The effects of the introduction of tax incentives on retirement saving

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The views and opinions in this paper are the authors', and do not necessarily correspond to those of the Bank of Spain

Section 1: **Introduction**

- Tax incentives for retirement savings prevalent in OECD
  - Up to limit, each euro contributed is tax exempt.
  - Savings impact?? (Engen/Gale, Poterba, Venti and Wise)
- Reasons: opposing income and substitution effects, timing, lack of exogenous variation (Duflo et al., 2006)
- THIS PAPER looks at *introduction* of tax incentives in Spain in 1988 (*Fondo de Pensiones*)
  - Use tax returns and consumption panel to examine take-up and consumption growth.

Section 1: **Literature**

- US IRAs and 401(k) Bernheim, 2002
  - Poterba Venti and Wise or Engen and Gale: trends in non-tax favored asset holding
  - Attanasio and DeLeire (2002) new saving implies consumption drop only at first contribution.
- Other countries
  - UK / Netherlands/Canada: Chung et al. (2006), Alessie et al (2007), Milligan (2001)
  - Italy : Jappelli and Pistaferri (2002, 2006) no portfolio effects

Section 1: Our contribution

- Introduction of the deduction: isolate changes in after-tax returns

- Dataset 1: micro panel on tax returns: contributions in top income quartile, ages above 36

- Dataset 2: consumption panel: estimate consumption drop relative to base group: 20-35 years of age

- Find largest (durable) cons. drop on 46-55 years of age, zero among 56-65

  - Small overall impact: 10-19 cents of new savings per euro contributed.

Section 2: Pension funds in Spain, early 90s

- Introduced in 1988. Two types: individual and employer-sponsored.

- Fiscal treatment: Contributions tax-exempt, Acrue at pre-tax interest rate, Limited disposal.

  - At retirement: (1) cash fund (40% tax-exempt) (2) annuitized as income flow.

- Contribution limit in 1988: min$\{$15% household earnings, 4,500 euro$\}$

- Other changes in limits: 1992, 1996, 1997, 1999 and 2002

Simultaneous reforms in 1988

Changes in the marginal income tax schedule.

- Introduction of tax splitting (married couples allowed to file separately)

Comparison of marginal income taxes before and after 1988

	1987		1988	
	Income bracket	Marginal tax rate	Income bracket	Marginal tax rate
1	**0**	**8.00**		
2	**3162.7**	**16.85**		
3	3795.2	21.29	3614.5	25.00
4	5060.2	27.20		
5	6325.3	33.10	6024.1	26.00
6	7590.4	22.13		
7	8855.4	23.74	9036.1	27.00
8	11385.5	25.90	12048.2	28.00
9	13915.7	28.06		
10	16445.8	30.22	15060.2	30.00
11	18975.9	32.38	18072.3	32.00
12	21506.0	34.54	21084.3	34.00
13	24036.1	36.70	24096.4	36.00
14	26566.3	38.86	27108.4	38.50
15	29096.4	41.02		
16	31626.5	43.18	30120.5	41.00
17	34156.6	45.34	33132.5	43.50
18	36686.7	47.50	36144.6	46.00
19	39216.9	49.66	39156.6	48.50
20	41747.0	51.82	42168.7	51.00
21	44277.1	53.98	45180.7	53.50
22	46807.2	56.14		
23	49337.3	58.30	48192.8	56.00
24	**51867.5**	**60.46**		
25	**54397.6**	**62.48**		
26	**56927.7**	**63.38**		
27	**59457.8**	**64.19**		
28	**61988.0**	**64.86**		
29	**64518.1**	**65.37**		
30	**67048.2**	**63.54**		
31	**69578.3**	**64.17**		
32	**72108.4**	**64.41**		
33	**74638.6**	**65.13**		
34	**77168.7**	**66.00**		

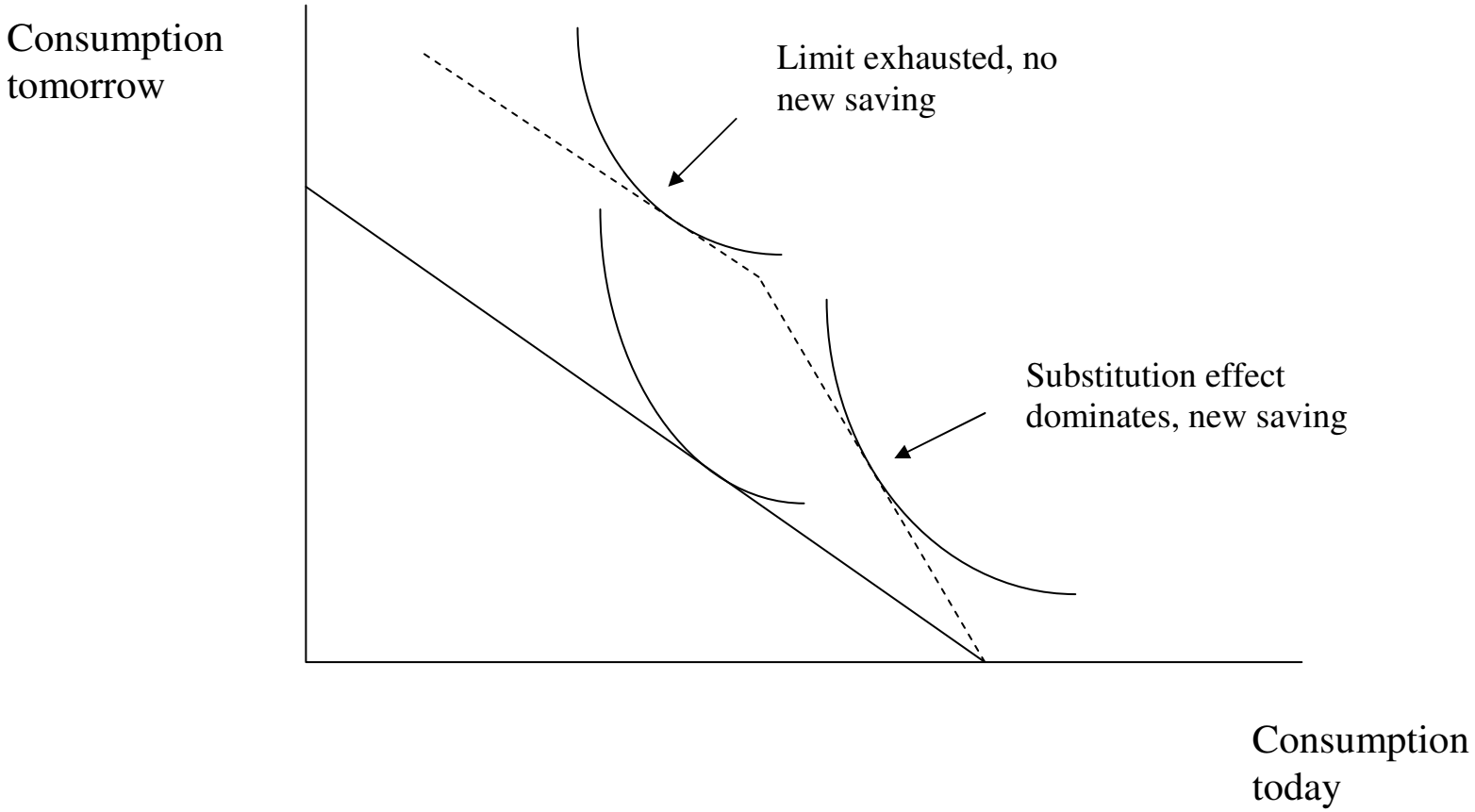
Section 3. Some theory

- Bernheim (2002): textbook model predicts tax favored products rise interest rate on savings
  - Opposing income and substitution effects, contribution limits attenuate substitution.

- BUT: credit access matters (without credit constraints, may have no impact

- Assume r equals zero. Return to each euro invested:

$$mtax_{today}(1 - f_{exempt}\frac{mtax_{retire}}{mtax_{today}})$$


Consumption tomorrow
Limit exhausted, no new saving
Substitution effect dominates, new saving
Consumption today

Three period model

- Agents live three periods. Third is retirement.
  - Income: $y_1, y_2, y_3 = \lambda y_2$ ($\lambda < 1$).
  - Two saving products: liquid (a_1, a_2), illiquid (f_1, f_2)
  - Tax rates: t_1, t_2, t_3. If save f_i increase current consumption by $t_i f_i$

- Second period income uncertain: y_2^{low} with probability πor y_2^{high} with probability $1 - \pi$.

Problem of the consumer

$$\frac{c_1^{1-\rho}}{1-\rho} + E\left(\frac{c_2^{1-\rho}}{1-\rho} + \frac{c_3^{1-\rho}}{1-\rho}\right)$$

subject to (first period budget constraint)

$$c_1 + a_1 + (1-t_1) f_1 = y_1$$

(second period budget constraint)

$$c_2 + a_2 + (1-t_2) f_2 = y_2^{high} + a_1$$

(final period)

$$c_3 = y_3 + (1-t_3)(f_1 + f_2) + a_2$$

Problem in the second period when incentives introduced

- Asset allocation always a corner solution. If $t_2 > t_3$, all savings in form of f_2

$$c_2 = \frac{1}{1+k}(y_2 + \frac{1-t_2}{1-t_3} y_3)$$

$$\text{where } k = \frac{1}{(1-t_3)^{\frac{1}{\rho}}(1-t_2)^{\frac{1}{\rho}-1} + 1}$$

- If ρ smaller than 1, c_2 falls when exemption introduced ($t_2 > 0$)

- Consumption only falls when contributions start (consumption plan is revised) – Attanasio and De Leire, 2002.

First period, incentives introduced

- Uncertainty and product illiquidity gives an incentive to invest in a_1 and f_1

- Highly stylized example: y_2^{low} is zero, the condition to invest in f_1 is

$$\frac{y_1}{y_2 + \frac{1-t_2}{1-t_3} y_3} > \frac{t_1^{-\frac{1}{\rho}} + k_1(t_2, t_3)\pi^{-\frac{1}{\rho}}}{\pi^{-\frac{1}{\rho}}(1-\pi)^{\frac{1}{\rho}}(1-t_1)^{-\frac{1}{\rho}} - t_1^{-\frac{1}{\rho}}}$$

- The condition is most likely to hold as t_1 increases and as π falls

- If ρ close to zero, c_1 drops after the introduction of tax incentives (when t_1 increases)

Summary of implications

- Uncertainty and liquidity determine the impact of incentives on consumption.
  - Closer to retirement, the "more liquid" the asset (closer substitute to other savings)

- Contributions most likely among high $mtax$ households. Within that group, increase with age
  - Heterogeneous savings impact over life-cycle
    * PF contributions more likely (increase in savings)
    * Strong sustitutability (limit most likely to bind)

Section 4. Empirical strategy

- Panel of tax returns (1988-1991): cross tabulation by age and pre-tax labor earnings
  - Average contributions, proportion contributors, limit contributors
  - Characterize age and income groups that contribute.
- Consumption survey (ECPF, 1985.1-1991.4): trends in consumption *growth* relative to base group
  - Triple difference estimates
- Comparison of expenditure drop to average annual contribution: involves periodifying expenses

Section 4. Methodology (step 2): Drop in consumption growth?

$$\begin{aligned}\Delta_4 \log C_{hq} &= b_0 + \sum_{i=1}^{i=3} a_i Age_i POST881(y > y_{75}) + \sum_{i=1}^{i=3} b_i Age_i POST88 \\ &+ b_4 POST881(y > y_{75}) + \sum_{i=1}^{i=3} b_{4+i} Age_i 1(y > y_{75}) \\ &+ \sum_{i=1}^{i=3} b_{5+i} Age_i + b_9 POST88 + b_{10} 1(y > y_{75}) + X_{it}\beta + \Delta_4 \varepsilon_h\end{aligned}$$

- 1985.1-1990.4 earnings y above median. C_{hq} :total expenditure
  - Age_i dummies for 20-35, 36-45, 56-65.
- If new saving, a_1, a_2, a_3 negative (magnitude hard to interpret).

Section 5: Datasets

- Dataset 1: Panel of Income Tax Returns (*IEF*)
  - 1987 tax filing units: continuously married filers, earnings above ECPF median: 115,956 cases of 40,170 employees

- Dataset 2: Expenditure survey (ECPF *Encuesta Continua de Presupuestos Familiares)*
  - Households headed by continuously married head, employee.
  - Exclude cases in which $C_{q+4} > 7.38 C_q$ or $C_{q+4} < .13 C_q$
  - 4,257 cases on 1,762 households (earnings above median).

Table 1: Incidence and amount of contributions to "Fondo de Pensiones".

Year	1 if contributes	Mean (if nonzero)	Median (if nonzero)	10th perc.	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

1. Source: 1988-1998 Panel of Tax returns. Tax units with a filer between 18 and 65
2. Sample size: 122531, all monetary magnitudes in "thousand euros as of 1987".
3. Contributions include both employer and individual contributions, and are aggregated at the level of 1987 fiscal unit

Table 1 Panel B: Characteristics of 1988-1991 Panel of Tax Returns

	Mean	Std. Dev.	Min.	Max.
Contribution to pension funds	0.125	0.567	0	4.518
Fraction who contribute	0.09	0.23	0	1
Contribution/gross earnings (if positive)	0.06	0.07	0.00	0.37
Household taxable income	21.6	11.5	11.6	101.2
4-quarter change, yearly income	1,770	4900	-263.86	466.87
Family size (excluding adults above 18 years)	3.3	1.1	2	12
Age	41.3	11.1	20	65

1. Sample size: 122531, all monetary magnitudes in 1000s of "1987 euros".
2. Sample includes filers between 20 and 65 years without self-employment or professional income, between 1988 and 1991.
3. Contributions include those made by the employer, and are aggregated at the level of the 1987 fiscal unit.

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

Households in top quartile of earnings	Mean	Std. Dev.	Min.	Max.
Quarterly total expenditure	3.195	2.251	0.191	35.246
4-quarter growth in expenditure (levels)	0.049	2.583	-26.583	25.902
Annual household taxable earnings	16.625	5.061	7.385	51.469
4-quarter change in yearly income	1.183	3.155	-16.868	14.360
Family size	4.3	1.3	2	11
Age	42.9	9.1	23	65
Spouse works	0.58	0.49	0	1
Marginal income tax	28.7	3.7	23.7	54.0
Sample size		2106		

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 (with 0s)	.063	.125	.181	.269
2. Fraction who contribute	.061	.092	.115	.121
3. Contribution/taxable income	.068	.065	.071	.106
4. Exhausts limit?	.122	.122	.142	.305
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	.018	.029	.041	.059
6. Fraction contrib.	.031	.041	.047	.047
7. Contribution/income (if positive)	.054	.097	.079	.115
8. Exhausts limit?	.084	.105	.136	.268
Marginal income tax		26.56		

1. Each tax filing unit in 1987 (a period of compulsory joint tax filing by couples) contributes an observation per year

2. Sample partitions 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 A.2: Average 4-quarters log expenditure growth, 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. Households head Age 46-65	.068	.010	-0.058
	(.050)	(.030)	(0.041)
2. Household head 20-35	.011	.083	0.072
	(.046)	(.038)	(.058)
			D-in-D
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. Households head Age 46-65	.025	.045	0.02
	(.040)	(.031)	(.045)
5. Household head 20-35	-.005	.050	0.055
	(.051)	(.034)	(.084)
			D-in-D
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.

Graph 1: Consumption growth relative to 20-35, by income quartile

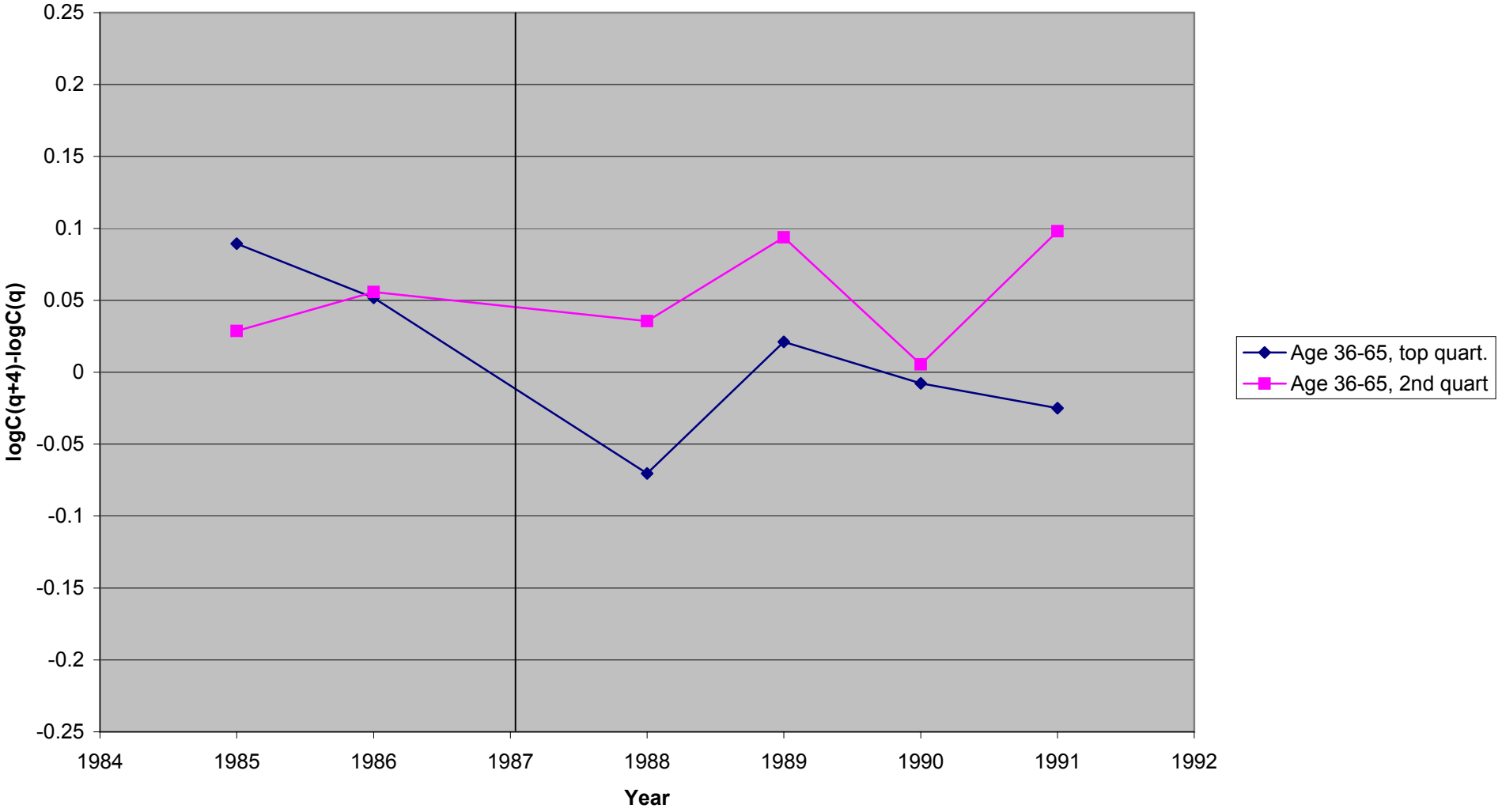


Table 5: Changes in expenditure growth around the exemption, accounting for age -specific trends

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)
Sample size:	4249			
R squared in OLS (WLS)	.013 (.146)			

Other covariates:
1. POST 88 dummy, dummies for Age 56-65, Age 46-55, Age 36-45, a dummy for Y>y75, and second-order interactions between all those variables.
2. Time effects: 4 year dummies and 3 quarter dummies
3. Household composition: Number of household members and 4-quarter change. Number members between 1 and 3, 2 and 5, 6 and 13, 14 and 17 and above 65 and 4-quarter change
4. Income: Period q family earnings, the change in earnings between q and q+4
Dummy for "both members of the couple work" and an interactions of "both work" and post 88.

Table 6: Changes in expenditure growth around the exemption, accounting for age -specific trends

Estimation method:	WLS	Quantile regression		
		25th	Median	75th
Panel B: Households with earnings above the ECPF median, effect through the marginal tax on income.				
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)

Table 5b: Which expenditure components fell within the top income quartile?

Estimation method:	WLS	Quantile regression		
		25th	Median	75th
Dependent variable: 4-quarter change in level of non-durable expenditure				
1. Age 56-65 * (POST 88)	.071			
	(.28)			
2. Age 46-55 * (POST 88)	-.030			
	(.206)			
3. Age 36-45 * (POST 88)	.091			
	(.184)			
Dependent variable: 4-quarter change in bulky purchases (cars, white & electronic goods, furniture)				
4. Age 56-65 * (POST 88)	.750	-.082	--	-.077
	(.150)**	(.115)		(.083)
5. Age 46-55 * (POST 88)	**-.324**	-.034	--	-.222
	(.021)**	(.054)		(.118)*
6. Age 36-45 * (POST 88)	.026	.035	--	-.028
	(.014)*	(.057)		(.057)

Methodology (step 3): quantifying expenditure drop, TSIV

- How does the consumption drop after the introduction compare to the average contribution?

$$\gamma_1 = \frac{E[C_{it}^{post88} - C_{it}^{pre88} | Age \geq 36, Y_{it}] - E[C_{it}^{post88} - C_{it}^{pre88} | Age < 36, Y_{it}]}{E[Contr_{it}^{post88} | Age \geq 36, Y_{it}] - E[Contr_{it}^{post88} | Age < 36, Y_{it}]} \quad (1)$$

- γ_1 estimated by Two-sample 2SLS, where contributions are instrumented by an age-specific trend in the top income quartile

Methodology (step 3): quantifying expenditure drop, TSIV (ii)

- Using Panel of Tax Returns (1998-1991)

$$contr_{ht} = \delta_0 + \sum_{i=1}^{i=3} \delta_i Age_i 1(Y > y_{75}) + \sum_{i=4}^{i=7} \delta_i Age_i + \delta_8 1(Y > y_{75}) + u_{ht}^{contr}$$

- Using data on expenditure (1985.1-1990.4)

$$\begin{aligned} \Delta C_{ht} &= \gamma_0 + \gamma_1 \widehat{contr}_{ht} + \sum_{i=1}^{i=3} \gamma_i Age_i 1(Y > y_{75}) + \sum_{i=4}^{i=7} \gamma_i Age_i POST88 \\ &+ \gamma_8 1(Y > y_{75}) POST88 + \gamma_9 1(Y > y_{75}) POST88 + \varepsilon_{ht}^{\Delta C} \end{aligned}$$

Section 6: Relating the expenditure drop to contributions

- Hard to compare mean expenditure drops to mean contributions
  - Adjustment through durables, financed with various years' contributions
  - Long panel data or information on the value of the stock needed to annualize consumption
- Our strategy to distribute bulky expenditures over a number of years:
  - Annualize *purchases* of durables: Fraumeni (1997)
  - Impute a value of zero if no purchase observed.

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

		Period: 85:1-90:4		
Estimation method:	WLS			
		Drop expenditure relative to 20-35	Mean contribution relative to 20-35	Consumption drop as a fraction of contribution =(2)/(3)
	(1)	(2)	(3)	
Panel B: Dependent variable: changes in the level of periodified expenditure				
4. Age 56-65* (POST 88)	.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

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

	OLS Contributions (5)	Weighted TSLS Change expend (6)
1. Amount contributed to PF		**-.193**
		(.215)
2. Age 56-65*POST 88*1(Y>y75)	.135	--
	(.014)	
3. Age 46-55*POST 88*1(Y>y75)	.066	--
	(.008)	
4. Age 36-45*POST 88*1(Y>y75)	.018	--
	(.005)	
Level of earnings	YES	
Earnings in 6000 euro brackets	YES	
"Both work" and interaction with POST88	YES	

Other covariates:

1. POST 88 dummy, dummies for Age 56-65, Age 46-55, Age 36-45, a dummy for Y>y75, and second-order interactions between all those variables.
2. Time effects: 4 year dummies and 3 quarter dummies
3. Household composition: Number of household members and 4-quarter change. Number members between 1 and 3, 2 and 5, 6 and 13, 14 and 17 and above 65 and 4-quarter change
4. Income: Period q family earnings, the change in earnings between q and q+4

Dummy for "both members of the couple work" and an interactions of "both work" and post 88.

Section 7: Conclusions

- Use introduction of tax incentives to identify their impact on household consumption (saving)
  - Marginal taxes increase incentive to contribute
  - Within $mtax$, age increases incentive to contribute
- Infer impact of tax incentives from consumption drops of *groups* that contributed most
  - Small drops among the group that contributed the most: 56-65 years of age. Drop among 46-55 old.
  - Each euro contributed diminishes consumption by 19 cents.

Table A.3: Other changes correlated with the reform

Estimation method:	Probit	Probit	Probit
Dependent variable:	Purchase of a house	Joint filing	Spouse works
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			
		(1)	(2)
1. Age 56-65 * (POST 88)	-0.0028	-0.0015	-0.0144
	(.0142)	(0.0093)	(.121)
2. Age 46-55 * (POST 88)	-0.0153	0.0375	-0.085
	(.0071)**	(0.0072)**	(.097)
3. Age 36-45 * (POST 88)	-0.0066	-0.0288	0.0227
	(0.012)	(0.006)**	(.0967)
4. Age 56-65	0.013		-0.2139
	(.0182)		(0.104)**
5. Age 46-55	-0.0004		-0.247
	(.0116)		(0.089)**
6. Age 36-45	0.002		-0.1896
	(.0109)		(0.0816)**
7. POST 88	-0.012		0.048
	(.011)		(0.084)
Sample size:	2362	106208	2082