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**How Price Elastic is the Demand
For Retirement Saving?**

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How Price Elastic is the Demand for Retirement Saving? *

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Abstract

An administrative dataset of a big insurance company is exploited to assess the effects on annuity demand of a French regulatory reform which impacted actuarial return to deferred life annuity products. Female savers whose conversion rate of capital into annuities fell by 10% are distinguished from men in couple whose conversion rate was reduced by 5% if they expected to opt for a joint and survivor annuity at retirement. Single men who did not expect to take the survivor option were not affected by the reform. Once controlled by the evolution of the latter group, we find a decrease in demand by women and men in couple of -16% and -12% respectively with corresponding price elasticities of subscriptions of -1.5 and -2.5. The reform did not significantly alter payments in saving accounts conditional on subscribing. We also document a very large anticipation effect created by the opportunity given to early subscribers to benefit from older pricing.

J.E.L. codes : D8, E21

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1 Introduction

The rise in life expectancy in developed countries puts pressure on public pension systems and their financial equilibrium but also affects private retirement plans that guarantee a regular income until the death of the insured. Longer lifespan at old age makes the stream of guaranteed income payments more costly to insurers which preserve their solvency by lowering annuities. Lowering conversion or annuity rates (the annuity payouts in proportion to capital at the date of conversion), may be done either by revising the assumed interest rate (the rate insurers expect to obtain when they invest premiums in financial markets) or the mortality tables used to convert wealth into a flow of annuities. The two measures raise the annuity price and may discourage savers from subscribing a contract or contributing in existing contracts.

In France, regulatory survival probabilities have been revised upwards several times since the 1980s which resulted in a significant decrease of conversion rates. The trend may be illustrated in a telling manner by the experience of a French man born in 1952. His conversion rate was reduced from 7% before 1985 to 5% in 2007 and 4.5 % in 2013, representing an overall 35% decrease. This drop affects a given generation and is entirely driven by successive upward revisions of its longevity. It would be even larger if generations of different birthdates had been compared.

Longer life expectancy being an international phenomenon, the upward trend of annuity prices has been observed in other countries as well. Cannon and Tonks (2004) document in United Kingdom a significant drop in conversion rates since the 80s. Cannon and Tonks (2009) show that lower conversion rates recorded over the 1994-2007 period are largely explained by strong revision of annuitants' life expectancy. This trend is confirmed by Lowe (2014) who notes that, to obtain a nominal income of £10,000, £65,000 were needed in 1990 but over £175,000 by 2013. In Switzerland, insurance companies have significantly reduced for the same reasons the conversion rate in the unregulated segment of the annuity market (Bütler, Staubli and Zito, 2013).

The long-term annuity price increase raises many questions about savers' reaction and the future of longevity insurance. Does it mean a fall of the demand for annuity with worrying long-term consequences for living adequacy of retirees in a context of reduced state-provided public pensions (OECD, 2011)? Or are savers willing to compensate rising prices by saving more so as to preserve their standard of living at retirement? Savers might also decide to stay away altogether from annuity products meaning less insurance against longevity risk.

Answering these questions requires an estimate of the price elasticity of demand for annuity contracts. To do so, we investigate savers' response to a major reform of regulatory mortality tables which took place in France early 2007 and produced asymmetric effects on men and women. The reform was approximately neutral to men insofar as they did not expect to opt for a joint and survivor annuity, but reduced female conversion rate by about 10 %. The decision of reversion impacts the conversion rates but is made later at retirement, not at subscription. Having subscription and payment data before retirement, we assume that single men do not expect to opt for reversion and use this population as a control group.

We exploit subscription data of a large insurer for retirement saving contracts targeted to self-employed workers over the 2003-2009 period. In addition to information on the number of monthly subscriptions and individual payments, the data set records subscribers' sex, birth date, family status, district of residence, proportion invested in risky financial assets and the distribution channel. It is supplemented by data from the marketing department about income and wealth profiles.

We first study reform's anticipation effects on sales. Attracted by the benefits of old mortality tables, women subscribed six times more contracts the last six months prior to the reform compared to normal time, which constitutes a truly large increase. More surprisingly, male subscriptions were multiplied by a similar factor in spite being much less impacted. We then isolate two populations affected by the reform: women whose conversion rate was down by 10% and men in couple (who are presumed to expect to opt for reversion at retirement) whose

conversion rate was reduced by 5%. We find a 16% decrease of contracts sold to women and a 12% decrease to men in couple after controlling for the evolution of sales to single men. Elasticities with respect to conversion rates are respectively -1.5 and -2.5. We also show that the reform did not significantly alter payments in saving accounts when controlling for demand by single men. Overall and paradoxically, the reform brought about a positive net effect on demand thanks to strong reform's anticipation effects.

Our results may be analyzed through the lens of economic theory. In a standard consumption-saving model with uncertain longevity, competitive markets and time-separable intertemporal utility functions, the longevity risk is fully insured by the purchase of annuities, in the sense that consumption evolves smoothly over the life-cycle (Yaari, 1965). If longevity is revised upward during the saving phase, life-cycle consumption should be immediately reduced leading to more savings. This result is found empirically by articles which study the relation between life expectancy and aggregate savings (Kinugasa and Mason 2007, Miles 1999, Deaton and Paxson 1997 and Lee, Mason and Miller 2001). Yet, there are several reasons why this relationship may not hold in annuity markets. First, annuity prices do not continuously track changes in savers' average life expectations and are adjusted stepwise on an irregular basis.¹ Second, savers may misinterpret the increase in annuity prices. If they underweight (or ignore altogether) the longevity gains at the origin of the price increase, they may wrongly conclude that annuities yield insufficient return. Lowe (2014) remarks that annuities have become unpopular in United Kingdom due to a large fall of conversion rates and that this disaffection is explained by people not factoring in the improved benefit provided by annuities when longevity is extending. Hence marked preferences by investors for cash-out rather than annuities documented in the literature (Brown (2009), James and Song (2001), and James and Vitas (2004) for international evidence) may well be amplified by the fall of conversion rates. Such response may however be detrimental to investors as cash is a poor protection against longevity risk. Davidoff, Brown and Diamond

¹In France for instance regulatory mortality tables have been updated in 1985, 1993, 2007 and 2013

(2005) and many others find that annuity products are adequate to insure against the risk of outliving one's resources at old age.

While theoretical and simulation studies on annuity demand are abundant, the empirical literature is comparatively still small. Several articles have analyzed survey data in which hypothetical questions are asked to a sample of the population about their willingness to annuitize their wealth (Hurd and Panis, 2006, Cappelletti et al., 2013). Other articles study real choices between annuities and lump-sum payments by retiring employees (Warner and Pleeter, 2001, Benartzi et al., 2011, Büttler and Teppa, 2007). Yet, only two articles investigate the relationship between demand and price in the annuity market. Chalmers and Reuter (2012) study the choice between life annuities and lump sums made by a large sample of retiring public employees. They find little evidence that retirees respond to plausibly exogenous variation in life annuity pricing, which suggests that cross-sectional variation in annuity pricing is not salient enough to be noticed by unsophisticated investors. In contrast, Büttler, Staubli and Zito (2013) analyze the effects of a salient and sizable decrease of conversion rates which apply to the unregulated segment of the annuity market. They find a 14 percentage points decrease in the proportion of individuals choosing to convert their savings into annuities at retirement. We also study the consequences of a large and salient regulatory reform but focus on the demand for retirement saving during the accumulation phase rather than the choice at retirement between cash-out and annuities. We confirm a significant price elasticity of annuity demand.

The article is structured as follows. Section 2 describes the French pension system, examines the effects of the 2007 reform for savers and presents the database. Section 4 assesses the effects of lower conversion rates on new subscriptions. Section 5 looks at the impact on payments in saving accounts. Section 6 discusses some methodological issues and Section 7 concludes.

2 French background and the 2007 reform

2.1 French background

The French pension system is a three-pillar system with a first pay-as-you-go pillar covering most pension expenditures and two funded pillars, one occupational, the other personal. The last pillar is steadily growing since the 1990s. The main financial products that compose it are deferred annuities which bundle together an investment product and an annuity phase. They are tax-favored during the payout phase and mandate annuitization at retirement. Some products are specifically designed to civil servants (Préfon Retraite), wage-earners (Plan d'Épargne Retraite Populaire) or self-employed (Madelin contracts). In 2014, 7 million investors held those products.

Yet, individual and occupational retirement savings are still a small market. Contributions in the second and third pillars represented in 2013 only 4.3% of first pillar contributions, and 2.2% of total pension benefits during retirement (Laborde, 2015). Annuities paid in proportion to last earned income remain low due to insufficient contributions (Direr and Roger, 2011). Madelin contracts analyzed here were created in 1994. Those products, directed to self-employed, are deductible from taxable benefit and supplement public pensions. Savings may be converted into annuity between age 55 and 75. At retirement, annuity income is taxed at normal income tax rate. Self-employed invest more in retirement savings than wage-earners due to lower public pensions. Their maximum pension replacement rate is indeed 50% of labor income against 75% for wage-earners. Payments in Madelin contracts totaled two billion euros in 2009. 834,000 contracts are in the accumulation phase with an average payment of 2400 euros per contract. 57% of self-employed owned a policy in 2009 compared to only 8% for the employed population.

Conversion rates of capital into annuities are regulated. The annuity is calculated so as saver's capital at retirement is equal to the expected actuarial sum of annuities weighted by survival probabilities at each age. The assumed interest rate which serves to discount annuities in the formula varies between 0 and 2.5%, depending on the contract (it is 1.5% in our data). Mortality

tables used by insurers are enforced by government law. They are periodically updated with the latest revisions in 1985, 1993, 2007 and 2013. In 2006, the government, led by a European directive, issued a decree forcing insurers to price annuities separately for men and women. In March 2011 however, the European Court of Justice unexpectedly ruled that it would, in future, be unlawful for European Union member states to use gender as a factor in the calculation of insurance premiums and benefits with effect two years later. This led to a new regulatory reform implemented in 2013. This article focuses on the consequences of the 2007 reform. The 2011 regulatory reversal four years later is unlikely to bias our estimates since it came as a complete surprise for savers and even professionals in the market.

2.2 The 2007 reform

In summer 2006, the government published new prospective mortality tables called TH05 differentiated by birth year and sex (TGH05 for men and TGF05 for women), to replace previous gender-neutral tables TPRV93 from 2007 onward. However most contracts subscribed before this date retained the benefit of previous tables, which is the case of insurance policies analyzed in this study. Figure 1 shows conversion rates before and after the 2007 reform for female subscribers with respect to birth year.

<Insert Fig. 1>

Rates are decreasing with birth year for both tables as younger generations are expected to live longer than older ones.² Annuity contracts are much less attractive for women under the new tables TGF05 than under older ones TPRV93. For example, cohorts born in 1950 enjoyed a conversion rate of 5% before the reform and only 4.5% with new tables representing a 10% fall of annuity for a given amount of converted wealth. The price rise is explained by increasing longevity and by the fact that annuities are now solely based on female survivorship rates. Fig.

²As the distribution period is extended, insurers lower annuity payout so as to maintain the actuarial equality between capital and the expected discounted sum of annuities.

2 shows the same graphic for men.

<Insert Fig. 2>

The impact of the new tables is approximately neutral for men. This comes from the coexistence of two opposite effects of similar magnitude. On the one hand, previous tables were unisex and actually based on female mortality. New gender-specific tables are favorable to men as their statistical life expectancy is shorter. On the other hand, the new tables factor in improved longevity recorded since the last update which reduces male rates of conversion.

The annuity rates are only valid for savers who will not opt for a joint and survivor annuity. The insurer may also guarantee a benefit to a secondary beneficiary, usually the spouse, to whom insurer shall pay all or part of the annuity after policyholder's death. For the contracts analyzed in this study, 60% or 100% of the annuity may be payable to the second beneficiary until death. The higher the percentage, the lower the conversion rate so as to maintain actuarial equality between converted capital and the discounted sum of annuities.

The asymmetric effect of the reform on the two sexes persists in the event savers choose a survivor annuity but with qualifications. Insurers use as inputs for spouse's survival probabilities the new tables by sex (TGH05 in the case of a male spouse and TGF05 for a female spouse), regardless of the subscription date. In other words, subscribers before regulatory changes benefit from previous tables only for their own mortality rates, not for the secondary beneficiary's ones. Fig. 3 shows female conversion rates under various configurations with 60% reversion to spouse.

<Insert Fig. 3>

Mixed tables (TPRV93 for the policy owner and TGH05 for the secondary beneficiary) apply to subscribers before 2007 (early subscribers for short). TG05 tables apply to late subscribers (TGF05 for the main beneficiary and TGH05 for the secondary beneficiary). For reference, conversion rates from table TPRV93 would have applied to early subscribers had the reform not been implemented. Female early subscribers still benefit from better conversion rates than late

subscribers if they expect to choose a survivor annuity but the gap is narrowed (7% on average instead of 10% without reversion). The reform did not significantly alter the situation of early subscribers as in both scenarios, male survivorship is described by similar tables (TGH05 with the reform and TPRV93 without). Fig. 4 shows male conversion rates under various combinations with a 60% survivor annuity to spouse.

<Insert Fig. 4>

The reform reduces early subscribers' rates by about 4% (TPRV93 tables vs mixed tables) as they insure their spouse on the basis of less favorable female table (TGF05 instead of TPRV93). But it lowers late subscribers' rates by an equivalent margin so that the gap between the two groups is still approximately zero.³ The reform's final impact depends in some cases on the survivor annuity option at the time of conversion. Savers' expectations about this choice are not observed. We dispose of reversion decisions from past converted saving plans (Table 1).

Table 1: Reversion frequency by sex

%	no reversion	60% reversion	100% reversion
Men	46.6	16.2	37.2
Women	92.5	5.3	2.2

Source: insurer's internal data. Sample: Madelin contracts converted into annuities. Reading the Table: 16.2% of male subscribers chose to convert their retirement plan with a 60% reversion to a secondary beneficiary.

More than one in two men chose to opt for a survivor annuity either at 60% or 100% while the vast majority of women did not choose a survivor annuity. Providing a similar pattern is extrapolated forward, most women in our data will not opt for survivor annuity and will benefit from a conversion rate reduced by 10%. Table 2 summarizes changes in conversion rates caused by the reform.

³The two groups insure the first beneficiary on the basis of equivalent tables (TPRV93 and TGH05) and the second beneficiary on the basis of the same female table TGF05.

<Insert Table 2>

Differences across sex are maximal in the absence of spouse reversion and become approximately zero for a 100% survivor annuity (5.5% vs 5.3%), as only couple's joint life expectancy matters. Not only the reform impacts differently the two sexes, but also with a distinct timing. Women should subscribe before changes take effect. For men expecting to opt for a survivor annuity, reform effects are unavoidable as new tables TGF05 are applied to the secondary beneficiary regardless the subscription date. Hence effects on demand, if any, should only be driven by a price effect which occurs as soon as men became aware of the reform to come. This happened in the middle of the year 2006.

2.3 Data

We dispose of data recording nationwide sales of retirement saving contracts called Madelin contracts from a large insurance company between March 2002 and April 2009. The anonymized data set contains 7,853 subscriptions with information about savers and contracts: sex, birth date, marital status, number of children, occupational category, district of living⁴, subscription date, amounts paid and payment dates.

Payments in Madelin contracts may be allocated among several mutual funds preselected by the company and a money-market fund. The former, mostly composed of equities, are risky, whereas the latter is composed of short-term debt and offers a close-to-riskless rate of return. Portfolio allocations depend on savers' risk profile. Our data indicates the share of wealth invested by policy owners in mutual funds at the end of each year.

We dispose of an income index and a wealth index for each customer produced by the marketing department. The higher the index, the higher the estimated customer's income or wealth. We build from those indices two dummy variables called high income profile and high wealth profile which are equal to 1 if policy owner's index exceeds a conventional threshold so

⁴The French territory is divided into 101 administrative units called départements.

that approximately 10 % of customers are either classified as high income or high wealth. The type of seller who distributed the contract is also recorded. It is either a general agent who sells all insurance products of the company (home insurance, car insurance, ...) or a specialized agent who focuses on financial planning (retirement, financial advice and insurance planning) for high income customers. Both types of seller are independent contractors with an exclusive mandate with the insurer.

The transition date to the new tables was established by government decree on January 1st 2007. Yet some insurers delayed their application to new contracts by a few months, mostly for sales promotion. The insurer which provides us with the data switched to the new tables on March 1st 2007. Even for savers who subscribed before this date, previous tables are only guaranteed to plans converted into annuities before December 31st 2030. As most subscribers convert their plan before age 65, all savers born after 1965 are discarded.

We observe all payments made between January 2002 and February 2009 and still in the accumulation phase in 2009. Payment frequency varies from one subscriber to another. Some make a payment every month, others quarterly or annually. Payments are annualized by aggregating infra-annual payments starting from the first month of subscription.⁵

Table 3 shows summary statistics of the dataset by subscription years.

<Insert Table 3>

The Table shows interesting raw results, which will be more thoroughly investigated in next sections. Annual subscriptions reach a peak in 2006, just before the policy change. It represents 2.5 times the average number of sales recorded between 2003 and 2005 and 2.4 times that observed in 2007. The share of women is stable around 35% before the policy change then drops to 28% two years after the reform, which is attributable to the negative effects of the reform to

⁵The first payment may start one or two months after the subscription. The relevant date for the mortality tables is the subscription date, not the date of the first payment. Thus, a saver opening a plan in February 2007 and making a first payment in April 2007 benefits from old tables. Her first annual payment aggregates all payments recorded between April 2007 and March 2008.

women. Payments are steadily increasing between 2003 and 2007. We will show that this trend is smooth around the reform date both for impacted and non-impacted populations. Last, the share of subscribers in couple falls after 2007. We will see that this is mainly attributable to single men who are negatively impacted by the reform.

The next two sections examine the extent to which the policy change has affected subscriptions. We distinguish the anticipation effects, the impact before the reform (Section 3), and the post-reform price effect (Section 4).

3 Reform's anticipation effects

3.1 A six-fold increase in semestrial subscriptions

Fig. 5 shows the monthly evolution of male and female new subscriptions. The vertical bar indicates the date from which the new tables take effects.

<Insert Fig. 5>

An annual seasonality is observed with a trough in August and a peak at the end of the year mainly for tax reasons.⁶ An outstanding peak of sales extends the six months preceding the application dates of the new tables, from September 2006 to February 2007. It is observed for both men and women and demonstrates that the reform has not gone unnoticed. Annual sales jump from approximately 1,000 contracts in 2004 and 2005 to 2500 in 2006. This represents 1,500 sales in excess which concentrates the last six months before February 2007.

Fig. 6 helps visualizing the relative importance of the 2006 peak by distinguishing women from single men (unmarried, divorced or widowed) and men in a couple (married or in a relationship).

<Insert Fig. 6>

⁶Subscribing in December of year n instead of January of year $n + 1$ allows savers to meet year n deduction limit.

New contracts are aggregated by periods of six months and normalized to 100 the first half of 2006. Years start in March, so that the first half of 2007 begins the first month of implementation of the new tables. The vertical line indicates the date of the reform. Outside of the peak, sales remain approximately stable apart from a seasonal increase the second half of each year by about 50%. The six months preceding the reform are characterized by a six-fold increase in female subscriptions, a five-fold increase for male in couple and a seven-fold increase for single men. Over this short period, the insurer sold the equivalent of three years of normal time subscriptions. This represents a net demand rather than a mere displacement of sales. The period just before and after the peak does not appear to suffer from a trough of sales. Rather, it seems that the imminent implementation of the reform convinced a new population of customers to take out a savings plan.

The female peak can be simply explained by the appeal of old tables. We saw that late subscribers may expect to experience a 5 to 10 percent decrease of conversion rates (depending on the survivor option). The male peak is more difficult to rationalize. Men will benefit from a lower conversion rate if they expect to take the survivor option but regardless of the subscription date. Given that the increase in demand is mainly a net demand, it appears that a large number of male investors would have not subscribed absent a reform. It seems that men have been confused by the actual effects of the reform and that the differential treatment of the two sexes has been widely overlooked. The next section investigates more thoroughly this issue.

3.2 Who were the most sensitive to anticipation effects?

One may wonder if some groups of investors better understood the real benefits of an early subscription. As sales have increased six-fold over a short period of time it is likely that some composition effects may be observed. Graphics in Fig. 7 shed light to this issue.

<Insert Fig. 7>

For reference, Fig. 7.1 and 7.2 show in a stylized manner how the subscription share of a sufficiently informed population should evolve in response to the incentives created by the reform. Men should not subscribe more the six months before the reform (indicated by a shaded area) to benefit from elusive better returns. Yet we know from Fig. 6 that they actually did. Hence a peak of the relative share of a given male group within the male population means that an above-average fraction of this group got it wrong. After the reform, the group's share may remain stable, decrease or increase depending on the relative sensitivity to conversion rate changes, at least for men anticipating a survivor option. For women, a relative sale peak of a given group would be visible if the group were better informed or more sensitive to the benefits of the reform compared to the rest of the female population.

Graphs 7.3 to 7.12 show the evolution of the share of subscribers sorted by socio-demographic categories and distribution channel.⁷ Insurance agents specialized in financial planning, who presumably have a better knowledge of regulatory constraints than general insurance agents, appear to have attracted more customers than general insurance agents, as attested by a peak for women but also for men (Fig. 7.3).

Investors grouped by socio-economic category seemed to react differently to the reform. Male independent professions are over-represented at the peak. Male or female business leaders and executives and male owners of small businesses (craftsmen, shopkeepers, ...) appeared to under-react to the peak, although the pattern is not clear-cut. No peak is clearly discernible for other categories of investors: inhabitants of Paris and its posh suburbs⁸, high income and wealth savers and subscribers with children. Age is also unrelated to subscribing more at the peak. So does the average proportion invested in mutual funds (the risky part of the saving account) which tracks the financial market cycle.⁹

⁷Other factors than the reform may as well affect the evolution of the shares but they are presumably wiped out by the outstanding size of the anticipation effects and the six-fold increase of subscriptions.

⁸Hauts de Seine and Yvelines. The inhabitants of these districts seemed to have overreacted to the reform but six month before the expected period.

⁹See Direr and Yayi (2014) for a full analysis of savers' portfolio choices with the same dataset.

The graphical interpretation is supplemented by an econometric analysis. We estimate a logistic model over an 18 month period, from March 2006 to August 2007. The explained variable PEAK is a binary variable equal to 1 if savers subscribe during the six month peak and 0 if they subscribe six months before or six months after that period. We regress separately for men and women on a series of explanatory variables listed in Tables 4 and 5.¹⁰

<Insert Tables 4 and 5>

For women (Table 4), the presence of children, ownership of mutual funds and subscription with a specialized agent significantly explain the presence of a peak. For men, independent professions, owners of mutual funds and subscribers with a specialized agent also contribute to the sales peak. Graphical analysis of Figures 7 suggests however that only subscriptions with a specialized agent for both sexes and independent professions for men seem to have experienced a genuine peak which cannot be confused with sample fluctuations. Conversely, the visual peak for male or female business leaders and executives and male owners of small businesses is not confirmed by the econometric analysis. Overall, the sales peak does not induce strong deformation of the sales mix, which is surprising given its magnitude. We conclude that misinterpretation of the reform's effect was uniformly widespread among savers.

4 Reform effects on new subscriptions

In this section we are interested in the effects of the regulatory reform on contract sales after the implementation date. We first present the impact on male savers in couple, then on women.

4.1 Impact on men in couple

Fig. 6 shows that men in couple subscribed proportionally less than single men after September 2006 which corresponds approximately to the moment when the imminence of a reform were

¹⁰The econometric test is complementary to the graphical analysis. Significant coefficients may reveal other configurations such as a permanent decline in the probability of purchasing

released to the public. Fig. 8 investigates in more details the pattern. It shows semi-annual variations of the share of savers in couples in the male population. It also indicates as a reference the same statistic for women.

<Insert Fig. 8>

We see opposite effects on male and female populations with relatively more women in couple subscribing after the reform and less men in couple. Both variations are consistent with reform's expected effects as regulatory changes penalize men in couples and disadvantage less women in couple insofar as the two groups expected to opt for a survivor annuity. Indeed, as noted in Table 2 of Section 2, the first group benefited from lower conversion rates after the reform whereas the second group was less negatively impacted among women. Figure 8 indicates a break between the first and second half of 2006 for both groups, which is the approximate period when investors became aware of the reform and its effects.

The reform's impact on male demand may be estimated by using the counterfactual evolution of the weighted average share during the previous three years. Appendix 1 presents the calculations and indicates a decrease in demand attributable to the reform by around -12%. Table 2 in Sub-section 2.2 shows that the conversion rate decrease is 3.5% for a survivor annuity of 60% and 5.5% for one of 100%. The average decrease in conversion rates is estimated at - 4.8% by assuming as in Table 1 that about one third of men in couple will choose the 60% survivor annuity and two thirds 100%. This leads to a demand elasticity with respect to conversion rate of about -2.5.

4.2 Impact on women

The analysis of the reform shows that the conversion rate of women who subscribed after the reform was reduced by about 10% compared to that of early female subscribers. The reduction is lower for those who planned to opt for a survivor annuity but very few of them were expected to do so (see Table 1). Did it discourage savers to subscribe a contract ? We answer this question

by comparing changes in subscription after the reform of women and single men presumably not affected by the reform. Figure 9 shows the ratios of new subscriptions for women vs men and women vs single men.

<Insert Fig. 9>

The ratio women vs single men remains approximately flat from 2003 to 2006, then starts declining after the reform implementation date indicated by a vertical bar. Assuming the female demand would have remained parallel to that of single men absent a reform, Appendix 2 shows a 14.6% decrease of female subscriptions in 2007 and 2008 attributable to the reform. If a 9.74% decrease in female conversion rates is retained, which represents an average estimate experienced by women (see table 2), we obtain an elasticity of demand with respect to conversion rate equal to -1.5.

The impact on female demand may be econometrically estimated by a logistic equation:

$$AFTER_i = f(\beta_0 + \beta_1 WOMEN_i + X_i\beta_2 + \epsilon_i)$$

in which $AFTER_i$ equals 1 if subscription i takes place after the reform (from March 2007 to February 2009) and 0 before the reform (from March 2004 to February 2009). X_i is a vector of covariates described in Sub-section 2.3 and presented in Table 3. Our sample is restricted to women and single men. The variable of interest β_1 measures to what extent female subscriptions deviate from single men subscriptions after the reform. Table 6 shows the results for three models. In model (1) the dummy $AFTER$ is regressed on $WOMEN$ without any control variables. Model (2) adds a full set of covariates. We saw in section 4 that sales jumped right before the reform without major changes in the composition of demand. Nevertheless one may worry that a six-fold increase in demand during a short period of time may bias our estimation (see also the next section on methodological issues). This is why the robustness of our results are checked in model (3) in which the six-month period of the peak has been removed.

<Insert Table 6>

In all three models and in accordance with visual impression from Fig. 9, the *WOMEN* estimator is significantly negative at the 1% threshold.¹¹

The marginal effect of *WOMEN* measures by how much the female share varies due to the reform. It is equal to -8.16% in model (1), -10% in model (2) and -13% in model (3). Taking the average share of women after the reform as a reference, changes in female demand are $-0.1/0.623 = -16\%$ and $-0.13/0.623 = -20.9\%$ in models (2) and (3) respectively. Corresponding elasticities are $16/9.74 = 1.64$ and $20.9/9.74 = 2.1$. The econometric analysis confirms a significant impact of the reform on female demand.

5 Reform's effects on payments

Which impact had the reform on payments made by savers ? We exploit the asymmetric effects of the reform for women and single men to estimate the impact on payments. We use a difference-in-difference approach with a treated group (women) and a control group (single men). We however do not follow a cohort of subscribers before and after the reform as women who subscribed before the reform retained the benefit of the old tables afterwards. Instead, we compare the payments of subscribers who opened a plan before and after the reform. Hence the method allows us to control for time effects (payments are compared the same dates), but not for cohort effects. The latter are controlled by the inclusion in the regressions of demographic, geographic, socio-occupational variables, and by income and wealth indices.

The econometric model of payments between March 2002 and February 2008 is:

$$V_i = \beta_0 + \beta_1 AFTER_i + \beta_2 WOMEN_i + \beta_3 AFTER_i \times WOMEN_i + \beta_4 D_i + X_i \beta_5 + \epsilon_i$$

where V_i denotes subscriber i log of annual payment, *AFTER* equals 1 if subscription takes

¹¹It can be checked that the univariate model (1) leads to the same estimates than the ones calculated in Appendix 2. Indeed, $\text{Prob}(AFTER|WOMEN) = (\exp(\beta_0 + \beta_1))/(1 + \exp(\beta_0 + \beta_1)) = (\exp(-0.539 - 0.372))/(1 + \exp(-0.539 - 0.372)) = 0.287$ and $\text{Prob}(AFTER|MEN) = (\exp(\beta_0))/(1 + \exp(\beta_0)) = (\exp(-0.539))/(1 + \exp(-0.539)) = 0.368$. The female share before and after the reform may be deduced, which are 0.623 and 0.532 respectively. Those are the same estimates than the ones found in Appendix 2.

place between March 2007 and February 2008, 0 before and *WOMEN* is equal to 1 for female policyholders and 0 for male ones. The cross-dummy variable $AFTER \times WOMEN$ equals 1 if annualized payment is made after the reform by a woman and 0 otherwise. Its coefficient measures the impact of the reform on payments. D_i are temporal dummies which cover annual periods from March to next year February over the period 2002 to 2006 and X_i includes covariates described in Sub-section 2.3 and presented in Table 3.

<Insert Table 6>

Table 6 presents two sets of regression, one with control variables limited to temporal dummies, and another one with all control variables. In both models women contribute significantly less than single men. Men and women contribute more after the reform than before but the difference is statistically the same across groups. Hence it is not possible to discern any controlled impact on women payments.

Other explanatory variables have the expected sign. In the full model, contributions increase with age. Upper occupational categories (business managers, executives and independent professions) contribute more than other occupations, and so do high incomes and high wealth. Customers who live in Paris or its posh suburbs and those who subscribed a plan with an insurance agents specialized in financial planning contribute more as well. High proportions of wealth invested in risky mutual funds have no statistical impact on contributions.

6 Methodological issues

The drop of female subscriptions relative to single men documented in Section 4 is attributable to the reform as all other causes should impact the two sexes the same way. This raises the issue of the quality of the control group. Men subscribed *en masse* right before the reform as women did, which reveals a confusion about actual effects of the regulatory change. From a methodological point of view, however, anticipatory effects of the male population similar to

those of women do improve their ability to control for confounding factors. Figures 7 do not point to contrasted behaviors of men and women before, around and after the peak.

One might also fear that the sales peak which precedes the implementation date dries up the market for several years and weakens female demand after the reform. But since the male peak was proportionately as important as the female one, this potential effect is also controlled by the evolution of the male demand. Despite a six-fold increase in demand the last six months before the reform, the share of women did not seem to deviate from its trend in Fig. 9.

Regarding contributions, the identification strategy shares similar concerns. First, anticipation effects documented in previous section are likely to bias the reform's estimated impact on payments. Unobserved variables could be correlated with the propensity to contribute and the decision to subscribe before the reform. For example, if wealthier savers subscribe earlier due to better information, the reform's impact on payments could be biased down. Second one may wonder to what extent the parallel trend assumption on which the double-difference analysis is based, is valid.

Several arguments are in order. First single men seem to adequately control for anticipation effects as well. This group experienced a subscription peak at the same time and of similar magnitude than women. This suggests that potential unobserved effects driving the anticipation effect affected women and single men the same way. This impression is reinforced by previous results in Section 4 showing that sales composition was not significantly altered during the peak for most observed variables, including wealth and income indices. In particular, one main factor of the peak, subscribing with an agent specialized in financial planning, affected the same way both sexes. Only male independent professions seem to have moderately contributed more than proportionally to the peak without a similar effect for women.

Second, the validity of the methodology is based on the parallel trend assumption according to which payments from the two groups would have followed a common trend had there been no reform. This assumption can be tested on years preceding the reform. Figure 10 shows average

payment the first twelve months after subscription for women, men and single men over the period 2002 to 2007.

<Insert Fig. 10>

Payments in saving accounts are annualized to eliminate infra-annual fluctuations and differences in timing of payments. We graphically check the result of parallelism for years prior to the reform. Men's payments seem to control for women's contributions in the absence of identified events differently affecting the two sexes. The difference remains approximately constant even after the reform, suggesting that regulatory changes did not produce a significant impact on contributions.

The parallel trend assumption can be more formally tested by replicating the difference in difference procedure shifted in the past at a time when no known event has distinctly affected single men and women. Our data starting in 2002, the econometric test can be replicated four times back in the past. Table 8 shows the regression results.

<Insert Table 8>

Estimates of the variable of interest $AFTER \times WOMEN$ are not significant at the 10 % threshold for all subperiods and for the two alternative control groups, men or single men. The parallel trend assumption in absence of differential treatment is therefore backed by our data.

7 Conclusion

Annuities are special saving products. They address the financial planning needs of people approaching retirement by protecting against the risk of outliving one's assets. It is therefore of prime interest to study to what extent higher prices deter savers from purchasing life annuities. This study exploits the asymmetric effects of a French reform of regulatory mortality tables to estimate the impact on the demand for retirement savings. Three margins of behavioral

responses are distinguished: anticipation effects created by the opportunity to benefit from old conversion rates, post-reform effects on subscriptions and contributions.

A strong reaction in the imminence of the reform is documented. Subscriptions are multiplied by six over a six month period. A significant effect on subscriptions is also highlighted by comparing post-reform subscriptions of women, affected by the reform and single men, not concerned by the reform insofar as they do not expect to take the survivor option. A large annuity price elasticity of -1.5 is estimated. Post-reform subscriptions of men in couple affected by a more costly survivor annuity are also compared to single men with an even greater estimated price elasticity of -2.5.

While the reform was anticipated by a large number of investors, payments in saving accounts remained stable the first year after the reform. Hence the drop in conversion rate has not been offset by more saving, at least in the short-run, which means that savers are likely to benefit from lower annuities at retirement, nearly 10% for women and 5% for men who choose the survivor option.

Overall, the reform had lasting positive effects on the number of subscriptions. Due to powerful anticipation effects, the post-reform reduction in demand was more than offset by the initial strong increase the six months preceding its implementation. Assuming that the demand is permanently 10% lower than what it would have been absent the reform, post-reform effects would cancel out the initial peak sales only after 20 years of depressed demand.

The overall positive effect of the reform is largely based on male peak sales as men make up about two thirds of total demand. Yet, closer inspection of the reform reveals that men had no clear interest in subscribing before the reform. This puzzle reinforces the idea that annuity contracts are complex products poorly understood by investors (Brown, 2009; Brown et al. 2012), which involve knowledge about capital markets, mortality tables, and the regulatory framework that most savers lack.

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APPENDICES

Appendix 1: Univariate analysis of the impact of the reform to subscriptions by men in couple relative to single men

The table shows the annual evolution of contract sales from September 2003 to August 2008 for men in couple (either married or in a relationship) relative to the whole male population (men in couple and single men). Years start in September, which is the approximate month during which the government decision to update regulatory mortality tables has been known by the public. The share of men is relatively stable at around 64% the first two years and then goes down by about five percentage points from mid-2006. To assess the effects of the reform on subscriptions, we extend past trend by assuming a counterfactual share of men in couple equal to the average share observed the previous three years (2003-6). The variation of subscriptions by men in couple attributable to the reform is -12.6% the first year $((0.581-0.665)/0.665)$ and -11.4% the second year.

Number of subscriptions	2003-4	2004-5	2005-6	2006-7	2007-8
Men in couple	400	369	356	844	435
Men	570	580	543	1453	739
Share of men in couple	0.702	0.636	0.656	0.581	0.589
Counterfactual share					
(previous three year average)				0.665	0.665
Variation of male subscriptions				-12.6%	-11.4%

Note : a year goes from September n to August $n + 1$. September 2006 is the approximate date from which the reform was known to the public. Men whose family situation is not recorded are excluded from the analysis.

Appendix 2: Univariate analysis of the impact of the reform to subscriptions by women relative to single men

The table presents annual evolution of contract sales between March 2004 and February 2009 for women relative to single men. Years start in March, which is the first month of implementation of the reform in 2007. We extrapolate the share of women in 2007-8 and 2008-9 by assuming a counterfactual share equal to the average share observed the previous three years. The variation of subscriptions by women attributable to the reform is -14.6% $((0,532-0,623)/0,623)$ the first two year after the reform.

Number of subscriptions	2004-5	2005-6	2006-7	2007-8	2008-9
Women	354	361	909	299	354
Single men	194	205	585	263	311
Total	548	566	1494	562	665
Share of women	0.646	0.638	0.608	0.532	0.532
Counterfactual share					
(previous three year average)				0.623	0.623
Variation of female demand				-14,6%	-14,6%

Note : a year goes from March n to February $n + 1$. March 2007 is the first month from which new subscribers have been impacted by the reform.

Fig. 1. Female conversion rates with respect to birth year in mortality tables TPRV93 and TGF05

Note: conversion rate is the annuity payout in proportion to wealth at the time of conversion. Table TPRV93 was valid for women between 1993 and 2007, TGF05 between 2007 and 2012. Calculation hypotheses: saving plan's conversion at 65 y.o. ; assumed interest rate of 1.5% ; no reversion to the surviving spouse.

Fig. 2. Male conversion rates with respect to birth year in mortality tables TPRV93 and TGH05

Note: Table TPRV93 was valid for men between 1993 and 2007, TGH05 between 2007 and 2012. Calculation hypotheses: conversion at 65 y.o.; assumed interest rate of 1.5% ; no reversion to the surviving spouse.

Fig. 3. Female conversion rates with respect to birth year for a 60% joint and survivor annuity

Note: Mixed table was valid for female savers who subscribed before 2007. It is composed of TPRV93 for the policy owner and TGH05 for the secondary beneficiary, assuming a male spouse. Tables TG05 apply to subscribers after 2007, which are female table TGF05 for the main beneficiary and male table TGH05 for the secondary beneficiary. Before the reform, the same table TPRV93 applied to women as the main beneficiary and men as the second beneficiary. Unisex Table TPRV93 (lines with diamonds) would have continued to apply to all subscribers after 2007 had the reform not been implemented. The reform has not changed the situation of early female subscribers as TPRV93 has been replaced for the secondary beneficiary by the equivalent table TGH05 (see Fig. 2). Calculation hypotheses: conversion at 65 y.o.; assumed interest rate of 1.5% ; reversion to the male surviving spouse one year older.

Fig. 4. Male conversion rates with respect to birth year for a 60% joint and survivor annuity

Note: Mixed table applied to male savers who subscribed before 2007. It is composed of TPRV93 for the policy owner and TGF05 for the secondary beneficiary (assuming a female spouse). Tables TG05 applied to men who subscribed after 2007: TGF05 for the main beneficiary and TGF05 for the secondary (female) beneficiary. Before the reform was known to the public, the same table TPRV93 applied to men as the main beneficiary and women as the second beneficiary. Table TPRV93 would have continued to apply to all subscribers after 2007 had the reform not been implemented (lines with diamonds). The reform has impacted men whatever their subscription date. Calculation hypotheses: conversion at 65 y.o.; assumed interest rate of 1.5% ; reversion to the female surviving spouse three years younger.

Fig. 5. Number of subscriptions, quarterly, March 2002- February 2009

Note: The vertical line indicates the application date of the new tables.

Fig. 6. Six-month subscriptions, index base 100: first half of 2006 (06S1)

Notes : The first half of the year starts in March, so that the first half of 2007 begins the first month of implementation of the new tables. The period 02S1 covers the months from March 2002 to August 2002, 02S2 September 2002 to February 2003, etc. The number of subscriptions is normalized to 100 the first half of 2006 (06S1). The vertical line indicates the implementation date of new tables.

Fig. 7. Evolution in biannual frequency of subscribers' share sorted by characteristics

Fig. 7 (continued).

Note: The shaded area represents the six months preceding the application of the reform. Population is limited to new subscribers. Fig 7.1 and 7.2 present how the share of well informed subscribers should schematically evolve with two possible price elasticities for women and men respectively. "High income" and "high wealth" are dummy variables constructed from segmentation indices used by the marketing department. Specialized agents are insurance general agents specialized in financial planning, contrary to other general agents who sell all insurance products of the company. **Reading:** In Figure 7.3, the share of contracts sold by specialized agents rose to 87% for women and 78 % for men during the six months preceding the reform.

Fig. 8. Share of women and men in couple compared to their respective population, semi-annual frequency

Note: The graphic plots the share of male subscribers in couple (married or cohabiting) relative to the whole male population (single or in couple) and the share of female subscribers in couple relative to the whole female population. Subscribers whose family situation is not recorded are excluded (13% of male and female subscribers). Semester 02S1 covers March to August 2002, 02S2 from September 2002 to February 2003, etc. The vertical line indicates the implementation date of new tables.

Figure 9. Women vs men ratios (left scale) and women vs single men ratios (right scale) of new subscriptions, semi-annual frequency

Note: semester 02S1 extends from March to August 2002, 02S2 from September 2002 to February 2003, etc. The vertical line indicates the implementation date of new tables.

Fig. 10. Average payment the first year of subscription

Note : A year n goes from March n to February $n+1$.

Table 2. Reform's impact on conversion rates by sex and subscription date

		Spouse reversion			Average reduction
		0%	60%	100%	
Men		approx. 0	-3.5%	-5.5%	-2.6%
Women	before 2007	approx. 0	approx. 0	approx. 0	approx. 0
	after 2007	-10%	-7%	-5,3%	-9,74%

Note : average reduction is weighted by probabilities taken from Table 1. Conversion rates are valid for cohorts born between 1945 and 1965. Hypotheses: conversion at age 65 and assumed interest rate of 1.5%.

Table 3. Summary statistics of the dataset

	2003-5	2006	2007	2008
Number of subscriptions	3023	2536	1054	1240
Women share	0.341	0.358	0.283	0.285
Average annual payment (euros)	6067	7718	9213	-
Share of couples (married or in a relationship)	0.585	0.569	0.533	0.527
Mean age	48.3	49.5	50.4	51.0
Share of savers with children	0.344	0.320	0.328	0.325
Share of small businesses (craftsmen, shopkeepers, ...)	0.141	0.110	0.172	0.159
Share of independent professions (doctors, lawyers, ...)	0.713	0.733	0.581	0.561
Share of business managers and executives	0.075	0.068	0.114	0.125
Share of high incomes	0.086	0.100	0.092	0.068
Share of high wealths	0.090	0.134	0.093	0.113
Share invested in mutual funds (MF)	0.362	0.437	0.435	0.300
Share investing more than 50% in MF	0.334	0.420	0.391	0.203
Share subscribed with specialized agents	0.601	0.788	0.626	0.640
Share living in Paris, Yvelines or Hauts de Seine	0.175	0.207	0.189	0.157

Note : A year goes from March n to February $n+1$. The period 2003-5 aggregates three years of subscriptions and goes from March 2003 to February 2006. Payments being aggregated on an annual basis, complete payments are not available for subscribers between March 2008 and February 2009. High incomes and high wealths are binary variables constructed from segmentation indices used by the marketing department. Mutual funds are risky funds invested in financial markets available within savings accounts. Specialized agents are insurance general agents specialized in financial planning, contrary to other general agents who sell all insurance products of the company. Yvelines and Hauts de Seine are Paris's richest suburbs.

Table 4. Regression of the probability of subscribing during the peak vs before or after the peak for women (logistic model)

Dependent variable : 1 if subscription takes place during the six-month peak (from September 2006 to February 2007) and 0 before (from March 2006 to August 2006) or after the peak (from March 2007 to August 2007)		
	Women	Marginal effects (%)
Age	-0.019 (0.015)	-0.43
In couple (married or in a relationship)	<i>ref</i>	<i>ref</i>
Single (never married, divorced or widow)	0,132 (0.180)	2.49
Other marital situation or not recorded	-0.289 (0.237)	-6.15
With children	0.388** (0.188)	6.79
Small businesses (craftsmen, shopkeepers, ...)	<i>ref</i>	<i>ref</i>
Independent professions (doctors, lawyers, ...)	0.400 (0.272)	7.94
Business managers and executives	-0.434 (0.467)	-8.02
Other (employees, farmers, unemployed, inactive, retirees)	0,323 (0,339)	5,79
High income profile	-0.042 (0.285)	-1.31
High wealth profile	-0.120 (0.237)	-2.70
Share invested in mutual funds	0.866** (0.354)	14.04
Contract sold by insurance agents	<i>ref</i>	<i>ref</i>
Contract sold by specialized insurance agents	0.934*** (0.202)	19.05
Live in Paris, Yvelines or Hauts de Seine	0.021 (0.204)	0.38
Number of observations	1035	
Pseudo R2	0.074	
Standard errors in parentheses ; *** p<0.01, ** p<0.05, * p<0.1		

Sample: female subscriptions from March 2006 to August 2007.

Note: the estimator of the constant is not reported. "High income" and "high wealth" are variables constructed from segmentation indices used by the company's marketing department. Mutual funds are risky funds invested in financial markets available within savings accounts. Specialized agents are insurance general agents specialized in financial planning, contrary to other general agents who sell all insurance products of the company. Yvelines and Hauts de Seine are Paris's richest suburbs.

Table 5. Regression of the probability of subscribing during the peak vs before or after the peak for men (logistic model)

Dependent variable : 1 if male subscription takes place during the six-month peak (from September 2006 to February 2007) and 0 before (from March 2006 to August 2006) or after the peak (from March 2007 to August 2007)		
	Men	Marginal effects %
Age	-0.021 (0.108)	-0.52
In couple (married or in a relationship)	<i>ref</i>	<i>ref</i>
Single (never married, divorced or widow)	-0.160 (0.140)	-3.19
Other marital situation or not recorded	-0.393** (0.183)	-8.26
With children	-0.018 (0.131)	-0.35
Small businesses (craftsmen, shopkeepers, ...)	<i>ref</i>	<i>ref</i>
Independent professions (doctors, lawyers, ...)	0.342** (0.158)	6.92
Business managers and executives	-0.004 (0.209)	0.08
Other (employees, farmers, unemployed, inactive, retirees)	0.168 (0.213)	3.22
High income profile	-0.100 (0.206)	-2.00
High wealth profile	-0.142 (0.168)	-2.88
Share invested in mutual funds	0.901*** (0.247)	17.78
Contract sold by insurance agents	<i>ref</i>	<i>ref</i>
Sold by specialized insurance agents	0.779*** (0.135)	16.28
Live in Paris, Yvelines or Hauts de Seine	0.076 (0.165)	1.49
Number of observations	1894	
Pseudo-R2	0.065	
Standard errors in parentheses ; *** p<0.01, ** p<0.05, * p<0.1		

Sample: male subscriptions from March 2006 to August 2007.

Note: the estimator of the constant is not reported. "High income" and "high wealth" profiles are binary variables constructed from segmentation indices used by the company's marketing department. Mutual funds are risky funds invested in financial markets available within savings accounts. Specialized agents are insurance general agents specialized in financial planning, contrary to other general agents who sell all insurance products of the company. Yvelines and Hauts de Seine are Paris's richest suburbs.

Table 6. Least ordinary square regression of log of payment over 2002-2008

Dependent variable: log of annualized payment the first 12 months after subscribing		
	model (1)	model (2)
Constant	8.0570*** (0.0487)	7.694*** (0.0906)
AFTER (March 2007 to Feb. 2008)	0.3519*** (0.0802)	0.1846** (0.0799)
WOMEN	-0.1344*** (0.0352)	-0.1114** (0.0479)
AFTER×WOMEN	-0.0802 (0.0941)	-0.0567 (0.0913)
2002	<i>ref</i>	<i>ref</i>
2003	-0.0534 (0.0640)	-0.0983 (0.0621)
2004	0.1172* (0.0623)	0.0240 (0.0619)
2005	0.1477 (0.0619)	0.0000 (0.0632)
2006	0.0992 (0.0515)	-0.0496 (0.0538)
Age < 46		<i>ref</i>
Age 46-50		0.1235*** (0.0377)
Age 51-55		0.3625*** (0.0449)
Age 56-60		0.6685*** (0.1658)
Age > 60		0.5354*** (0.1658)
In couple (married or in a relationship)		<i>ref</i>
Single (never married, divorced or widow)		-0.0148 (0.0458)
Other marital situation or not recorded		0.1673*** (0.0643)
With children		-0.324 (0.0405)
Small businesses (craftsmen, shopkeepers, ...)		<i>ref</i>
Independent professions (doctors, lawyers, ...)		0.1751*** (0.0547)
Business managers and executives		0.3670*** (0.0896)
Other (employees, farmers, unemployed, inactive, retirees)		0.0713 (0.0755)
High income profile		0.2097*** (0.0581)
High wealth profile		0.2862*** (0.0522)
Share invested in mutual funds = 0 %		<i>ref</i>
Share invested > 0 and < 50%		-0.0749 (0.0522)
Share invested ≥ 50%		0.0278 (0.0561)
Contract sold by an insurance agents		<i>ref</i>
Sold by a specialized insurance agents		0.1050** (0.0433)
Live in Paris, Yvelines or Hauts de Seine		0.1183*** (0.0424)
Number of observations	4214	4214
R2	0.01486	0.08212

Standard errors in parentheses ; *** p<0.01, ** p<0.05, * p<0.1

Sample: subscriptions by women and single men between March 2002 and February 2008.

Note: AFTER is equal to 1 if subscription takes place after the reform (between March 2007 and February 2008), and 0 otherwise. "High income" and "high wealth" are binary variables constructed from segmentation indices used by the marketing department. Mutual funds are risky funds invested in financial markets available within savings accounts. Specialized agents are insurance general agents specialized in financial planning, contrary to other general agents who sell all insurance products of the company. Yvelines and Hauts de Seine are Paris's richest suburbs.

Table 7. Logistic regression of the probability of subscribing after vs before the reform date

Dependent variable: AFTER equals 1 if subscription takes place after the reform (from March 2007 to February 2009), 0 if before (from March 2004 to February 2007)			
	With subscriptions during the peak		Without the peak
	model (1)	model (2)	model (3)
Constant	-0.539*** (0.053)	1.001** (0.339)	1.466*** (0.390)
WOMEN	-0.372*** (0.070)	-0.464*** (0.113)	-0.529*** (0.127)
	[-8.16]	[-10.02]	[-13.15]
Age < 46 ans		<i>ref</i>	<i>ref</i>
Age 46-50 ans		0.280** (0.094)	0.394*** (0.107)
Age 51-55 ans		0.394*** (0.107)	0.411*** (0.121)
Age 56-60 ans		0.587*** (0.135)	0.756*** (0.158)
Age > 60 ans		1.580*** (0.318)	1.544*** (0.380)
In couple (married or in a relationship)		<i>ref</i>	<i>ref</i>
Single (never married, divorced or widow)		-0.118 (0.114)	-0.201 (0.128)
Other marital situation or not recorded		0.131 (0.154)	0.025 (0.172)
With children		-0.158 (0.099)	-0.189* (0.111)
Small businesses (craftsmen, shopkeepers, ...)		<i>ref</i>	<i>ref</i>
Independent professions (doctors, lawyers, ...)		-0.544*** (0.124)	-0.596*** (0.144)
Business managers and executives		0.322* (0.190)	0.202 (0.220)
Other (employees, farmers, unemployed, inactive, retirees)		0.201 (0.162)	0.556** (0.199)
High income profile		-0.228 (0.143)	-0.201 (0.164)
High wealth profile		0.029 (0.119)	0.043 (0.138)
Share invested in mutual funds = 0 %		<i>ref</i>	<i>ref</i>
Share invested > 0 and < 50%		-1.134*** (0.111)	-0.895*** (0.127)
Share invested >= 50%		-1.481*** (0.121)	-1.156*** (0.138)
Contract sold by an insurance agent		<i>ref</i>	<i>ref</i>
Sold by a specialized insurance agent		-0.118 (0.107)	0.324** (0.120)
Live in Paris, or its richest suburbs		-0.071 (0.099)	-0.031 (0.114)
Log of annualized payment		0.008 (0.034)	-0.050 (0.040)
Number of observations	3835	3835	2545
Pseudo-R2	0.010	0.127	0.131

Standard errors in parentheses and % marginal effect (only reported for WOMEN) in brackets ;
 *** p<0.01, ** p<0.05, * p<0.1

Sample: subscriptions by women and single men between March 2004 and February 2009.

Note: Model (1): univariate analysis of being a woman on subscribing after the reform; model (2): multivariate model of subscribing after the reform; model (3): multivariate model without subscription data during the peak (from September 2006 to February 2007). "High income" and "high wealth" are binary variables constructed from segmentation indices used by the marketing department. Mutual funds are risky funds invested in financial markets available within savings accounts. Specialized agents are insurance general agents specialized in financial planning, contrary to other general agents who sell all insurance products of the company. Paris's richest suburbs are Yvelines and Hauts de Seine.

Table 8. Least ordinary square regressions of log of payment for various sub-periods

Dependent variable: log of annualized payment the first year after subscribing					
Panel A. Comparison group: single men					
	2003-2008	2004-2008	2005-2008	2006-2008	2007-2008
AFTER	0.1415*	0.1341*	0.0997	-0.1136	0.1846**
	(0.0833)	(0.0759)	(0.0731)	(0.0721)	(0.0799)
WOMEN	-0.1374	-0.1447**	-0.1779***	-0.1541***	-0.1114**
	(0.0933)	(0.0719)	(0.0614)	(0.0556)	(0.0479)
AFTER×WOMEN	0.0212	0.0343	0.0955	0.0723	-0.0567
	(0.0932)	(0.0733)	(0.0654)	(0.0633)	(0.0913)
# of observations	4214	4214	4214	4214	4214
Panel B. Comparison group: all men					
	2003-2008	2004-2008	2005-2008	2006-2008	2007-2008
AFTER	0.1705***	0.1579***	0.1592***	0.1523***	0.1730
	(0.0487)	(0.0471)	(0.0465)	(0.0465)	(0.0490)
WOMEN	-0.1544**	-0.1864***	-0.1797***	-0.1861***	-0.1575***
	(0.0650)	(0.0470)	(0.0382)	(0.0331)	(0.0261)
AFTER×WOMEN	-0.0057	0.0384	0.0340	0.0578	-0.0143
	(0.0698)	(0.0545)	(0.0490)	(0.0481)	(0.0723)
# of observations	7748	7748	7748	7748	7748
Standard errors in parentheses ; *** p<0.01, ** p<0.05, * p<0.1					

Note: regressions duplicate model (2) in table 7 with two differences: (i) Panel B includes all men rather than single men; (ii) the post-reform period is artificially shifted to the past: 2003 to 2008 means that the dummy variable AFTER now covers the period from March 2003 to February 2008. The pre-reform period is limited to March 2002 to February 2003. For 2004-2008, the post-reform period goes from March 2004 to February 2008 and the pre-reform period from March 2002 to February 2004, etc. AFTER×WOMAN is equal to 1 if the contract is signed by a woman after the reform. For comparison with the baseline case studied in Table 7, log annualized payments are observed the first year after subscription. Control variables are identical to those used in Table 6 and are not reproduced: age and year dummies, marital status, presence of children, occupational category, income and wealth profiles, mutual funds holding, distribution channel, and residence.