of financial and personal characteristics determining marginal tax rates, earnings volatility, pension wealth, discount and interest rates, etc., together with individual/household-level information on income, consumption, and wealth and its composition, and iii) the *differential impact that tax incentives* may have at the moment when they are introduced with respect a situation in which they have been operative for a long period, as it is conceivable that there is some gradual adjustment to the desired level of savings and to the optimal wealth composition after the introduction of tax incentives for retirement saving, and that this adjustment differs across individuals of different characteristics and wealth.

In this paper we provide empirical evidence on the impact of tax incentives on saving by examining the effects of the introduction of tax incentives of retirement in Spain in 1988. We argue that by using the introduction of the

[1] See Milligan (2002) and Veall (2001) on Canada, Blundell, Emerson and Wakefield (2006) and Chung, Disney, Emmerson and Wakefiled (2006) on the UK, and Japelli and Pistaferri (2002) on Italy. Those studies mostly focus on the impact of tax incentives on portfolio composition. There is also some aggregate evidence based on cross-country regressions (e.g. Lopez-Murphy and Musalem, 2004), pointing out that the accumulation of pension funds increases national savings only when they are compulsory.

exemption as an arguably exogenous-to-the individual change in incentives to save, our analysis may be less affected by problems (i) and (ii) than previous work. Of course, by focussing on the introduction of the exemption, our analysis is affected by problem (iii): we provide little information about the impact of the exemption when the program has been operative for a long period. We analyze the impact of the introduction of these tax incentives in two steps. First, we use a panel of tax returns to identifying the population cohorts who most used these incentives. Secondly, we use a panel of household consumption to estimating the impact of tax incentives on consumption/saving of different population groups.

We think that this paper contributes to the literature on tax incentives to save in two different ways. First, we are able to use data spanning the periods before and after the introduction of tax-favoured retirement plans. Thus, we are able to observe consumption choices in a situation in which tax incentives are not present. In the absence of a controlled experiment, such as in Duflo et al. (2006), examining the evolution of savings around the introduction of the tax exemption mitigates some of the problems in the analysis of IRAs, that typically study the impact using post-introduction trends among different groups in the population.

Secondly, we follow Attanasio and DeLeire (2002) and focus on the impact of the introduction of the pension funds program on household consumption, rather than on household wealth. While household wealth is a very important outcome, household consumption conveys complementary useful information. In the presence of employer contributions, household consumption is more likely to reflect how the flow of active household saving is affected by tax incentives than household wealth (see Chernozhukov and Hansen, 2001). Moreover, according to the permanent income model, household wealth is much more affected by transitory income changes than household consumption (Blundell and Preston, 1998). Any analysis that focuses on group-specific changes in household wealth over time faces the problem of disentangling between the impact of tax incentives and the impact of different forms of between-group income changes.[2] We extend the techniques in Attanasio and de Leire (2002), who infer the impact of tax incentives on new saving by comparing the consumption changes of new contributors to those of old contributors. Bernheim (2002) and Poterba, Venti and Wise (1996) object that the variation associated to actual contributions may reflect other variables rather than the incentive to save.[3] To get around such omitted variables problem, we build a variable that summarizes the incentives to contribute and is arguably less affected by endogeneity biases. Our

[2] Also, using consumption allows comparisons of tax incentives across countries. While virtually every European country has an expenditure survey, very few countries have detailed SCF or SIPP -type of household wealth surveys.

[3] A first objection by Bernheim (2002) is that the timing of contributions is correlated with saving preferences of the households, and that such differences are hard to detect using consumption growth - a poor indicator of intrinsic thrift according to Bernheim, Skinner and Weingberg (1997). In addition, Bernheim (2002) and Poterba, Venti and Wise (1996) also argue that Attanasio and De Leire's (2002) results can be also be re-interpreted as contributions of old contributors representing new saving and those of new contributors representing portfolio reshuffling.

instrumental variable is the interaction between the income marginal tax rate and the age of the individual at the time of introduction of the exemption. Individuals with higher income marginal tax rates experiment a higher increase in post-tax returns (Milligan 2001) and age proxies income risk and preference for liquid assets. We check that our variable is indeed a strong predictor of contributions: it was mainly filers in the top quartile of labor earnings who exempted contributions and, within that group, average contributions increased monotonically with age. Using a separate expenditure survey, we then examine if the consumption growth of broad age groups in the top income quartile, relative to our control group of young households, experienced a drop around the introduction of the exemption.

Our results suggest that there is indeed substantial heterogeneity in the contributions to pension funds and in the response of household saving to tax incentives. While the overall amount of new saving we estimate is limited (around 19 cents per euro contributed on average), saving responses differ substantially across age groups - a finding also reported in the literature.[4] In particular, we document very small consumption drops among the group of households between 56 and 65 years of age, the group that most actively contributed to the plan. We document a larger decrease in consumption expenditures of the group of households between 46 and 55 years of age. A way of interpreting such pattern of responses is that households in the verge of retirement find pension funds and other saving forms as strong substitutes, and tend to exhaust tax-exempted contribution limits by reshuffling their wealth portfolios. Conversely, groups further away from retirement, with plausibly less accumulated wealth and for whom contribution limits are plausibly not binding, need to save more to take advantage of the tax incentives of retirement savings.

The structure of this paper is as follows. Section 2 provides a description of the main regulation of pension funds in Spain when tax incentives were introduced in 1988. Section 3 contains some theoretical discussion of the factors determining the impact of the introduction of tax incentives on retirement saving. Section 4 discusses the characteristics of the datasets we use and lays out our empirical strategy. Section 5 examines the incidence of contributions across age and income groups, while Section 6 presents the main empirical results. Section 7 quantifies the impact of contributions on savings, and Section 8 contains some concluding remarks.

[4] Chernozhukov and Hansen (2004) document small wealth responses to 401(k)s in the top of the wealth distribution and some evidence of new saving at the bottom. Engen and Gale (2000) compare trends in household wealth across individuals that are not eligible for the 401(k)s and those that are not, and document substantial heterogeneity across income and age groups.

2 The introduction of tax incentives of retirement saving in Spain

In Spain the first piece of legislation regulating private pension funds was not passed until 1987, when the *Ley de Planes y Fondos de Pensiones* (formally, *Ley 8/87*) established three types of private pension plans: employment plans (*planes de empleo*), under which the sponsor is a non-financial firm while its employees are the plan members, associate plans (*planes asociados*), under which the sponsor is some legal association and the association members are entitled to contribute to the plan, and individual plans (*planes individuales*), created by financial entities – that act as sponsors – and open to any individual who wants to contribute. These pension funds have similar features to post-86 IRAs in the US.

Contributions to these funds were exempted from income taxation, up to certain limits. More concretely, contributions below the minimum of 15% of labour income and half a million pesetas (3,005.06 euros) where directly deducted from the income tax base. An additional 15% of contributions beyond this limit but below 750,000 pesetas (4,507.59 euros) was deductible from the income tax quota. It is worth noting that up to 1987, the income tax levied household individual partners jointly. Since 1988, however, couples may decide whether to be taxed jointly or individually. In the former case (joint income tax return) limits apply to each spouse individually, and therefore could even double for households opting for joint income taxation.

Upon redemption, funds were subject to income taxation at different rates depending upon how redemption took place. They were considered non-regular income if received as a single payment and as a regular income when received in the form of annuities. In the first case, 40% of the payment was exempted from taxation, while in the second case it was taxed at the marginal tax rate on income. As the income tax on non-regular income is lower than that on regular income – in order to correct the distortion created by tax rates that increase with income level when multi-period income accumulates in a single year – redemption in the form of a single payment was, in general, much more prevalent.

As in this paper we focus on the effects on household consumption of the introduction of tax incentives of retirement saving, it is important to bear in mind that two other important changes in household income taxation were introduced in 1988. On the one hand, income marginal tax rates were substantially modified. The rate was set to zero for income below 600,000 pts (3,606.07 euros) and raised from 8% to 25%, at that income level. The number of rates was reduced from 34 to 16, and the maximum one was set at 56%, 10 percentage points less than one year before. Also, as commented above, in 1988 household individual partners were allowed to decide whether to pay income taxes individually or jointly. As the income tax was highly progressive, households were both spouses had labour income often opted for individual taxation, something

we examine in Section 6.3.[5]

3 Some theoretical considerations

Typically the analysis of tax incentives of retirement saving is conducted in an equivalent manner to the rise in the marginal rate of return to saving (see Bernheim, 2002). Under this analysis, tax incentives increase this marginal rate of return so that the impact on saving would depend on substitution and income effects. The relative size of these two effects crucially depends on the prevalence of borrowing constraints and preferences for liquid assets.

To grasp some intuition about the determinants of these effects, let us consider an individual with initial wealth W_0. When tax incentives for retirement savings are introduced, contributions to pension funds, f, yield a tax deduction which is given by $f\tau$, for $f \leq \overline{f}$ and $\overline{f}\tau$ for $f > \overline{f}$, where $\overline{f}$ is the limit applied to contributions for tax-exemption, and τ is the marginal tax rate on income. When the pension fund is redeemed, only a fraction λ of the receipts are subject to the marginal tax rate on income, τ'. Thus, assuming that the time discount rate is equal to the accrual rate of the pension fund, contributions to pension funds increase individual wealth by $f\tau(1-\lambda\tau'/\tau)$, for $f \leq \overline{f}$ and $\overline{f}\tau(1-\lambda\tau'/\tau)$ for $f > \overline{f}$. Hence, the smaller λ and the smaller the ratio between future and current marginal tax rates on income are, the larger this wealth increase is. Insofar as marginal tax rates rise with income, individuals who expect a higher fall in income after retirement would experience a larger wealth increase from contributing to pension funds. This also suggests that individuals will concentrate their contributions to pension funds in those periods when their incomes and, hence the marginal tax rates they face, are highest.[6] Thus, the incentives to contribute in pension funds result from the interaction between tax incentives for retirement saving and the income tax and benefit systems.

Notice that, if there are not borrowing constraints, initial wealth, W_0, does not determine the optimal contribution to the pension fund. In this case, contributions to pension funds could arise, not only through higher saving, but also by (unconstrained) reshuffling the wealth portfolio. However, when there are borrowing constraints, individuals without initial wealth can only contribute to pension funds by saving more, while individuals with positive wealth could also reshuffle their asset holdings to benefit from the tax incentives of retirement saving. Moreover, under borrowing constraints, the decision on retirement saving is also affected by the different liquidity characteristics of retirement savings and other savings. Individuals facing higher income risks would regard retirement savings as an imperfect substitute of normal savings, as the former can only be used to smooth consumption after retirement.

[5] Female labour market participation rates in Spain have traditionally been relatively low, more so for the older population cohorts. Thus, the effects of voluntary joint income tax filing are likely to depend on the age of the household's head. See Section 6.3 for an empirical assessment.

[6] Blundell, Emmerson and Wakefield (2006) also highlight that some individuals face a very strong incentive to contribute to pension funds at particular times during their working lives.

These considerations lead us to conclude that, upon introduction of tax incentives of retirement savings, the effects on saving would be different depending on several individual characteristics, such as, initial wealth, income profile and other factors (household composition, etc.) determining current and future marginal tax rates on income, and borrowing constraints, income risks, and preference for liquidity. For some individuals, with invariant marginal rate of returns to savings, there would be only a wealth effect and no substitution effect, so that their consumption profiles would shift upwards. For others, the marginal rate of return to savings would change, there would be a substitution effect, and, as a result, there would be a change in the slope of their consumption profiles.

Since in the data we cannot identify all of the factors determining income and substitution effects, we characterize the impact of tax incentives of retirement savings on total saving using demographic and income groups. First, we condition the analysis of the contribution to pension funds by focusing on individuals at the top of the income distribution, that at the time of the reform faced the highest income marginal tax rates. We regard individuals between 20-35 years when tax incentives were introduced as the most likely to have accumulated less wealth and to find pension funds less attractive for liquidity reasons (see Gale and Scholz, 1994 for a similar reasoning). Hence, we expect contributions to pension funds from these individuals to be low. We also expect contributions to pension funds to increase with age and marginal tax rates on income. As for impact on consumption, we expect to find a larger consumption drop among medium-age individuals with high income. For these individuals incentives for contributing to pension funds are largest, as income and marginal tax rates on income are at their peaks, and uncertainty and liquidity considerations are less important than for younger individuals. Also, for that population group, accumulated wealth is not at its highest, so that reshuffling under borrowing constraints cannot be too large, and contributions to pension funds need to arise from lower consumption. Finally for older individuals, close to retirement, wealth is higher and liquidity considerations are even less relevant, so that contributions to pension funds are more likely and to arise from reshuffling of the wealth portfolio than from higher saving.

4 Data sets and empirical strategy

We use two data sets. The first is a panel of tax returns filed by individuals between 1982 and 1998 and collected by the Spanish Tax Agency (the so-called *Panel of Income Tax Returns*). The second is a household expenditure survey.

4.1 The Panel of Income Tax Returns

In 1987 the Spanish tax authority sampled 1 in 25 tax returns in 48 out of the 52 Spanish provinces, and then tracked back the returns of those filers from 1982

and forward until 1998.[7] To maintain the representativeness of the sample, the tax authority also added in each year after 1988 a refreshment sample with new tax returns. The sample contains each year all the information contained in a tax return (i.e., all taxable income sources and all tax deductions but excludes all information that can threat anonymity). While the original sample did not contain the age of the main filer, the Tax Authority subsequently collected the age of a filer in the household for 70 percent of the 1987 sample. Due to compulsory joint filing in the year in which the sample was made, the Statistical Agency was able to identify pre-1988 "fiscal households" and then keep track of the tax returns filed by each member of the original 1987 couple - even if married filers opted for filing separately in a particular year.

We use as the unit of our analysis the "fiscal household" (i.e., the 1987 tax filing unit), focusing in variables such as the yearly income of the 1987 tax filing unit and household charcateristics (marital status and the number of children below 18 years).[8] After 1988, we aggregate at the household level the individual and employer contributions to pension funds, but nothing substantially changes when we exclude employer contributions, which represented a very small fraction of the total in the immediate years after the introduction of the tax incentives.

Our main goal with this information is to identify who contributes and to quantify the mean contribution by age and income groups. Thus, our analysis focuses on the subsample of the tax return panel containing the age of the main filer between 1988 and 1991. The reason to focus on those specific years is that one should only observe a consumption drop when households start contributing and presumably adjust their savings plan in response to the introduction of tax incentives. After that initial period, the life-cycle hypothesis predicts that, holding other variables constant, individuals who face higher return to their saving tend to delay consumption to the future.[9] Thus, we use the period up to 1991, when we observe more new filers starting to contribute. Additionally, in 1992 there was a further reform on the tax treatment of the exemption, with confounding impacts on consumption growth.

The evolution of the fraction of "fiscal households" with at least one contributor to pension funds is shown in Table 1, Panel A, Column 1. While initially low, the fraction of contributors rapidly increased, and at the end of the 1990s some 24% of "fiscal households" had made a contribution. Possibly because contributors in 1988 reported higher incomes than contributors who did their initial contribution after that year, the mean and median contribution declined in real terms from 1,337 euros in 1988 (Table 1, Panel A, Column 2, first row), about 6% of the gross labor income reported by filers who contributed, to 1,191 euros in 1998 (Panel A, Column 2, last row of Table 1). As we discuss below, the vast majority of contributions (70%) were made by filing units that reported gross labor income in the top quartile of the income distribution. Contributions

[7] Due to a special tax regime, the Basque Country and Navarra, which represent about 5% of the Spanish population, were not covered.

[8] We have dropped the contributions to pension funds by tax filers who report self-employed income, since in this case reported income could be subject to serious measurement bias.

[9] See Attanasio and DeLeire (2002) who discuss this point in detail.

in the high end of the income distribution were relatively persistent: 81% of contributors who were in the top income quintile in 1988 and started contributing would contribute on the following year, and the average number of contributions over a six- year period was 5.04 (see Table A.1)

Panel B of Table 1 shows the summary statistics of the sub-sample used for the analysis. The mean gross labor income reported by the tax unit was 13,974 euros. The (unconditional) average contribution is 65,7 euros with 5% of tax units actually making a contribution. The mean age of the main filer is 41 years.

4.2 The Household Expenditure Survey (ECPF)

The second sample uses the 1985-1991 waves of a quarterly expenditure survey called *Encuesta Continua de Presupuestos Familiares* (henceforth, ECPF).[10] The ECPF interviews some 3,000 households in each wave. Households are handed a notebook to record their expenses on food, transportation, textiles, health and schooling during some weeks of the quarter. Also, households report retrospective information about more bulky purchases, like furniture, cars, electronic goods (TV, and others) and white goods (washing machines, dishwashers, fridges). Respondent households are tracked during eight quarters (at most), and report information about household composition and the income received by each household member, with some disaggregation on net-of-tax income sources. We focus on households headed by an individual who is a married employee.

Ideally, the key variables in our analysis would be total household expenditures and the household-specific marginal taxes to labor income. However, while we make limited use of income marginal tax rates, not directly observed in this survey, most of our analysis focusses on dummies based on the quartile of pretax income, and concentrate on the top two quartiles of the income distribution. We obtained yearly pre-tax income by applying the withholding tax rates and adding contributions to the post-tax income reported in the ECPF (see Appendices A.1 and A.2 for details). Regarding household expenditure, we have little priors on how specific household consumption components react to changes in tax incentives. Thus, and following Attanasio and Brugiavini (2003), we include basically all consumption components (including the expenditure in all durable goods, but housing) and present results separately by type of good. The main characteristics of the samples used are shown in Tables 2A (all households) and 2B (the top two quartiles of the income distribution).

4.3 Empirical strategy

The empirical analysis proceeds in three steps. The first verifies that pre-tax labor earnings and the age at the time of the introduction of the tax incentives of retirement saving are strong predictors of both the probability of contributing

[10] See Browning and Collado (forthcoming), Carrasco, López-Salido and Labeaga (2005) and Albarrán (2004) for recent uses of the ECPF to test theories of consumption behavior.

and of the amount contributed to pension funds. To that end, we use the panel of tax returns.

The second step builds on the previous results and examines the evolution of mean consumption growth of the groups that, according to the panel of tax returns, used the contributions most heavily. The data set used in this step is the Expenditure Survey. While this strategy allows us to detect consumption drops around the time of the introduction of the tax incentives, we cannot quantify how much new saving is created.

Thus, in the third step we use Two-Sample Two Stage Least Squares to relate mean contributions to pension funds and mean drops in expenditure.

In what follows, we discuss each of these steps in detail.

4.3.1 Distribution of contributions when tax incentives were introduced

Following the theoretical considerations sketched in Section 3, we examine both contributions to pension funds around the date of the introduction of tax incentives of retirement savings. As already mentioned, we expect households with higher income marginal tax rates to experience a larger increase in return to new retirement saving and, thus, to have a higher incentive to contribute. Secondly, within households with similar income marginal tax rates, those in the latter part of their working lives are most likely to contribute, as wealth is plausibly higher, and income risk and liquidity considerations are less relevant. We check these hypotheses using the panel of tax returns to compute the average probability of contributing and the average contribution by age group (holding the quartile of labor earnings constant). We divide the sample along two dimensions: i) age groups (in four 10-years brackets), and ii) the quartile pre-tax labor earnings of the 1987 tax filing unit. This easily identifies individuals who contributed to pension funds by most after the introduction of tax incentives of retirement savings.

4.3.2 Changes in expenditure when tax incentives were introduced

In the second step we compare the consumption growth for households with high income marginal tax rates in the later part of their working lives (the group with the highest incentive to contribute) to that of individuals with high income marginal tax rates and headed by a person below 35 years of age (a group with lower incentives). Note that everyone who files a tax return qualifies for the subsidy, so a group of ineligibles does not really exist. Instead, our definition of "treatment" and "control" is defined by the differential incentive to contribute faced by households in different income quartiles.[11] That test based on consumption growth has the advantage of controlling for unobserved differences between the

[11] In some sense, the literature on the elasticity of taxable income to marginal income taxes faces the same problem (no one is really excluded from a change in marginal taxes, see Gruber and Saez, 2002). We borrow from that literature in defining treatment and control groups on the basis of differences in marginal income taxes based on last year's income.

"control" and "treatment" group, as long as they remain constant over time. It is also unaffected by trends in saving that affected similarly to individuals within the same income quartile or within the same age group.[12]

We estimate the following equation separately for the top two quartiles of the pre-tax family earnings (where the earnings quartile is determined by the first time we observe the household in the sample):

$$\begin{aligned}\log C_{h,q+4} - \log C_{h,q} &= \beta_0 + \sum_{i=1}^{i=3} \beta_i (Age\_i)_h POST88_q + \beta_4 POST88_q + \\ &+ \sum_{i=1}^{i=3} (Age\_i)_h \beta_{4+i} + \beta_8 X_{it} + \varepsilon_{h,q+4} - \varepsilon_{h,q} \qquad (1)\end{aligned}$$

The dependent variable is the household-specific difference between total expenditure four quarters-ahead and current total expenditure. Age_i are three dummies indicating whether or not the household head is between 36 and 45 years old, 46 and 55 years old, or 56 and 65 years old. $POST88_q$ is a dummy indicating whether or not quarter q is before or after 1987.1 (that is, if the four-periods ahead observation on expenditure happens after the introduction of the program). X_{it} contains year and quarter dummies (excluding the fourth quarter), the level and four-quarter change of household size (number of members) and composition (the number of and four-quarter change of the number of children between 1 and 2 years of age, of the number of children between 3 and 5, 6 and 13, 14 and 17 and after 65 years of age). It also contains the level of gross household earnings and the four-quarter change in household earnings. To control for the change in reporting mode in 1988, that may have increased the expected lifetime income of couples by allowing separate filing, we include two extra dummies: i) an intercept of "both members of the couple work", and ii) "both members work" interacted with the post 88 dummy. We think that those variables capture any mechanical effect of separate filing on expected lifetime income. As for behavioral responses, we briefly discuss them in Section 6.3. We do not include changes in other sources of income (like interest rates), because saving in interest-yielding assets is likely to change due to the introduction of the exemption.

The coefficients β_1, β_2 and β_3 give the averages of individual changes in expenditure growth in a specific demographic group relative to the "base" group.

[12] One could argue that the right comparison is between the consumption growth of individuals who actually contribute and those who do not. Nevertheless, in using the incentive to contribute rather than actual contributions as the key covariate we follow most of the literature on 401(k)s. Even with complete samples, Engen and Gale (2000), Poterba, Venti and Wise (1996) and others assess the impact of 401(k)s by comparing trends in saving behavior between households eligible and non-eligible for 401(k) and disregard the comparison between contributors and non-contributors. To reinforce our argument, notice that variations in actual contributions are correlated with unobserved variables that may have a separate impact on consumption growth beyond interest rate increases (time preference or changes in the preferences for liquidity).

Those averages mix households that contribute to pension funds and those that do not. Note that only contributors faced an increase in the return to new retirement saving at the time of the introduction of the program. If contributions were financed from changes in consumption we would expect β_1, β_2 and β_3 to be negative. On the contrary, if contributions were financed from reshuffling assets, and not from higher saving, we would expect β_1, β_2 and β_3 to be non-negative.[13]

Mean impacts on consumption changes may not be the only relevant moment. The proportion of filers who contributed to pension funds between 1988 and 1991 was low (see Table 1). Thus, the introduction of tax incentives is unlikely to have generated a constant impact throughout the distribution of consumption changes; on the contrary, it is likely to be located in specific centiles of the distribution. Secondly, our expenditure measure includes durable goods. If households delayed the purchase of a car or of new furniture to finance their contributions, we would expect again a nonlinear impact over the distribution of expenditure changes. Thus, as a further specification check, we report quantile regression estimates of the impact of the interaction of age dummies and income group on the 25th, 50th, and 75th centiles of the distribution of consumption changes. Finally, and given that consumption growth is clearly heteroskedastic, we tighten our estimates presenting Weighted Least Squares (WLS) estimates, weighting observations by the inverse of the absolute value of the residual of a consumption change equation estimated by OLS.[14]

4.4 Robustness checks

A potential problem with model (1) is that it attributes any differential trend in expenditure growth that happened between 1985 and 1990 in the age groups we consider to the introduction of tax incentives of retirement saving. To control for age-specific trends, in some specifications we use as a benchmark the evolution of consumption of the group with incomes between the 50th and the 75th centile of the distribution of earnings (a group with high pre-tax income but a lower incentive to contribute). Namely, using the subsample of households whose

[13] We compute standard errors allowing arbitrary heteroscedasticity and autocorrelation within observations from the same household. Bertrand, Duflo and Mullainathan (2004) argue that if there is positively autocorrelation in the dependent variable, standard errors in DD applications may be artificially low. However, note that in our case, the dependent variable, changes in log consumption is *negatively* autocorrelated (coefficient of group-specific autocorrelation: -.16), in which case the standard errors we report are not affected by Bertrand et al's concerns necessarily.

[14] WLS does not always lead to unbiased estimators due to the difficulties in modelling variances. To assess whether or not this is a problem, Table 4 reports both OLS and WLS estimates below, to permit informal comparisons of the differences in point estimates.

income is above the median, we estimate the following model:

$$\log C_{h,q+4} - \log C_{h,q} = \beta_0 + \sum_{i=1}^{i=3} \gamma_i (Age\_i)_h POST88_q * 1(Y > Y_{.75}) + \sum_{i=1}^{i=3} \gamma_{4+i} (Age\_i)_h POST88_q + \gamma_8 POST88_q * 1(Y > Y_{.75}) + \sum_{i=1}^{i=3} \gamma_{8+i} (Age\_i)_h * 1(Y > Y_{.75}) + \sum_{i=1}^{i=3} \gamma_{12+i} (Age\_i)_h + \gamma_{16} POST88_q + \gamma_{17} 1(Y > Y_{.75}) + \gamma_{18} X_{it} + u_{h,q+4} - u_{h,q} \quad (2)$$

Model (2) attributes to tax incentives any trend in the expenditure growth of households in the later part of their working life and in the upper quartile of the distribution of earnings that is different from the corresponding trend in the second quartile of the distribution of earnings. Model (2) makes the implicit assumption that, if tax incentives of retirement saving had not been introduced, the difference in consumption growth between households in the top quartile with ages above 45 and households below 35 would have evolved as the same difference among households in the second-to-top income quartile.

4.4.1 The impact of contributions to pension funds on new household saving

A parameter commonly used in the literature that evaluates the impact of tax incentives on retirement saving is "How much new saving does an extra euro of contributions generate"? In our setting, a way of obtaining such measure is expressing the average consumption drop among groups who relatively contributed more to pension funds as a fraction of the amount that those same groups contributed to pension funds in excess of other groups. Namely, we are interested in the parameter α_1:

$$\alpha_1 = \frac{E[C_{it}^{post88} - C_{it}^{pre88} | Age\_i \geq 36, Y_{it}] - E[C_{it}^{post88} - C_{it}^{pre88} | Age\_i < 36, Y_{it}]}{E[Contr_{it}^{post88} | Age\_i \geq 36, Y_{it}] - E[Contr_{it}^{post88} | Age\_i < 36, Y_{it}]} \quad (3)$$

where C_{it} measures yearly consumption after and before the introduction of tax incentives and $Contr_{it}$ is the amount contributed to pension funds in the early years when the exemption was introduced. The numerator of the expression is the average consumption drop of households above 36 years of age, relative to that of households below 36 years of age. The denominator is the average amount contributed by households headed by an individual above 36 years of age relative to that contributed by households below 36 years.

The parameter α_1 can be estimated using a Two-Sample Least-Squares estimator of the impact of the amount contributed on the consumption of the household, where contributions are instrumented (see Angrist and Krueger 1992). The

key instrument in our study is an age trend that differs with respect to the 20-35 age group that operates after 1988 within the top income quartile but not within the second-to-top income quartile. Thus, we assume that such differential trend only affects consumption growth through its impact on contributions to pension funds, then is correlated with contributions but not with consumption changes.

We implement the TSLS estimator as follows. In the panel of tax returns, we use the 1988-1991 waves to estimate:

$$Contr_{it} = \delta_0 + \sum_{i=1}^{i=3} \delta_i Age\_i * 1(Y > Y_{.75}) + \delta_4 1(Y > Y_{.75}) + \sum_{i=1}^{i=3} \delta_i Age\_i + u_i$$

In the consumption survey, we estimate

$$\begin{aligned} \Delta C_{it} &= \alpha_0 + \alpha_1 \widehat{Contr}_{it} + \alpha_2 POST88_t * 1(Y > Y_{.75}) + \sum_{i=3}^{i=5} \alpha_i Age\_i * POST88 \\ + \sum_{i=6}^{i=8} \alpha_i Age\_i * 1(Y &> Y_{.75}) + \alpha_9 POST88_t + \alpha_{10} 1(Y > Y_{.75}) + \sum_{i=11}^{i=14} \alpha_i Age\_i + \varepsilon_{it} \end{aligned}$$

where $\widehat{Contr}_{it}$ is the OLS prediction in the sample of tax returns.

Two notes of caution about the TSLS exercise. The first is that both samples differ in their sampling and population coverage: the panel of tax returns captures the rich in a much better way than the panel of expenditure. While we think this is less of a problem for the exercise that merely detects consumption drops, as that specification only requires identifying broad groups that contribute, it may be somewhat problematic for imputing contributions within cells. The second note of cuation is that the specifications with the level of consumption as a dependent variable are somewhat noisy, leading to imprecise estimates. For those two reasons, we emphasize less the new saving results than the rest of the results.

5 By how much did tax incentives promote contributions to pension funds?

Table 3 presents the size of contributions to pension funds of different population groups obtained using the 1988-1991 waves of the Panel of Tax Returns. Population groups are defined by age groups (in four 10-year brackets) and the pre-tax labor earnings of the 1987 tax filing unit. The centiles are computed using the Expenditure Survey, to keep consistency across samples.

Panel A shows the distribution of contributions in the top quartile of the labor earnings distribution. The unconditional mean contribution increases with age; the unconditional mean contribution (Table 3, row 1 Column 1) in the

lowest age group is 62.72 euros; the same mean contribution in the group close to retirement (Table 3, row 1, column 4) is four times higher, 269.2 euros.The percentage of filing units with at least one contributor was relatively small and also varies monotonically with age, from 6% in the group of filers with ages between 20 and 35 years of age to 12% in the group between 56 and 65 years of age (Table 3, Panel A, row 2, columns 1 and 4, respectively).

The proportion of filers exhausting the limits is roughly constant up to 56 years of age (12 percent of tax filers who contributed to pension funds in the previous years, row 4 Panel A of Table 3). In the latter part of the working life, the fraction is much higher, 30% (Table 3, row 4 column 4). That finding is consistent with our prior that a substantial fraction of the contributions to pension funds of filers in the later part of their working life may arise from reshuffling wealth portfolios.

Panels B and C in Table 3 present similar summary statistics for the second quartile of the labor income distribution (Panel B) and the bottom two quartiles (Panel C). The unconditional group-specific average population fraction that contributed to pension fund is between 3 and 6 times smaller than in the top earnings quartile. Still, for all age groups, the fraction of contributors in the verge of retirement that exhaust the tax-exemption limit is about 30%.

Overall, the evidence in Table 3 suggests that, if there is an impact of contributions on household expenditure, it can mostly be found in the top quartile of the (pre-tax) earnings distribution. In addition, the impact should vary with age. Of course, some households in the bottom three quartiles of the income distribution may have made substantial contributions to pension funds. Nevertheless, as a group, we can only expect a little impact of the introduction of pension funds on the expenditure of the bottom three quartiles of the income distribution. This leads us to make some use of households in the second-to-top income quartile as an additional control group.

6 Did tax incentives to retirement savings raise households' saving rates?

This section presents the estimates of the drop in expenditures around the introduction of tax incentives of retirement savings. Table A.2 presents our empirical strategy in Diffs-in-Diffs form. Each entry in Table A.2 shows the average of household specific expenditure growth, by income and age group. Row 1 column 1 of Table A.2 shows that prior to the exemption, average consumption growth in the top income quartile for the 46-65 age group was 6.8 percent, while in the group of 20-35 years of age consumption growth was 1.1 percent (row 2, column 1 of Table A.2). After the introduction of the exemption, expenditure growth in the group of 46-65 years of age dropped to 1 percent, while it was 8.3 percent in the group of 20-35 years of age. That results in a diff-in diff estimate of 13 percent. Row 4 in the second panel shows the change in consumption growth for the age 46-65 age group in the second-to-top income quartile. That group

experimented an increase in expenditure growth of 2 percent (see row 4, column 3). In the second-to-top income quartile, households in the 20-35 age group experimented an average expenditure growth of 5.5 percent. The corresponding diff-in-diff estimate is - 3.5 percent, much lower than the 13 percent in row 3, column 3.

We provide further illustration of the dynamics of the effect in Figures 1 and 2. To detect if there was an age-related discontinuity in consumption growth that started in 1987, we ran year-specific OLS regressions of household expenditure growth on a dummy indicating whether the age of the head was between 36 and 65 years of age.[15] Each estimate in each year measures the difference in log expenditure growth between households in the later part of the life-cycle and our control group of young households. The full line in Figure 1 displays the estimates of the yearly age dummies for households in the top income quartile. Before the exemption (in years 1985 and 1986), log-expenditure changes of groups above 36 and 65 years of age were about 5 points larger than those of the 20-35 age group. Expenditure growth of groups above 36 became negative in 1987 and stayed so during the rest of the sample period. The dotted line in Figure 1 shows the corresponding estimates for households in the second-to-top income quartile (who contributed much less to pension funds). While in this group the evolution is somewhat noisy in 1987, unlike households in the top income quartile, one-year ahead expenditure growth was positive both before and after 1988.

One concern with the evidence in Figure 1 is that the Spanish economy was growing at a 4% rate between 1985 and 1991. If during periods of GDP growth, the expenditure of young households in the top income quartile increases more than that of other age groups, Figure 1 would be picking up such effects. To test for the possibility of periods of GDP growth affecting relatively more the expenditure of young households, we examine the same trends during a period of similar GDP growth; like that spanning 1998 and 2002 (the average yearly increase of real GDP was about 4%). Figure 2 displays the estimates of the same OLS coefficient as in Figure 1. Between 1998 and 2002, the age coefficients in the top and second-to-top quartiles look similar to each other. We interpret from this that age-specific trends in the top income quartile during an expansion are unlikely to generate the pattern of results shown in Figure 1.

6.1 Regression evidence (D-in-D)

We start by examining the evolution of household expenditure among households in the top quartile of the income distribution using estimates from equation (1). Consumption growth of individuals between 56 and 65 years of age (relative to households between 20 and 35 years of age) is estimated to have fallen by 9.8% after the introduction of the program (row 1 column 1 of Table

[15] The omitted group are households headed by a person between 20 and 35 years of age. To hold household composition constant, we also add as covariates one-year changes in demographics (changes in the number of children, elderly and overall number of household members).

4). However, this estimate is very imprecise and not significantly different from zero (the standard error is 12.3%). The corresponding drop in consumption expenditure growth for the group between 46 and 55 years of age is 21.7%, significantly different from zero at the 5 percent confidence level (row 2, column 1, Table 4). Finally, for the group between 36 and 45 years of age the drop in relative consumption expenditure growth is 8.7%, which is consistent with the notion that households cut their expenses upon the introduction of the program. Nevertheless, the results are very imprecise.

Column 2 presents Weighted Least Squares (WLS) estimates of magnitude similar to the OLS case, but much more precise standard errors. The impact is again negative for all age groups and significantly different from zero at conventional confidence levels. The impact is not monotonic with age, and the highest impact is located among the group with 46-55 years of age.

As mentioned above, both the fact that few households had exempted contributions in the early years following 1988 and the presence of durable goods in our measure of expenditure leads us to expect that the age-specific drop in consumption growth was not uniform. Columns 3 through 6 of Table 4 confirm that hypothesis for the group of individuals between 46 and 55 years of age. The estimates shown in row 2, columns 3-5 of Table 4 suggest that the drops in consumption growth were driven by a few large changes: the 75th-centile of the consumption drop was 35 log points (standard error: .13).[16] Conversely median consumption growth did not change as much (19.4 log points, but the standard error is 11.2). In other words, the average drop in expenditure is due to the behavior of a limited set of households. For households close to retirement (56-65), we find a constant drop at different centiles, a finding that leads us to suspect that the estimates in row 1, Column 1 of Table 4 may reflect other trends. Finally, for our youngest treatment group (individuals between 36-45 years of age), while the estimates are not significantly different from zero, the magnitude of the coefficients also suggests that the fall in consumption expenditure growth is also uniform over the distribution.

Rows 4 through 6 of Table 4 present estimates from a similar specification to that in Panel A, but for households with incomes between the 50th and the 75th centiles. Those households faced lower marginal tax rates on income and contributed less on average, as documented in Table 3. Thus, if the decreases in consumption expenditure growth documented in rows 1-3 of Table 4 are indeed due to the introduction of tax incentives of retirement savings, we should find lower impact of the introduction of the program on their consumption growth. The point estimates in row 5 (the group between 46 and 55 years of age) confirms that prior: the drop in consumption growth oscillates between .033 (OLS specification) and .027 (WLS specification) and they are significantly lower than in the top quartile of the distribution of earnings. Further, the distribution of the drop in expenditure among the 46-55 age group is very different from that in the top income quartile: the drop in consumption growth is not located at

[16] Standard errors in the quantile regression specification were computed by 200 bootstrap replications in which the replications preserved the multiple observations of the same household in each of the replication samples.

the largest centiles of the distribution of consumption growth.

Rows 7 through 9 in Table 4 repeat the analysis now using the change in the level (rather than logs) of consumption expenditures. The advantage of that specification is that one can readily interpret the magnitude of the consumption drop and informally compare it to the estimates in Table 3, to see how likely it is that the drop in consumption was indeed due to increases in contributions to pension funds. The results in row 8 of Column 1 suggest that average expenditure among the group with ages between 46 and 55 fell by about 687 euros and that the average drop was far from constant, but driven by a relatively small set of households. Note that this average is much higher than the excess contribution of the 46-55 group with respect to the base group with ages between 20 and 35: (119 euros, as it results from substracting Column 1, row 1 from Column 4, row 1 in Table 3).

In rows 10 to 12 of Table 4, we examine the concepts of expenditure that fall, and run a regression similar to equation (1), but in which the dependent variable only contains the following set of durable goods: "white" durable goods (purchases of fridges, dishwashers, washing machines... etc.), electronic goods (TVs, radios, CD players), cars and furniture. The results in row 11 suggest that, among the group that most diminished expenditure (46-55 years of age), the bulk of the adjustment happened due to a drop in expenses of durable goods. Results (not shown) also suggest that the drop in the expenditure growth of non-durable goods (food, textiles, transportation, health and entertainment) after 1988 was around 65 euros (standard error: 37,5 euros) among the group with ages between 46 and 55 years of age and a not-significant drop of 89 euros, (standard error: 428.6 euros) at the 90th centile of the distribution of consumption. The fact that the adjustment occurred through durables, coupled with the persistence of contributions (see Table A.1), gives a potential explanation of the discrepancy between the estimated consumption drop and the average annual contribution; households cut the stream of payments involved in the purchase of a durable good to sustain their contributions.

Overall, from Table 4 we draw four main conclusions. First, the introduction in 1988 of tax incentives of retirement savings coincided with a drop in consumption expenditure growth among the treatment group of households between 45 and 56 years of age in the top income quartile, relative to our control group of households between 20 and 35 years of age. We find less evidence of such an impact for households headed by individuals close to retirement age, a finding we discuss below. Secondly, the drop in both the log and in the level of household consumption expenditures is driven by a few large changes, consistent with the notion that only a small fraction of households made contributions to pension funds. Thirdly, further evidence for the differential trend among the 46-55 age group between 1985 and 1991 being due to contributions to pension funds is the fact that the drop in expenditure was much lower within households in the same age group (46-55 years of age) within the second-to-the top income quartile (that, as a group, contributed much less to pension funds in the onset of the program). Fourthly, the evidence in the bottom part of Table 4 also suggests that households in the top quartile of the income distribution and who

were between 46 and 55 years of age reacted to the introduction of the program by delaying bulky expenditures.

6.2 Controlling for age-specific trends

A problem with the evidence in Table 4 is that we detect a drop in expenditure growth for households that, as a group, did not contribute much to pension funds; in particular households between 46 and 55 years of age and those between 36 and 45 in the second-to-the top income quartile also experimented drops in expenditure growth around the time of the introduction of the exemption. An interpretation of that evidence is that there were other trends that depressed expenditure growth for those age groups and were not related to the introduction of tax incentives of retirement saving.

Table 5 presents results from using an alternative strategy to "net out" age-specific trends. In Panel A, we substract the estimate of the drop in expenditure presented in Table 4, rows 1-3 column 2 (that among households in the top quartile of the income distribution) to the corresponding drop in expenditure reported in Table 4, rows 4-6 column (2). We do this by using the triple-differences estimator in (2). We report WLS, and estimates of the expenditure drop at different centiles. The estimates are similar to those reported in Table 4, rows 1-3, and we do not comment them in detail.

Panel B of Table 5 experiments with an additional source of identification. Our results so far use income quartiles to identify treatment and control groups. Yet, according to the theoretical discussion, tax incentives of retirement saving operate through the income marginal tax rate. The reason is that households with higher income marginal tax rates experience a larger increase in the return to retirement saving and consequently a stronger substitution effect. Hence, we explore if the expenditure drop after the introduction of tax incentives is stronger among households that faced higher income marginal tax rates[17] We estimate the following model again for the top two quartiles of the distribution of earnings.

$$\log C_{h,q+4} - \log C_{h,q} = \beta_0 + \sum_{i=1}^{i=3} \delta_i (Age\_i)_h POST88_q mtax_h + \sum_{i=1}^{i=3} \beta_i (Age\_i)_h mtax_h + \sum_{i=1}^{i=3} \beta_{3+i} POST88_q mtax_h + \sum_{i=1}^{i=3} \beta_{9+i} (Age\_i)_h + \beta_{13} POST88_q + \beta_{14} mtax_h + \delta_{18} X_{it} + \upsilon_{h,q+4} - \upsilon_{h,q} \quad (4)$$

where Age_i stands for three age group dummies: 36-45, 46-55 and 56-65. The parameters of interest are δ_1, δ_2 and δ_3 that measure the age-specific impact of

[17] For each household in the sample, we computed the marginal income tax using the rules between 1985 and 1988, ignoring all capital income (that is, we compute the marginal income tax on the first euro of capital income). After 1988, for each household we estimated whether it was more tax-advantageous to file separately or jointly and, for those for whom separate filing was optimal, we imputed to the household the highest marginal income tax of the couple.

income marginal tax rates on the average expenditure drop after the introduction of the exemption. If higher income marginal tax rates are associated to larger drops in consumption growth for all age groups, we should expect δ_1, δ_2 and δ_3 to be negative. The results shown in Table 5, Panel B confirm that for the group between ages 46 and 55, higher consumption drops happened among households with higher income marginal tax rates.

6.3 Other changes correlated with the introduction of the exemption

The exemption was introduced at the same time as a change in marginal income taxes and the introduction of tax splitting. To control for the change in marginal tax rates, we ran regressions very similar to (1) in the ECPF using marginal taxes as the dependent variable, finding very small effects. Possibly, the reason for this is that the new marginal taxes either affected households in the bottom of the income distribution (excluded from our subsample) or at the very top of the income distribution (who probably do not participate in an expenditure survey).

Furthermore, we examine if our key variable that identifies the incentive to contribute (a differential trend between 1985 and 1990 among different age groups in the top quartile of the income distribution) is correlated with other outcomes, such as

1) Purchase of a house: Table A.3 shows the evolution of the probability of purchasing a house in the ECPF before and after the 1988 reform, by age group. We find a sizable drop (-1.7 percent, relative to a overall statistic of 2.3 percent) in the probability of doing so in our base group, perhaps indicating that the drop in expenditure in the 46-55 age group was not confined to "small" durables.

2) Joint filing: The introduction of tax incentives of retirement savings in 1988 coincided with a major tax reform that changed compulsory joint filing to voluntary individual or joint filing. Such reform is likely to have changed the income marginal tax rate and the taxable income of households. In other words, the 1988 introduction of separate filing may have affected the expected permanent income and consumption of different age groups. For example, if joint filing was specially prevalent among households headed by our control group (persons between 20 and 36 years of age), the estimates in Model (1) would attribute to tax incentives what really is an income effect associated to a positive shock to labor supply. In principle, we focus on the top income quartile, that experienced similar tax changes, but there could be a problem if the option of separate tax filing affected differently different age groups. We check that possibility in Table A.3. Table A.3 Column 2 shows the impact of our instrument (a post-1988 dummy) on the probability that a tax filing unit files jointly. The group of tax filers headed by a person between 46 and 55 years of age was 3.7% more likely to file jointly than the base group. Thus, as a consequence of the tax reform, the 46-55 age group did not experience such an income increase as the base group. Still, it is not clear to what extent this is a

problem. First, while the estimate is very precise, it is relatively small: less than 4% with respect to 64% of filers who filed jointly in that income group. Secondly, we control for changes in family income in our consumption regressions shown in Table 4, for an indicator of whether both members of the couple work and an interaction of that variable with the post 88 dummy.

3) Spouse participation: We estimate a small drop of female participation in the group of households in the top income quartile headed by an individual between 46 and 65 years of age (1.6 percent points), as shown in Column 3 of Table 5, but it is also very imprecisely estimated and not significantly different from zero. In addition such drop in participation is consistent with the small impact of our instrument on joint filing.

Overall, the finding that the choice of separate filing and female participation has such a modest age-profile lead us to think that it is unlikely that the estimates presented in Tables 4 and 5 are driven by the introduction of separate filing.

7 How much new saving are pension funds generating?

This section combines expenditure data and data from contributions to estimate how much new saving was generated by the introduction of pension funds.

The evidence in Table 4 suggest that the adjustment among the group with ages between 46 and 55 and in the top income quartile happened through drops in durable consumption expenditures (i.e., households delayed the purchase of a new car or furniture to contribute to pension funds). By definition, the periodicity of those expenses exceeds the year, so unadjusted comparisons of annual contributions to drops in observed expenditure with periodicity over the year are not informative.[18]

We use the depreciation rates in Fraumeni (1997) to distribute among several periods the bulky expenditure in durable goods when we observe one such purchase in the data. Namely, whenever we observe the purchase of a durable good, we attribute to the year of the purchase (and subsequent periods if the household stays in the sample) the fraction of the purchase that is depreciated.[19] Unfortunately, we can estimate neither the flow of services from durables obtained by households who own durables but do not make a transaction during the sample period nor, for households that engage in a transaction, the consumption of the durable goods owned prior to the purchase of a new good. We

[18] The problem would be solved with either a sufficiently long panel of household expenses or with detailed information about the stock of durables. While the ECPF is one of the longest comprehensive consumption data sets in Europe, it only follows households for up to 2 years. Furthermore, the ECPF contains little information about wealth stocks.

[19] Our procedure amounts to multiplying .165 to the observed total payment for a car, .1179 to the cost of furniture, .165 to expenditures in white goods and .1833 for electronic goods like a TV or a radio. We obtain those estimates from Fraumeni (1997), who in turn obtains the estimates from Hulten and Wykoff (1995). See Bover (2005) for an application to Spanish data.

suspect that our measure overestimates consumption drops (basically, because we assign a zero to pre-purchase consumption of durable goods). Summary statistics of those variables are shown in Table 2.

Table 6 reruns the results in Table 4, now using our corrected measure of expenditure. The WLS results in rows 1 through 3 of Table 6 are qualitatively consistent with those in Table 4 but the magnitude is of course much lower (for the 46-55 group, we estimate a drop in our consumption measure of 3.3 percent). For the rest of the groups, we do not detect a significantly different from zero drop in expenditure once we distribute expenditures in durables among periods.

The second Panel in Table 6 documents the evolution of the level of periodified expenditure around the introduction of the tax incentives. The average expenditure drop in the 46-55 year-old group is about 72 euros, standard error: 40 euros. We find positive effects for the age groups of 56-65 and 36-45.

Columns 2-4 of Table 6 provide an informal assessment of the extent of new saving by age group within the top quartile of the family earnings distribution. Column 2 presents the drop in consumption estimated in Table 6, Column 1 relative to the control group, as estimated in Panel A of Table 6. In Column 3, we document the unconditional average contribution by each group minus the contribution of the control group. The estimates in Column 1 are obtained substracting magnitudes in row 1 of Table 3. For example, the estimated drop in consumption in the log specification for the 36 to 45 age group (relative to 20-35), is presented in row 1 of column 3, and is 19 euros. On average, the 36-45 age group contributed 62 euros more than the 20-35 years of age group, yielding an estimate of increased saving of 31 cents per euro contributed. As for the group between 46 and 55 years of age, they contributed 119 euros more than the 20-35 years of age group, and their consumption fell by 77 euros. In the 46-55 year-old group, 64 cents of new saving were created per euro contributed. Possibly the most surprising result is that in row 1. The contributions of the group that most actively contributed (top income quartile, ages between 56 and 65) represented no new saving at all and most likely came from portfolio reshuffling. In Panel B of Table 7 we present broadly similar results using the level of the consumption drop as the dependent variable.

A more formal, but perhaps less informative way of summarizing the degree of new saving created by the pension funds program is to look at two-sample Two Stage Least Squares.[20] Those estimates are presented in Table 7. The

[20] Namely, we use the following procedure. We use the subsample of hosueholds in the panel of tax returns who report incomes in the top two quartiles of the ECPF distribution of pre-tax earnings. We regress contributions (including zeroes) on the following variables: age dummies, year dummies, a dummy the level of pre-tax household earnings, household composition variables (dummies for one, two, three and more than four descendants, a dummy for the presence of an elderly of more than 65 years of age and the total number of members). We also include one year-change in all variables but age. We use OLS to predict average contributions, but average predictions of contributions do not change much when we use a Tobit model to obtain predictions. We then use the imputed contribution in an OLS regression of the change in the level of consumption on the same set of covariates listed above. Note that we identify the model by not including in the consumption regression an interaction between top income quartile, age group and post 88 dummy. Two final notes regarding the computation of the standard errors. We have used Weighted Least Squares to estimate the

first column is the first-stage equation, that predicts contributions to pension funds using the age group and income quartile of the main filer at the time of the introduction of tax incentives, and restricting taxpayers to those who were in the top two quartiles of the income distribution that year. The interactions between age dummies, top income quartile (and POST88dummy) in Column 1, rows 2-4 are significantly different from zero at any conventional significance level. The TSLS estimate is presented in the second column of Table 7 row 1, and is -.054 (.155). While extremely imprecise, the result suggests that each additional euro of contributions reduces consumption by a marginal amount. Columns (3) and (4) include an additional control variable dummies indicating the income bracket the household.[21] The corresponding TSLS estimate is somewhat larger and suggests a consumption drop of 12 cents per euro contributed. Finally, columns (5) and (6) introduce as additional covariates dummies for the labor status of both members of the couple and its interaction with a POST88 dummy, resulting in a consumption drop of 19 cents, suggesting a larger consumption drop than the previous estimates.

As we discuss above, those average estimates conceal substantial heterogeneity across age groups.

8 Concluding Remarks

Tax incentives of retirement savings might increase wealth upon retirement by either increasing savings during individuals working lives or by changing the composition of wealth portfolios towards assets that are more likely to be maintained until retirement age, as it is the case of pension funds. The identification of the global effects of tax incentives of retirement saving is blurred by several difficulties, such as the wide heterogeneity in the individual responses, the lack of microeconomic data on consumption, saving, and wealth through the life cycle, and the differential impact that tax incentives may have at the moment when they are introduced with respect a situation in which they have been operative for a long period.

In this paper we have examined the effects tax incentives of retirement savings in Spain at the period in which they were first introduced. Thus, by using data spanning the periods before and after the introduction of tax-favoured retirement plans, we can observe changes in consumption trends among different groups in the population which could be related to contributions to pension funds. For establishing this relationship, we mostly rely on the fact that individuals with higher income marginal tax rates experiment a higher incentive to contribute to pension funds, while we use age as proxy for income risk and preference for liquid assets, another dimension in which retirement savings differs

models in Table 7, where the observation-specific weights come from the inverse of the OLS residuals. Standard errors are corrected for heteroscedasticity and arbitrary autocorrelation between the observations of the same household, but not for generated regressors.

[21] The brackets included as regressors are, income between 15,000 and 18,000 euro, another one for between 18,000 and 24,000 euro, another one for income between 24,000 and 30,000 euro and a final one for households whose income is above 30,000 euro.

from other savings.

While the overall amount of new saving we estimate is limited (at most 19 per euro contributed on average), saving responses differ substantially across age groups. In particular, we document very small consumption drops among the group of households between 56 and 65 years of age, the group that most actively contributed to the plan, while we find instead a larger decrease in consumption expenditures of the group of households between 46 and 55 years of age. In our view, these results cast doubts about the effectiveness of these tax incentives to promote retirement savings, specially when compared to the fiscal costs that they have in terms of lost government revenues. Nevertheless, a full assessment of these incentives would require the measurement on its impact on wealth upon retirement, a task which is in our agenda for future work.

9 Appendix 1: ECPF Sample construction

We use a sample of 148,679 households-quarters headed by married ECPF respondents between 1985 and 1996. We start by only considering households between 20 and 65 years of age, thus excluding 34,378 household-quarter observations and observations before 1992 (thus excluding 46,801 cases). We exclude 776 observations of households that reported zero food expenses at home. We also excluded 31,635 observations of households for whom our measure of reported income (incomes from labor, real estate, transfers, other income and irregular income, excluding interest rate income) was either missing or whose primary earner reported monthly net earnings below the statutory minimum wage. 139 observations on households-quarters headed by a retired individual were excluded. 529 observations in which the primary earner is unemployed were also dropped (the 19/1987 law did not allow those individuals to contribute to a pension fund). We also excluded 2,060 observations of quarter-households who reported self-employment income (including farm income). Those restrictions left us with 32,361 cases, that we used to compute year-specific quartiles of the pre-tax earnings distribution (see Appendix 2). We could define 4-quarters ahead differences in household expenditure for 8,361 cases. 75 cases exhibited expenditure in quarter q+4 that exceeded (were below) by more (less) than 7.38 (0.11) times expenditure in quarter q. We dropped such cases. Overall, we have information on 8,286 cases.

10 Appendix 2: Construction of pre-tax earnings in the Expenditure Survey

The paper uses pre-tax income group to split the sample. There are two reasons for doing this: the tax return sample provides pre-tax labor earnings and there is a clear link between pre-tax earnings and marginal income taxes (the variable in turn determines the incentive to use a tax-favored product). However, the ECPF questionnaire asks for a measure of monthly *post-tax labor* income (gross

income net of contributions to the Social Security System and income tax withholdings). The ECPF staff converts the monthly report into a quarterly one. We constructed measures of pre-tax earnings out of the ECPF labor income measure using four steps:

Step 1: First, we annualize the quarterly net income report contained in the ECPF. We do this by adding up all the net labor earnings we observe for the individual for each year if the individual is surveyed for four quarters. Otherwise, we convert quarterly income into yearly income by multiplying by the corresponding factor (e.g. 4/3 if the individual is observed in 3 quarters of the calendar year, 2 if the individual is observed in two quarters of the calendar year and 4 if the individual is onlny observed once in a year).

Step 2: Each year in the sample period, the Spanish law defined a schedule of some 27 brackets of pre-tax earnings $y_{gross}(i)$, where i indexes the bracket number=1,...,27. The schedule varies with the marital status of the individual and the number of children (if any). There are two deductions out of individual gross income: tax withholdings and social security contributions. First, when gross earnings are between $y_{gross}(i-1)$ and $y_{gross}(i)$ and exceed a minimum amount $y_{\min\_with}$, employers withhold a fraction of earnings $t_{inc}(i)$. In addition, a fraction of compulsory contributions to Social Security (typically 6% during the sample period) is substracted from pre-tax earnings if they lie between a minimum level of earnings $y_{\min\_SS}$ and $y_{\max\_SS}$. Using those rules, one can define for each value of gross earnings in the grid $y_{gross}(i)$ a one-to-one corresponding value of "net" earnings $y_{net}(i)$.

Step 3: We start the following recursion: if post-tax labor earnings y_{net} falls below $y_{\min\_SS}$, we compute gross earnings as $y_{net} + .06 y_{\min\_SS}$ (during the sample period, $y_{\min\_SS}$ was below the amount that required employers to withhold taxes). We impute $\frac{y_{net}}{1-.06}$ as gross labor earnings if $\frac{y_{net}}{1-.06}$ is above $y_{\min\_SS}$ but below the amount that requires employers to withhold taxes $y_{\min\_with}$. For values of net earnings that correspond to a level of pre-tax earnings that require employees to withhold taxes, the imputed amount of gross earnings is $\frac{y_{net}-y(i)*t_{inc}(i-1)+y(i)*t_{inc}(i)}{1-.06-t_{inc}(i)}$

We do the previous steps for each household member reporting employee labor earnings and then compute household pre-tax earnings as the sum of the earnings of the primary and secondary earners (if one exist).

A set of STATA programs and files with the mapping between gross and net earnings is available from the authors upon request.

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Tables and Figures

Table 1: Summary statistics of Panel of Tax Returns.

Panel A: The incidence of contributions to "pension funds" and amounts.

(1) Year	(2) 1 if contributes	(3) Mean (if nonzero)	(4) Median (if nonzero)	(5) 10th perc.	(6) 90th perc.
1988	0.024	1.337	0.760	0.137	3.012
1989	0.036	1.197	0.679	0.127	2.829
1990	0.053	1.121	0.636	0.141	2.683
1991	0.073	1.174	0.609	0.149	3.057
1992	0.107	1.047	0.563	0.086	2.652
1993	0.128	1.081	0.572	0.091	2.801
1994	0.138	1.054	0.514	0.085	2.844
1995	0.162	1.130	0.564	0.082	3.064
1996	0.172	1.119	0.548	0.088	2.950
1997	0.210	1.117	0.561	0.095	2.889
1998	0.246	1.191	0.570	0.099	3.157

Panel B: Characteristics of 1988-1991 sample

	Mean	Std. Dev.	Min.	Max.
Contribution to pension funds	0.066	0.402	0	750
Fraction who contribute	0.0535	0.225	0	1
Contribution/gross earnings (if positive)	0.063	0.072	0.001	0.4
Household pre-tax earnings	13.974	0.010	3.704	1,012
4-quarter change, labor earnings	0.888	3.701	-.263	465.89
Family size (excluding adults above 18 years)	3.374	1.13	2	12
Age	41.25	11.06	20	65

Sample size: 122,531

1. All monetary magnitudes in 1000s of euro (constant prices of 1987)
2. Sample used in Panel A: 1988-1998 Panel of Tax returns. We only include contributions made by tax units with a filer between 20 and 65 years of age that do not report self-employed income
Contributions include both employer and individual contributions, and are aggregated at the level of 1987 fiscal unit (In 1987 couples had to file income taxes jointly)
3. Sample used in Panel B: All filers between 20 and 65 years who do not report self-employment or professional income, between 1988 and 1991. Contributions include those made by the employer, and are aggregated at the level of the 1987 fiscal unit.

Table 2A: Summary statistics, Expenditure survey (ECPF)

					1985.1-1986.4		1987.1-1990.4	
	Mean	Std. Deviation	Min.	Max.	Mean	Std. Dev.	Mean	Std. Dev.
Quarterly total expenditure	2.135	1.640	.112	35.245	1.922	1.306	2.201	1.725
Quarterly expenditure -periodified	2.084	1.384	.112	14.344	1.872	1.174	2.149	1.437
4-quarter change of log of expenditure	.016	.55	-1.99	1.99	.009	.544	.0259	.553
4-quarter change of level of periodified expenditure	.072	.50	-1.99	1.99	.043	.52	.081	.50
Household pre-tax annual earnings	9951	5.458	.914	81.980	8.266	4.506	10.473	5.619
4-quarter change in yearly log earnings	.048	.18	-1.463	2.58	.023	.16	.023	.15
Family size	4.22	1.30	2	12	4.22	1.32	4.21	1.29
Age	42.60	9.87	20	65	42.34	9.89	42.68	9.807
Spouse works	.219	.414	0	1	.17	.38	.23	.42
Marginal income tax	26.57	3.77	0	53.98	26.443	4.649	26.603	3.456

Sample size: 8286 quarter-household observations on 3234 households

1. All monetary magnitudes in 1000s of euro (constant prices of 1987). Household income is the sum of primary and secondary earner earnings
2. Sample selection: Households headed by a continuously married employee, between 20 and 65 years of age. We exclude observations in which consumption was more (less) than 7.38 (.13) times consumption four quarters before.
3. Periodification of expenditure is done by applying the depreciation rates in Hulten and Wykoff (1995) to purchases of new durable goods when a purchase is observed. See text.
4. The marginal income tax is computed on the first monetary unit of capital income and depends in principle on the filing status. To impute the household's post-88 filing status, we computed for each observation the amount paid using joint and separate filing, and assigned that with the lower tax burden

Table 2B: Summary statistics, Expenditure survey (ECPF) - Top half of distribution of earnings

Households in top half of the distribution of earnings.					1985.1-1987.1		1987.2-1990.4	
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Mean	Std. Dev.
Quarterly total expenditure	2.597	1.850	.120	35.246	2.332	1.433	2.685	1.960
Quarterly expenditure (periodified)	2.526	1.517	.119	14.344	2.266	1.292	2.611	1.575
4-quarter change in log expenditure	.0218	.55	-1.99	1.953	.009	.544	.0260	.553
4- quarter change log expenditure (periodified)	.08	.50	-1.99	1.91	.06	.50	.086	.50
Household (yearly) pre-tax earnings	13.280	5.747	6602	81.980	10.917	4.675	14.057	5.854
4-quarter change in pre-tax earnings	.023	.156	-1.463	.973	.023	.16	.023	.15
Family size	4.25	1.25	2	11	4.215	1.324	4.254	1.23
Age	42.45	9.12	20	65	42.16	9.26	42.55	9.07
Spouse works	.321	.467	0	1	0.257	0.437	0.342	0.474
Marginal income tax	28.75	3.74	23.74	53.98	28.186	4.694	28.919	3.426
Sample size			4246			1051		3195

Sample size: 4246 observations on 1740 households observed in the top half of the earnings distribution in the quarter of the interview
See Notes to Table 4.

Table 3: Contribution to pension funds by age and income group, 1988-1991

Panel A: Gross annual labor earnings in the top quantile of the ECPF.

	(1) Age 20-35	(2) Age 36-45	(3) Age 46-55	(4) Age 56-65
1. Amount contributed (includes 0s)	0.063	0.125	0.181	0.269
2. Percentage households that contribute	0.061	0.092	0.115	0.121
3. Contribution/taxable income (if positive)	0.068	0.0647	0.071	0.106
4. Exhausts limit?	0.122	0.122	0.142	0.305
Sample size	[48027]	[40325]	[22241]	[11938]
Marginal income tax		33.4		

Panel B: Gross annual labor earnings in the second quartile in the ECPF.

	Age 20-35	Age 36-45	Age 46-55	Age 56-65
5. Amount contributed	0.018	0.029	0.041	0.059
6. Percent contrib.	0.0314	0.041	0.047	0.047
7. Contribution/income (if positive)	0.054	0.0971	0.079	0.115
8. Exhausts limit?	0.084	0.105	0.136	0.268
Sample size	[34540]	[17291]	[12190]	[9471]
Marginal income tax		26.56		

Panel C: Gross annual labor earnings in the bottom half of the ECPF.

	Age 20-35	Age 36-45	Age 46-55	Age 56-65
9. Amount contributed	0.007	0.029	0.020	0.025
10. Percent contrib.	0.014	0.0246	0.027	0.022
11. Contribution/income (if positive)	0.076	0.0971	0.198	0.134
12. Exhausts limit?	0.12	0.105	0.197	0.317
Sample size	[86799]	[26861]	[12190]	[9471]

Source: 1988-1991 Panel of Income Tax Returns, sample of households where main filer is an employee. All magnitudes in 1000 euros

1. Each tax filing unit in 1987 (a period of compulsory joint tax filing by couples) contributes an observation per year, regardless of filing mode.
2. Sample partitions were done according to the pre-tax family earnings centiles in the ECPF.
3. Labor earnings are the sum of gross earnings (including tax withholdings and social security contributions) declared by the filing unit if the original tax unit in 1988 continues to file jointly and of the tax reports of the spouses in the case of separate filings.

Table 4: Changes in expenditure among groups above median income, by age group

	Period: 85:1-90:4				
Estimation method:	OLS	WLS	Quantile regression		
			25th	Median	75th
	(1)	(2)	(3)	(4)	(5)
Dependent variable: 4-quarter changes in the logarithm of expenditure					
"Treated" group: household income above 75th centile					
1. Age 56-65 *(POST 88)	-.098	-.111	-0.17	-.171	-.182
	(.123)	(.025)**	(.128)	(.156)	(.202)
2. Age 46-55 * (POST 88)	-.217	-.214	-.109	-.194	-.349
	(.086)**	(.016)**	(.129)	(.112)*	(.134)**
3. Age 36-45 * (POST 88)	-.087	-.096	-.057	-.113	-.110
	(.075)	(.011)**	(.094)	(.075)	(.12)
Sample size:			2051		
"Control" group: household income between 50th and 75th centile					
4. Age 56-65 * (POST 88)	-.022	-.013	.008	-0.055	.065
	(.104)	(.035)	(.125)	(.145)	(.12)
5. Age 46-55 * (POST 88)	-.033	-.027	-.109	-.006	.062
	(.078)	(.017)	(.094)	(.088)	(.097)
6. Age 36-45 * (POST 88)	-.028	-.028	-.105	-.017	.058
	(.077)	(.014)**	(.094)	(.085)	(.098)
Sample size:			2195		
"Treated" group: household earnings in top quartile					
Dependent variable: 4-quarter change in the level of expenditure					
7. Age 56-65* (POST 88)	-0.012	-.122	-.528	-.680	-.427
	(.510)	(.090)	(.312)	(.372)	(.558)
8. Age 46-55 * (POST 88)	-.687	-.697	-.290	-.508	-.656
	(.417)*	(.053)**	(.284)	(.263)*	(.38)
9. Age 36-45 * (POST 88)	-.058	-.179	-.182	-.286	-.064
	(.310)	(.046)*	(.247)	(.193)	(.274)
Dependent variable: 4-quarter change in bulky purchases (cars, white & electronic goods, furniture)					
10. Age 56-65* (POST 88)	.164	.750	-.082	--	-.077
	(.408)	(.150)**	(.115)		(.083)
11. Age 46-55 * (POST 88)	-.475	-.324	-.034	--	-.222
	(.330)	(.021)**	(.054)		(.118)*
12. Age 36-45 * (POST 88)	.032	.026	.035	--	-.028
	(.227)	(.014)*	(.057)		(.057)

+,*,** means that the estimate is different from zero at the 15, 10, 5 percent confidence level.
1. Dependent variable: log[expenditure quarter (q+4)]-log [expenditure q]. We drop cases in which total expenditure in q+4 was larger (smaller) than 7.38 (.13) times expenditure in q.
2. POST 88 is a dummy that takes value 1 if the period covered by the expenditure change includes a quarter after the first quarter of 1988. Omitted age group: 20-35 years of age.
3. All models include the following covariates (not shown to save space): a POST 88 dummy, dummies for Age 56-65, Age 46-55, Age 36-45, year and quarter dummies, period q family earnings, the change in earnings between q and q+4, the number and 4-quarter change of household members the number of children between 1 and 3, 2 and 5, 6 and 13, 14 and 17 and above 65, and the 4-quarter change a dummy for "both members of the couple work and an interactions of "both work" and post 88.
4. Analytical standard errors corrected for heteroscedasticity and correlation within observations of the same household shown in columns 1 and 2. In columns 3-5, standard errors are bootstrapped 200 times, and each of the bootstrap replication samples is clustered at the household level.

Table 5: The impact of exemption on expenditure growth, accounting for age-specific trends

Estimation method:	WLS	Quantile regression		
		25th	Median	75th
Panel A: Households with earnings above the ECPF median, effect through dummies				
1. Age 56-65 * (POST 88) * (Y>y.75)	-.039	-.101	-.072	-.141
	(.042)	(.214)	(.215)	(.210)
2. Age 46-55 * (POST 88) * (Y>y.75)	-.144	.046	-.126	-.292
	(.022)**	(.140)	(.126)	(.152)*
3. Age 36-45 * (POST 88) * (Y>y.75)	-.026	.121	.021	-.035
	(.021)	(.131)	(.115)	(.127)
List of regressors included in all specifications, but only shown for the WLS specification				
4. Age 56-65 * (POST 88)	-.036			
	(.034)			
5. Age 46-55 * (POST 88)	-.043			
	(.017)*			
6. Age 36-45 * (POST 88)	-.052			
	(.017)			
7. Age 56-65 * (Y>y75)	-.009			
	(.038)			
8. Age 46-55 * (Y>y75)	.062			
	(.019)			
9. Age 36-45 * (Y>y75)	-.004			
	(.019)			
10. 1(Y>y75) * POST 88	.045			
	(.017)			
11. Age 56-65	.075			
	(.033)			
12. Age 46-55	.065			
	(.015)			
13. Age 36-45	.053			
	(.016)			
14. Y>y75	.003			
	(.015)			
15. POST 88	.059			
	(.015)			
Panel B: Households with earnings above the ECPF median, effect through the marginal tax on income.				
		25th	Median	90th
1. Age 56-65 * (POST 88) * MTAX	-.25	-.16	-.14	-.37
	(.10)**	(.40)	(.39)	(.51)
2. Age 46-55 * (POST 88) * MTAX	-.31	-.35	-.33	-.81
	(.08)**	(.27)	(.26)	(.39)**
3. Age 36-45 * (POST 88) * MTAX	-.18	-.14	-.23	-.60
	(.06)**	(.26)	(.24)	(.38)
4. Age 56-65 * MTAX	.08			
	(.07)			
5. Age 46-55 * MTAX	.40			
	(.30)			
6. Age 36-45 * MTAX	.18			
	(.32)			
7. MTAX * POST 88	.01			
	(.24)			
8. MTAX	-.73			
	(.28)			
9. POST 88	7.3			
	(.5.5)			

*,** means that the estimate is different from zero at the 10, 5 percent confidence level, respectively

1. y.75 is the 75th centile of the distribution of family earnings, computed each ECPF survey year

2. Additional regressors in Panel A: Set of regressors listed at bottom of Table 4

3. Additional set of regressors in Panel B: age dummies and regressors listed at bottom of Table 4

Table 6: Changes in annualized expenditure among groups above 75th centile, by age

		Period: 85:1-90:4		
Estimation method:	WLS			
		Drop in expenditure relative to 18-35 age group	Mean contribution relative to 18-35 age group (Table 3, row 2, differences with respect to column 1)	Consumption drop as a fraction of contribution
	(1)	(2)	(3)	=(2)/(3)
Treated group: household income above 75th centile				
Panel A: Dependent variable: changes in the logarithm of periodified expenditure				
1. Age 56-65 *(POST 88)	.030 (.023)	0.058	0.207	0.282
2. Age 46-55 * (POST 88)	-.033 (.016)**	-0.077	0.119	-0.645
3. Age 36-45 * (POST 88)	-.009 (.014)	-0.019	0.062	-0.312
Panel B: Dependent variable: changes in the level of periodified expenditure				
4. Age 56-65* (POST 88)	0.014 (.061)	.014	0.207	0.068
5. Age 46-55 * (POST 88)	-.099 (.047)**	-.099	0.119	-0.833
6. Age 36-45 * (POST 88)	.095 (.036)**	.095	0.062	0.655

1. Additional regressors in Panel A: Age dummies, post 88 dummy, 4-quarter changes in demographics, log income and 4-quarter and change in income
2. Column 2 in Panel A is obtained by multiplying each diffs-in-diffs estimate to the pre-exemption mean of periodified expenditure of each age group. Due to severe heteroscedasticity, we have ignored the variance of consumption growth in the computation.
3. Additional regressors in Panel B: Same as in Panel A, but income changes expressed in levels (see bottom of Table 4)

Table 7: The impact of an euro of contributions on annualized consumption

Estimation method:	OLS	Weighted TSLS	OLS	Weighted TSLS	OLS	Weighted TSLS
Dependent variable:	Contributions	Change expenditure	Contributions	Change expend	Contributions	Change expend
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: Triple difference estimates, sample of households with earnings above median						
1. Amount contributed to PF	--	**-.054**	--	**-.119**		**-.193**
		(.155)		**(.206)**		**(.215)**
2. Age 56-65*POST 88*1(Y>y75)	.135	--	0.14	--	.135	--
	(.014)		(.014)		(.014)	
3. Age 46-55*POST 88*1(Y>y75)	.068	--	.066	--	.066	--
	(.008)		(.008)		(.008)	
4. Age 36-45*POST 88*1(Y>y75)	.022	--	.018	--	.018	--
	(.006)		(.005)		(.005)	
5. Age 56-65*POST 88	.029	.094	.029	.114	.029	.068
	(.005)	(.030)	(.005)	(.036)	(.005)	(.029)
6. Age 46-55*POST 88	.022	-.008	.023	.020	.023	.060
	(.004)	(.024)	(.004)	(.027)	(.004)	(.019)
7. Age 36-45*POST 88	.008	.018	.093	-.194	.009	.074
	(.003)	(.019)	(.003)	(.025)	(.003)	(.018)
8. Age 56-65 * 1(Y>y75)	--	-.030	--	.031	--	.055
		(.038)		(.034)		(.031)
9. Age 46-55 * 1(Y>y75)	--	-.071	--	-.086	--	-.057
		(.020)		(.025)		(.022)
10. Age 36-45 * 1(Y>y75)	--	-.024	--	-.028	--	.057
		(.017)		(.021)		(.017)
11. 1(Y>y75)*POST 88	-.049	-.089	-.049	-.111	-.048	-.083
	(.014)	(.022)	(.007)	(.023)	(.007)	(.021)
12. Age 56-65	--	-.026	--	-.038	--	.075
		(.026)		(.031)		(.025)
13. Age 46-55	--	.075	--	.051	--	.142
		(.020)		(.022)		(.016)
14. Age 36-45	--	.007	--	.020	--	.093
		(.018)		(.024)		(.017)
15. POST 88	-.114	-.016	-.067	.096	-.067	.071
	(.023)	(.025)	(.033)	(.021)	(.033)	(.017)
16 1(Y>y75)		.137	--	.192		.170
		(.022)		(.026)		(.026)
Level of earnings	YES		YES		YES	
Earnings in 6000 euro brackets	NO		YES		YES	
Both work and interaction POST88	NO		NO		YES	

(*) Note that as prior to 1988, contributions were zero, covariates not interacted with POST 88 are zero

Appendix Tables

Table A.1: Do contributors persist contributing?

Panel A: By occupation	All employees	If MTAX<28	28<=MTAX< 30	30 <=MTAX < 36	36<MTAX
Sample size:	56,831	28,333	5,767	10,281	6,853
Contributes one year after first contribution.	0.710	0.665	0.719	0.765	0.814
[median contribution]	[377.71]	[361.44]	[433.73]	[1445.8]	[1237.3]
Contributes two years after first contribution.	0.654	0.596	0.629	0.717	0.778
[median contribution]	[361.44]	[40000]	[240.96]	[627.42]	[1321.86]
Contributes six years after first contribution.	0.563	0.454	0.532	0.619	0.709
[median contribution]	[317.86]	0	[180.72]	[526.23]	[1295.57]
Contributes eight years after first contribution.	0.525	0.392	0.548	0.599	0.707
[median contribution]	[180.72]	0	[301.2]	[526.5]	[1761.9]
Average # contributions six years after	4.637	3.993	4.502	5.04	5.468

Source: Panel of tax returns (1988-1998). The sample in the second Panel only contains observations on filers who report only income as employees.

Table A.2: Average 4-quarters log expenditure growth for selected groups, by age and time period

	Before 1987.1	After 1987.1	Time differences
	(1)	(2)	(3)
Panel A: Mean expenditure growth within the top income quartile			
1. Treatment group: Age 46-65	.068	.010	-0.058
	(.050)	(.030)	(0.041)
2. Control group: Age 20-35	.011	.083	0.072
	(.046)	(.038)	(.058)
			D-in-D estimate
3. Age difference, within period	.067	-.053	-0.130
	(.061)	(.041)	(.076)*
Panel B: Mean expenditure growth within the second-to-top income quartile			
4. Control group: Age 46-65	.025	.045	0.02
	(.040)	(.031)	(.045)
5. Control group: Age 20-35	-.005	.050	0.055
	(.051)	(.034)	(.084)
			D-in-D estimate
6. Age difference, within period	.031	-.002	-0.035
	(.064)	(.039)	(.072)

1. Each entry in the Table is the group average of household specific consumption growth over four quarters. Each household contributes as many observations as times is observed in the sample. Standard errors clustered at the household level and computed using an OLS regression of household-specific consumption growth on age dummies, period dummies and the interactions between those variables.
2. "Before 1987.1" means that the first observation used to compute household-specific expenditure growth is observed before 1987.1. Thus, consumption growth does not include any period after the introduction of the exemption.

Table A.3: Other changes correlated with the reform

Estimation method:	Probit	Probit	Probit
Dependent variable:	Purchase of a house	Joint filing	Spouse participation
Data source:	ECPF	Panel of Tax returns	ECPF
Mean dependent variable	0.0237	0.649	0.42
All samples are in the top quartile of the distribution of labor earnings in the ECPF			
		(1)	(2)
1. Age 56-65 * (POST 88)	-.0028	-.0015	.0083
	(.0142)	(.0093)	(.150)
2. Age 46-55 * (POST 88)	-.0153	.0375	-.0157
	(.0071)**	(.0072)**	(.103)
3. Age 36-45 * (POST 88)	-.0066	-.0288	.0363
	(.012)	(.006)**	(.0933)
4. Age 56-65	0.013		-0.388
	(.0182)		(.0664)**
5. Age 46-55	-0.0004		-.337
	(.0116)		(.071)**
6. Age 36-45	0.002		-.23
	(.0109)		(.072)**
7. POST 88	-0.012		.012
	(.011)		(.081)
Sample size:	2362	106208	2071

Figure 1: Expenditure growth relative to 20-35, 1985-1991

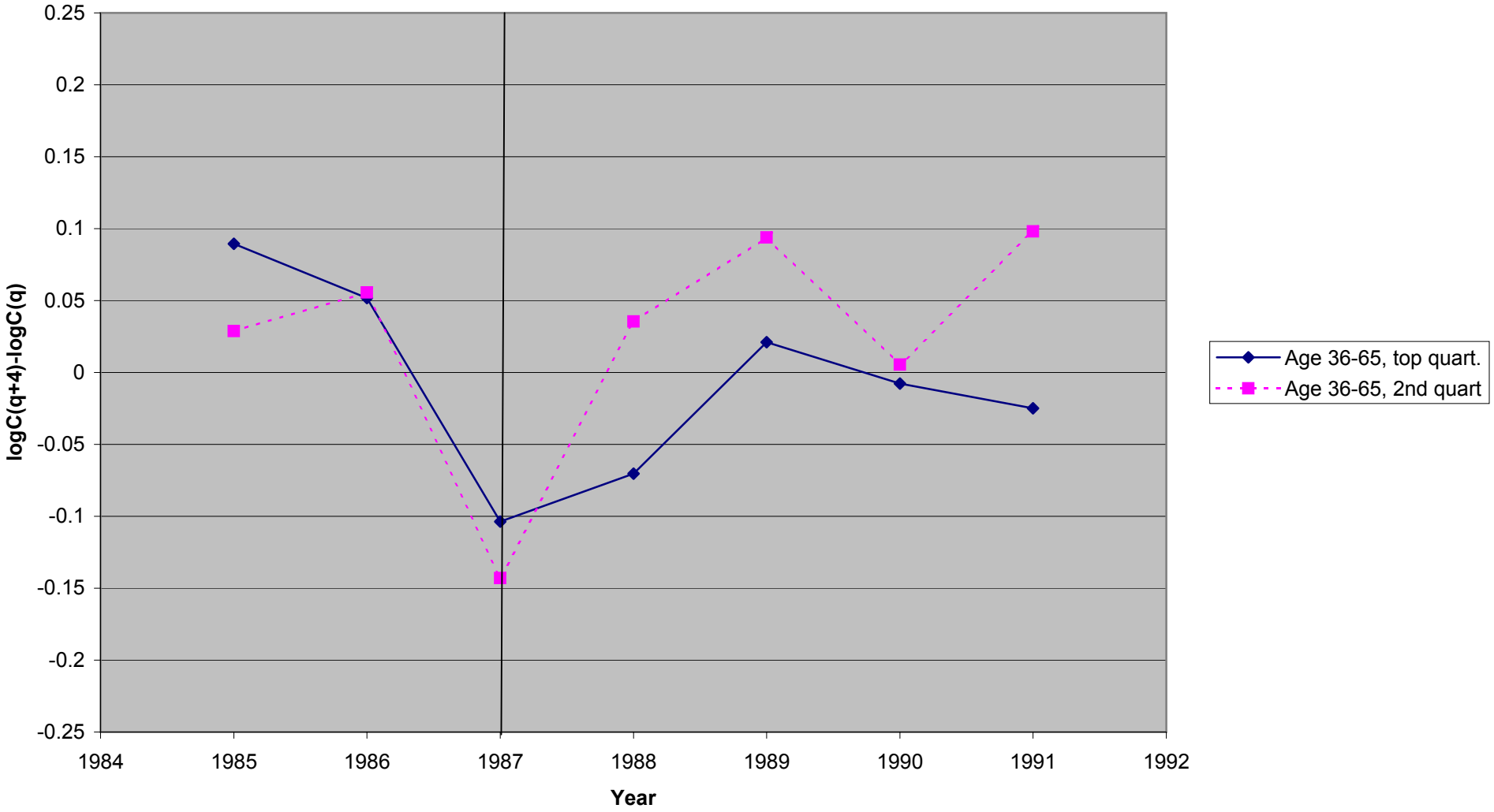

Figure 2: Expenditure growth relative to 20-35, 1998-2001