The elasticity of taxable income and the optimal taxation of top incomes: Evidence from an exhaustive panel of the wealthiest taxpayers

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Abstract

This paper proposes new estimates of the elasticity of taxable income with respect to taxation. We identify the effect of taxation using three important French tax reforms between 1998 and 2006 on data coming from a sample of tax forms oversampling rich taxpayers. These tax reforms involve differential variations in marginal tax rates across income groups as well as within income groups (dividend tax reform) enabling us to implement different identification strategies. After estimating the overall elasticity of taxable income using Gruber & Saez's framework to control for endogeneity, mean reversion and underlying trends in the income distribution, we take advantage of the exhaustive sampling at the upper-end of our samples to concentrate on top income elasticity, using an exhaustive panel of top .1% income earners. We propose an estimation technique based on two-step censored quantile regressions *à la* Buchinsky and Hahn to deal with the estimation problems encountered when focusing on top income responses. Our results demonstrate that short-run responses to taxation are quite small among French top incomes, and primarily driven by independent or self-employed taxpayers. We use our estimated taxable income elasticity to calibrate the deadweight loss of taxing top income households in France.

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Introduction

The elasticity of taxable income is a key parameter to assess the marginal cost and the deadweight loss of taxation because it summarizes not only labour supply responses to taxation, but also itemization and tax avoidance, that critically affect the marginal cost of levying public funds through income taxation. In the US, a large number of studies has therefore been devoted to the empirical estimation of this parameter. Gruber & Saez (2002) give a review of this empirical literature and show that what is needed to identify this elasticity of taxable income to taxation is not one but several tax changes and a wide range of controls for time variations in the income distribution. They also provide with a methodology to properly control for these methodological issues and demonstrate that the overall elasticity of taxable income is around .4 in the US, and primarily driven by top income responses.Goolsbee (1998) focuses on top income responses in the US, and shows that if short-term responses to taxation may be important, proper controls for non-taxed induced trends in top incomes considerably reduce the long term elasticity estimate of taxable income with respect to the net-of-tax share among the very Rich.

France has experienced several tax reforms in the past ten years destined to reduce income taxation and in particular to decrease top marginal tax rates. But little is known on the effect and efficiency of these reforms because apart from Piketty (1999), who had only access to aggregate time series on top income evolutions, there is no estimation of the elasticity of taxable income to taxation in France. And as shown by Kopczuk & Slemrod (2000) and Kopczuk (2004), there is little reason to believe that the overall value of the elasticity of taxable income is the same across countries because the definition of the tax base and all other institutional arrangements linked with the functioning of the income tax may affect the value of this elasticity.This paper therefore proposes estimation of the elasticity of taxable income to taxation on data coming from rich samples of taxpayers issued by the French tax administration and using 3 important reforms of the French income tax that occurred between 1998 and 2006.

Our contribution is twofold. First, we keep clear of methodological problems linked with underlying trends in the income distribution and mean reversion following Gruber & Saez (2002) and display elasticity estimates for the whole population of taxpayers, which is of primary importance on a tax policy point of view to assess the marginal cost of levying public funds through income taxation in France.

Second, we take advantage of the quality of the data, with exhaustive sampling at the upper-end of the income distribution to focus on top income responses. We construct an exhaustive panel of the top .1% of taxpayers in France and propose an estimation technique based on 2-step quantile regressions *à la*Bushinsky & Hahn (1998) to treat the selection problem encountered when focusing on top income responses.

Our result demonstrate that the overall elasticity of taxable income is low, around .05, and driven by top income responses. This is due to the progressivity of the French income tax, that targets top incomes, but little concerns low to middle income taxpayers. Among top incomes, the value of the taxable income elasticity is around .15 for the top .1% of the income distribution. This level is also quite small, and is strongly heteregeneous according to income type. Self-employed tend to react more sharply, with an elasticity around .5. We then use our estimate to discuss the issue of optimal taxation of top incomes in France.

The paper is organized as follows. Section 1 presents briefly the theoretical aspects of the question, and then describes the data and our baseline methodology. Section 2 presents our basic results for the whole population of taxpayers. Section 3 is devoted to top income responses and section 4 tries to derive optimal tax rules from our results.

1 The elasticity of taxable income: theory, data and methodology

There is now a long tradition of studies on the elasticities of labor supply and earnings to taxation. Since Lindsey (1987) and Feldstein (1995), there is also a growing set of papers concerned specifically with the response of taxable income to income tax rate changes, because taxable income elasticity has been identified as a key parameter to assess the social costs of income taxation. However, as stressed by Slemrod (1998), there are still a certain number of important empirical issues in measuring the elasticity of taxable income. We present the basic model underlying the empirical literature on earnings elasticity with respect to taxation in the next subsection, before discussing the various methodological issues for estimation. We then present our data and our identification strategy.

The model

In this subsection, we present briefly the baseline micro-economic model from which our regression specification is derived.

The model that we use is a textbook micro economic model with 2 goods: consumption (C) and income or earnings (z). Taxpayers maximize a utility function $u = u(C,z)$ on a linear part of the tax scheme subject to a budget constraint

$$C = z(1-\tau) + R$$

where τ is the (marginal) tax rate and R stands for public transfers or virtual untaxed non-labour income [2]. This maximization problem implicitly define the earning supply function $z = z(1-\tau, R)$. This income supply is affected by changes in R and τ as follows:

$$\begin{aligned} dz &= -\frac{\partial z}{\partial(1-\tau)} d\tau + \frac{\partial z}{\partial R} dR \\ &= -\zeta^u z \frac{d\tau}{1-\tau} + \eta \frac{dR}{1-\tau} \end{aligned}$$

where $\eta = (1-\tau)\partial z/\partial R$ stands for income effects and $\zeta^u = \frac{\partial z}{\partial(1-\tau)} \frac{1-\tau}{z}$ is the uncompensated elasticity of income with respect to the net-of-tax rate. We also define the compensated elasticity of income with respect to the net-of-tax rate as:

$$\zeta^c = \frac{\partial z}{z} \frac{1-\tau}{\partial(1-\tau)}|_u$$

Then, using Slutsky's equation, $\zeta^u = \zeta^c + \eta$, we get that:

$$dz = -\zeta^c z \frac{d\tau}{1-\tau} + \eta \frac{dR - z d\tau}{1-\tau} \tag{1}$$

Equation 1 summarizes the baseline behavioral model that we estimate in this paper.

Methodological issues in measuring the elasticity of taxable income

When estimating equation 1, the most elementary problem to deal with is the endogeneity of marginal tax rate variations due to the progressivity of the tax system (*i.e.* marginal tax rates increasing with the level of a taxpayer's income). Any positive (resp. negative) income shock unrelated to behavioral responses to taxation may push a taxpayer into a higher (resp. lower) tax bracket, thus creating a spurious correlation between tax rate variations and income variations. The problem is thus to find a suitable instrument, but in the presence of panel data, a number of different approaches are possible, and have already been adopted in the existing literature. In this study, we follow the procedure chosen by Auten & Carroll (1999) and Gruber & Saez (2002), which consists in instrumenting the net-of-tax rate of a taxpayer in year $n+1$ by the net-of-tax rate applicable to year n taxable income inflated to year $n+1$ level and given year $n+1$ tax law. To put it differently, this instrument is the net-of-tax rate that would be applicable to a taxpayer in year n if nothing but tax reforms had occurred so that identification is only brought through the exogeneous changes of the tax system due to tax law modifications. Note also that this endogeneity

[2] Note that the equivalence between the marginal and the average tax rate on linear parts of the tax scheme is of course an approximation. But we mainly focus here on very rich taxpayers for whom the marginal tax rate is usually very close to the average tax rate

problem is a concern when dealing with the whole distribution of taxpayers, but disappears when focusing on taxpayers sufficiently rich, like top incomes, whose marginal tax rate is not in danger of falling below the top.

The second concern when estimating models derived from equation 1 is the possible correlation between income changes (Δz) and the level of initial income z. There are at least two reasons why this correlation might occur and bias estimated elasticities. The first is the presence of important mean reversion effects. In case of mean reversion, people with large z in period 1 tend to experience declines in period 2, creating a negative correlation between Δz and z. The second reason is the presence of underlying trends in the income distribution. Rising inequalities for non-tax reasons, with, for instance, the level of top incomes increasing faster than median income, is a serious concern for identification, because it is likely to create a positive correlation between Δz and z. As there is substantial evidence that the distribution of income has fanned-out in France since the mid-1990s (**?**), this calls for rich controls for period 1 income. With only one tax change, as is the case in most studies, a rich set of controls for period 1 income usually destroys identification because the size of the tax rate change is most often correlated with the income level. What is needed is therefore a dataset exhibiting different tax changes over time for different income groups in order to identify tax effects while still controlling properly for lagged income. We use in this paper several income tax reforms that took place between 1998 and 2006 in France, and that affected different part of the income distribution. We can therefore control for time (with a set of year dummies) and at the same time control for period 1 income. To do so, we follow Gruber & Saez's method which consists in adding log period 1 income and a 10 piece spline in log first period income[3]. Our identifying assumption is of course that the rich controls for underlying inequality and mean reversion that we introduce are constant over time, which means that we cannot let all these effects change over time with changes in tax policy. Otherwise, we could not identify any variation of $(1-t)$ that would not be collinear to one of these effects.

Another noteworthy point is the opportunity to separately estimate short-run and long-run responses to anticipated tax changes. As underlined by Slemrod, "the distinction between short- and long-run elasticities is particularly important for getting welfare analysis right, because it is the response of the present value of revenue that is critical." Goolsbee (2000) already showed that short-run responses can be very large compared to long-run elasticities in case of anticipated tax changes because of income shifting (from the non-corporate to corporate sectors) and time-optimization in the realization of taxable compensation. He concludes that the short term response to the 1993 tax increase was 10 times higher for top compensated employees than the longer-run response. However,

[3] We also show results with larger numbers of splines to control more accurately for fanning out distributions at the top

such optimization is likely to be less widespread among all taxpayers than it is among top incomes, so that Gruber & Saez, on a larger set of tax reforms and calculating elasticities on the whole distribution of income find no clear impact of widening/reducing the "differencing window" on their estimates.

Eventually, questions may arise from the definition of taxable income. First, it is of course necessary to adopt a consistent definition of taxable income over the years 1998-2006. Our definition of taxable income excludes realized capital gains, and includes all the items and adjustments that can be computed for all the years between 1998 and 2006. In particular, our definition excludes "avoir fiscal" which is a tax credit given to dividend earners (to avoid double taxation of dividends) and which was included in the tax base between 1998 and 2004. Our definition is therefore close to the actual definition of taxable income except for the fact that it includes the 20% deduction for wages that was in place until 2005.

The second problem concerning the definition of taxable income is that it is not neutral for estimating the elasticity of taxable income, in particular when tax reforms are accompanied by substantial changes in the tax base, as was for instance the case with TRA 86 in the US. Slemrod, and Kopczuk investigate this question in depth. Indeed, this is not so much of a concern for France since the major broadening of the tax base was made in 2005 but was not accompanied by any change in $(1-t)$. Moreover, deductions are quite low in France as compared to tax reductions and tax credits, so that deduction behaviors do not affect the tax base that much in France as compared to the US. However we display results showing that taking always 1998 taxable income definition into account or to the contrary always the 2006 definition does not alter our estimates.

Data

The data we use in our study come from an original sample of the French Direction Generale des Impots with more than 500,000 taxpayers every year, oversampling rich taxpayers (with exhaustive sampling of taxpayers above a fixed taxable income threshold). This sample is drawn every year by the Tax Administration. The available variables in the data set are detailed income level and composition, family size, age, matrimonial status, deductions asked, and furthermore, all pieces of information contained in taxpayers tax forms.

The samples that we use are repeated cross-sections. Because of the sampling procedure chosen by the French Tax Administration, we could not create a panel relying on the method proposed by Auten & Carroll (1999). Nevertheless, for every observation in year

n, the sample include substantial information on year $n-1$ income, family size, tax liability, etc. For every taxpayer, we can therefore compute taxable income of year $n-1$ (given the consistent definition that we described above), the marginal tax rate in year n given taxable income of year $n-1$, and more generally all suitable variables for the estimation of equation 1. The limitation of the data are twofold. First, we cannot compute Δz for a wider time-span than two years on the whole distribution of taxpayers so that our baseline estimates are focused on short-run responses of taxable income to taxation. Neither can we properly compute broad income for year $n-1$ for all taxpayers so that our estimates primarily focus on taxable income elasticity. The second limitation lies in the fact that cross sections are sampled according to year n taxable income, and not according to initial income (year $n-1$). It is thus difficult to look precisely at top income responses, because oversampling is provided for year n top incomes, but not for year $n-1$ top incomes.

But one feature of our dataset is that it provides *exhaustive* sampling at the upper-end of the income distribution. Practically, very rich taxpayers whose taxable income is greater than 175,000 euros are present every year in the sample. Based on variables which clearly identify taxpayers every year (taxable income of year $n-1$, marital status of year $n-1$, date of birth of household head and date of birth of dependants), taxpayers with taxable income above the threshold for consecutive years can be identified and matched in order to construct an exhaustive panel of taxpayers belonging to the P99.9-P100 fractile. We use this panel in section 3 to produce more specific and more detailed estimates of the responses of top incomes to taxation.

Baseline empirical strategy

Baseline econometric specification

Starting from equation 1, which can be rewritten as follows:

$$dz/z = -\zeta^c \frac{d\tau}{1-\tau} + \eta \frac{dR - zd\tau}{z(1-\tau)} \qquad (2)$$

we derive our baseline econometric specification which is similar to that chosen by Gruber & Saez :

$$\Delta logz = \zeta \Delta log(1-t') + \eta \Delta log(z - T(z)) + \gamma logz + X'\beta + \sum_i \theta_i YEAR_i + \varepsilon \qquad (3)$$

where z is taxable income, t' stands for the marginal tax rate, and $T(z)$ is total tax liability. As explained in subsection 1, we instrument $log((1-t'_2)/(1-t'1))$ by $log((1-t'_{instr})/(1-t'1))$ where t'_{instr} is the marginal tax rate that the taxpayer would face in period 2 given his period 1 income (inflated to period 2 level). We also instrument

$log((z_2 - T_2(z_2))/(z_1 - T_1(z_1)))$ by $log((z_1 - T_2(z_1))/(z_1 - T_1(z_1)))$. Our controls X include marital status, and a 10 piece spline of log of period 1 income.

Tax reforms in France, sources of variation and identification

We computed taxable income, average and marginal tax rates and tax liabilities from our sample using our own tax simulator. Our computations control for all deductions from taxable income and for the "family-tax-splitting" mechanism (*Quotient Familial*). Note that we did not compute the effects of the *Prime pour l'Emploi* (a tax credit for low-income families) and that we did not simulate for the whole population of taxpayers the effects of all other tax credits affecting net tax liability Indeed, tax credits have rates that are independent of the marginal tax rate, and we can reasonably assume that the effects of variations of these rates on earnings z are negligible, so that neglecting tax credits has little effect on our functional form estimates for the whole population.

Identification is primarily brought by 3 tax reforms. The first tax reform was decided in 2000, and consisted in a gradual decrease of the income tax scheme, especially concentrated on top income brackets, with a reduction of the top marginal tax rate from 54% to 48.09% between 2000 and 2003. The second major reform is the transformation in the tax treatment of dividends in 2005. Before 2005, dividend earners received a tax credit called "avoir fiscal" destined to avoid double-taxation of dividends, and thus equal to the amount of the "corporate tax on profits" paid on these dividends. The important feature of this tax credit is that it was reintroduced into the taxpayer's tax base, so that taxable income was considerably increased. After 2005, this tax credit was abolished, and replaced by a 50% deduction for dividends. This reform had the effect of greatly reducing the taxable income of dividend earners, and therefore, because of the progressivity of the tax scheme, of greatly reducing their marginal income tax rates. The third consequent reform took place in 2006, and consisted in a further reduction of all marginal tax rates (with top marginal tax rate reduced from 48.09% to 40%) accompanied by a broadening of the tax base (removal of the 20% deduction on all wages).

Figure 1 summarizes these evolutions. It displays the average tax rate of several income groups for years 1998 to 2006. Average tax rate is computed as tax liability before tax credits divided by total reported market incomes (excluding realized capital gains). This figure reveals that tax reforms in France from 1998 to 2006 exhibit tax changes over time for different income groups that enable us to identify tax effects while still controlling properly for lagged income. Panel A shows evolutions for taxpayers between the 20-th and the 40-th percentile of broad income. These taxpayers almost never pay taxes because of the family-tax-splitting and of the *"décote"* [4], so that they were not affected by

[4] The *décote* system reduces the net tax liability of poor households by targeting households with a gross

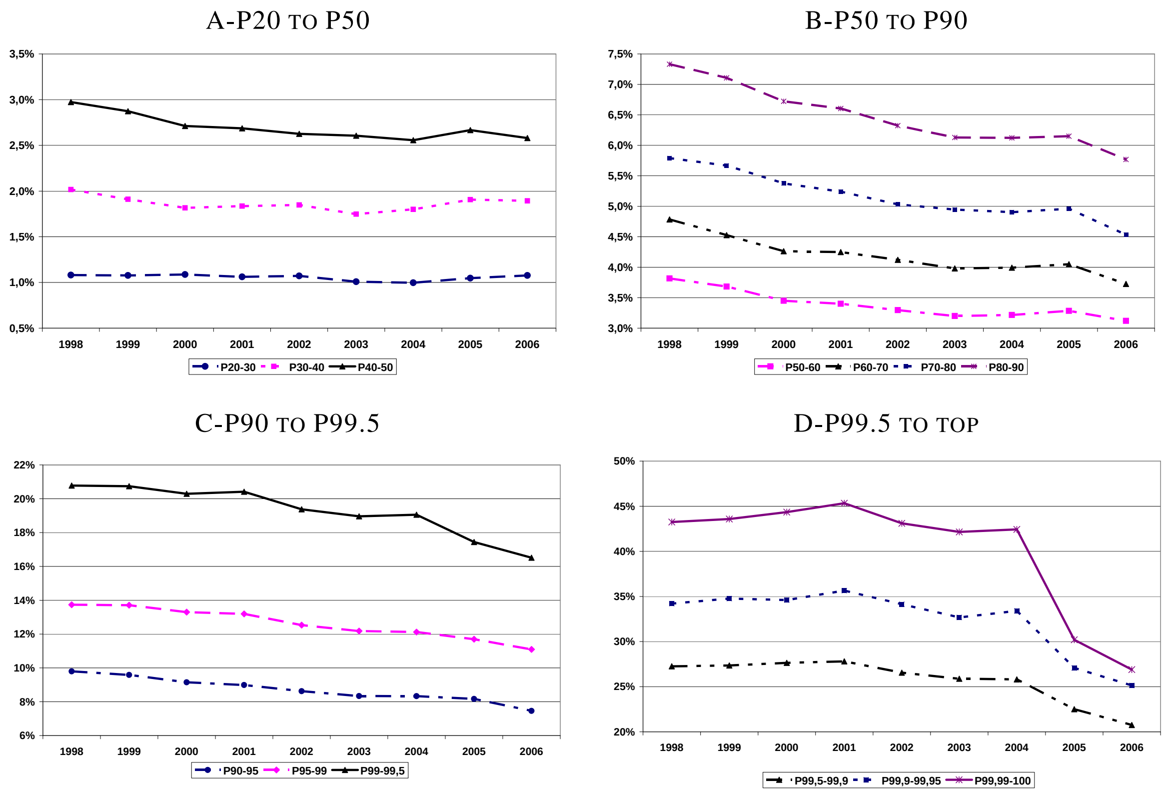
these three tax reforms. Panel B focuses on middle-class households. These households have been essentially affected by the 2000-2003 reform, and also by the 2006 reform, but, as the fraction of dividends is negligible in their income, they were not at all affected by the 2005 reform on dividends. Panel C displays the evolution of tax rates for the P90 to P95 income group. These taxpayers were affected by the 2000-2003 and 2006 reforms, but it is only among the first percentile that the tax cut on dividends was effective. Panel D eventually focuses on Income tax reforms have clearly affected primarily top incomes, and the major effects are concentrated among a very small fraction of taxpayers at the upper-end of the broad income distribution whose tax liability has decreased of more than 40%. Besides, the 2005 and 2006 tax reforms have affected rich taxpayers markedly while previous reductions in marginal tax rates have had relatively little effects on these households.

Note that the timing/applicability of these 3 tax reforms ensures that taxpayers were aware of the tax rates applicable to their income at the time they earned it, which is not always the case with the French tax system that does not function as a withholding tax system. The first tax reform spanning years 2001 to 2003 was voted in 2000 by the socialist government of Mr. Jospin and established a time schedule for gradually reducing the tax scheme. This reform was simply reinforced in 2002 by the new government, which further decreased the tax scheme for year 2003. The second reform, that of the tax treatment for dividends, was voted in 2004 in order to comply with a European directive, and was applicable starting from January 1., 2005. The third reform, the "Villepin reform", was voted in September 2005, and was applicable for incomes earned in 2006.

To give an idea of the way identification is brought in our setting, figure 2 compares the evolution of the marginal net of tax share for two income groups (P90-95 vs P99-100), and the related evolution of taxable income (the evolution of the income share ratio of those two groups). The differential in terms of marginal net of tax share has been reduced largely from 1998 to 2006, the top percentile of taxable income having experienced a much larger reduction of its marginal income tax rate than the P90-95 income group. The largest reduction of this differential occurs in 2006. The reaction of taxable incomes is given by the evolution of the income share ratio. This ratio was trending upward, indicating that some underlying forces have led to larger inequalities among top incomes. Nevertheless, the figure shows a little acceleration of the trend in 2006 following the relative decrease of top marginal tax rates for the P99-100 income group. This suggests that the overall short-term response is real, but is not large.

tax liability inferior to a certain threshold.

Figure 1: *Evolution of average income tax rates for different income groups (France 1998-2006)*



SOURCE: Echantillons Lourds DGI. Income groups are computed according to broad income (total reported market incomes excluding realized capital gains).
NOTE: Average tax rates are computed as tax liability before tax credits divided by total reported market incomes (excluding realized capital gains).

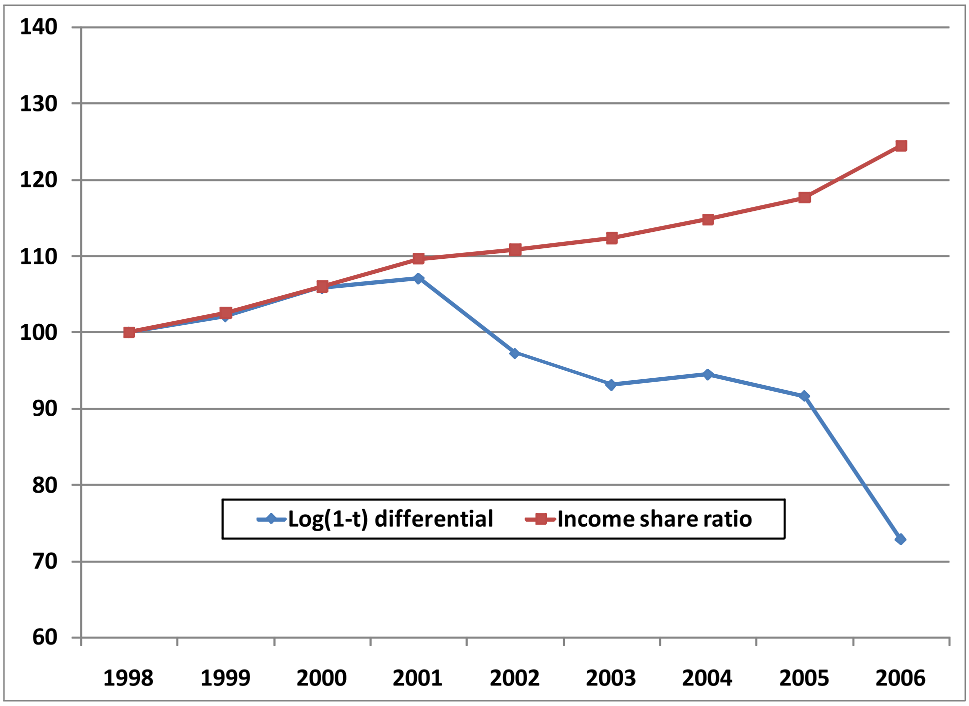
Table 1: *Summary statistics: weighted yearly samples of taxpayers of the French Tax Administration*

YEAR	1998		1999		2000		2001		2002	
variable	MEAN	std	MEAN	std	MEAN	std	MEAN	std	MEAN	std
taxable income	15 755	180 804	15 979	174 888	16 223	185 771	16 566	225 875	16 755	222 742
broad income	22 988	246 150	23 387	231 784	23 723	247 065	24 188	299 848	24 431	300 848
single	0,35		0,36		0,37		0,37		0,38	
married	0,40		0,39		0,39		0,38		0,38	
divorced	0,12		0,12		0,12		0,12		0,13	
widowed	0,13		0,12		0,12		0,12		0,12	
marg. tax rate n-1	0,129	1,045	0,131	0,942	0,134	0,980	0,124	0,984	0,123	0,954
marg. tax rate n instr.	0,128	1,045	0,131	0,942	0,120	0,939	0,119	0,966	0,117	0,893
Number of obs.	422 960		538 572		512 273		479 196		508 997	

YEAR	2003		2004		2005		2006	
variable	MEAN	std	MEAN	std	MEAN	std	MEAN	std
taxable income	16 579	210 353	16 587	239 764	16 806	249 333	17 076	264 485
broad income	24 166	287 852	24 230	322 082	24 341	291 325	24 665	309 071
single	0,39		0,39		0,39		0,39	
married	0,37		0,36		0,36		0,36	
divorced	0,13		0,13		0,13		0,13	
widowed	0,12		0,12		0,11		0,11	
marg. tax rate n-1	0,118	0,894	0,115	0,899	0,117	0,921	0,117	0,918
marg. tax rate n instr.	0,114	0,873	0,115	0,901	0,116	0,917	0,080	0,679
Number of obs.	538 447		511 965		497 920		500 680	

Notes: Incomes are expressed in constant 2006 euros.

Figure 2: *Evolution of marginal net of tax share differential and of income share ratio for two income groups: P90-95 vs P99-100 (1998-2006)*



SOURCE: Echantillons Lourds DGI. Income groups are computed according to taxable income.
NOTE: Marginal net of tax share is equal to (1-t'), t' being the marginal tax rate. It is the marginal fraction of earned income net of income tax. Income share ratio is defined as the taxable income share of group P99-100 in total taxable income divided by the taxable income share of group P90-95 in total taxable income.

2 Baseline results

In this section, we present our baseline results on the whole population of taxpayers.

2.1 Basic results

Table 2 presents our basic results and displays the short-term elasticity estimates of taxable income among the whole population of taxpayers according to 5 different specifications. Model 1 does not control for initial income. As we can see, the elasticity estimate is negative, suggesting that mean reversion effects are strong. Model 2 controls for mean reversion simply by adding the log of initial income. The elasticity estimate is positive and around .15. But better controls for underlying trends in the income distribution tend to reduce importantly this estimate. Model 3, which includes a 10 piece spline of the log of first period income, leads to an estimate around .06. This demonstrates that underlying trends in income inequality, with top incomes increasing faster than average incomes, tend to drive the result when these trends are not properly controlled for. Model 4 and 5 drop income effects, which are second order, with model 5 introducing a larger set of splines.

Our baseline results therefore suggest that short term taxable income elasticity is rather low in France, around .05, when the estimated model properly controls for mean reversion effects and underlying trends in the income distribution. We investigate in the next subsection for possible heterogeneity of taxable income elasticity among taxpayers.

Table 2: ***2 stage least square baseline estimates***

variables	**MODEL 1 :** no controls for mean reversion	**MODEL 2 :** mean reversion controls (logZ1)	**MODEL 3 :**	**MODEL 4:**	**MODEL 5:**
			controls for mean reversion and underlying trends		
			10 piece spline	10 piece spline	15 piece spline
				No income effects	
Intercept	-0,079	0,689	1,666	1,664	1,446
	0,001	*0,003*	*0,010*	*0,010*	*0,017*
elasticity	-0,477	0,141	0,061	0,061	0,054
	0,008	*0,009*	*0,009*	*0,009*	*0,009*
net inc. effects	-0,016	0,018	0,009		
	0,001	*0,001*	*0,001*		
logz1		-0,080	-0,189	-0,188	-0,146
		0,000	*0,001*	*0,001*	*0,001*
single	0,038	0,029	0,032	0,032	0,032
	0,001	*0,001*	*0,001*	*0,001*	*0,001*
divorced	-0,038	-0,027	-0,028	-0,028	-0,028
	0,001	*0,001*	*0,001*	*0,001*	*0,001*
married	0,053	0,105	0,093	0,093	0,092
	0,001	*0,001*	*0,001*	*0,001*	*0,001*

Notes: All regressions are weighted by income, and include year dummies.

2.2 Heterogeneity

There are several possible sources of heterogeneity of taxable income responses to taxation among taxpayers. The first source of heterogeneity is the level of income itself. Rich taxpayers tend to respond more to tax incentives than middle or low income households. Table 3 displays the elasticity estimated on 3 different income groups defined according to the level of their broad market income. Very low income households (with income inferior to the 30-th percentile of broad market income) are never taxable, so that we drop them from estimation. We first focus on taxpayers belonging to the P30-P80 income group. Elasticity estimated on this income group is strongly negative. This may be due to the fact that these taxpayers are eligible to a certain number of transfers that our microsimulation model cannot properly take into account and that may influence labour supply. It is thus difficult to conclude on the true elasticity of these taxpayers to taxation. Our results only suggest that these taxpayers are probably not very sensitive to income taxation through the French income tax, which is strongly progressive and does not truly concern middle income taxpayers. As shown in figure1, the average income tax rate in France for these taxpayers is inferior to 4.5%. However, it appears clearly that richer taxpayers, those belonging to the P80-P100 and to the upper decile of broad income[5], tend to react more sharply to taxation than middle income taxpayers. Most of the elasticity of taxable income is therefore driven by top income responses. This is in some sense the result of the strong progressivity of the French income tax scheme.

The second source of heterogeneity among taxpayers is the type of income that they earn. Pension earners, who stand for approximately 30% of the whole population of taxpayers, have very few means of adapting the level of their pension to short term tax changes. This is the reason why elasticity estimated excluding pension earners is stronger than elasticity estimated on the whole population of taxpayers. We reported in table 3 these two elasticities calculated on taxpayers with income superior to P50 (taxpayers with lower incomes being not responsive to taxation). Excluding pension earners from the sample increases slightly the elasticity of taxable income from .09 to .12. Nevertheless, this difference is rather small, and does not alter the broad picture of a low level of taxable income elasticity among all taxpayers in France. The reason is that pension earners are quite scarce among top incomes whose responses to tax changes primarily drive our baseline result. The second source of heterogeneity due to income type concerns self-employed vs wage earners. Self-employed individuals have greater opportunities to react to short-term tax changes because they have a greater control on their reported income. We focus on this issue in section 3.

[5]Income groups are defined according to initial (year $n-1$ broad income. Note that we cannot display results broken down for higher income groups with our baseline estimation technique because cross-sections are sampled according to year n income, and not according to year $n-1$ income.

Table 3: ***2SLS estimates: Heterogeneity of the elasticity of taxable income***

	elasticity est.	std
by INCOME GROUPS		
P30-80	-0,420	*0,0149*
P80-100	0,235	*0,0124*
P90-100	0,272	*0,0145*
by INCOME TYPE Taxpayers with income>P50		
with pension earners	0,097	*0,0103*
without pension earners	0,121	*0,0126*
by MARITAL STATUS Taxpayers with income>P50		
married	0,158	*0,0111*
single and divorced	-0,058	*0,0237*

Notes: Regression are weighted by income

Finally, heterogeneity may arise from marital status. In France, taxation is made at the household level, so that the response of taxable income includes the response of two individuals in the case of a married couple, while it only concerns one individual in the case a single or divorced taxpayer. There is little reason why these two type of responses may be equivalent. We display in table 3 the elasticity for married couples and for single or divorced taxpayers, among the top 50% of taxpayers. Married couples tend to react strongly (with an estimated elasticity around .15), while single taxpayers appear almost insensitive to tax rate changes. We implicitly consider here a unitary model of the family to compute this elasticity for married couples. But there are strong reasons to believe that the higher elasticity for couples is due to the fact that family taxation imposes heavy marginal tax rates on second-earners. So that a collective model of the family would be needed to disentangle more accurately the elasticity for the first and for the second earner in the family. And indeed, we believe that this result may very probably hide a discrepancy between a very high elasticity for the second-earner, and a relatively low elasticity of taxable income for the first income earner[6].

2.3 Controlling for time-varying income distribution changes

Our specification includes a certain number of controls for variations in the income distribution. However, we first made the assumption that these variations were constant over time. There may be reasons to believe that the way that income distribution varies is not the same over time. Figure 3 in the next section show for instance that the evolution of top incomes between 1998 and 2006 has clearly been threefold. This is the reason why we allow in this section for our income distribution controls to vary over time. Of course a complete interaction of all our income controls with year dummies will destroy identification, so that we can only interact time and income controls in some limited way.

We first display the estimation of a specification where the log of first period income is interacted with 3 time period dummies corresponding with the threefold evolution of the income distribution visible in figure 3. We then show the result of a model interacting our 15-piece spline of the log of first period income with a time trend. Table 4 summarizes the results. Our baseline result, that of a taxable income elasticity close to .05, appears robust to the introduction of these controls.

[6] See for instance Blundell & MaCurdy (1999).

Table 4: ***2SLS estimates: controls for non-constant variations of the income distribution over time***

	Model: 3 time period dummies interacted with logz		Model: 15 log(income) piece spline interacted with time trend	
variable	Estimate	StdErr	Estimate	StdErr
elasticity	**0,067**	***0,009***	**0,066**	***0,009***
net income effect	0,013	*0,001*	0,009	*0,001*
logz*time1	-0,190	*0,001*		
logz*time2	-0,206	*0,001*		
logz*time3	-0,183	*0,001*		
inc. gr.1*time trend			*ref*	*ref*
inc. gr.2*time trend			-8,4E-05	*9,3E-07*
inc. gr.3*time trend			-8,4E-05	*8,9E-07*
inc. gr.4*time trend			-8,3E-05	*8,7E-07*
inc. gr.5*time trend			-8,2E-05	*8,5E-07*
inc. gr.6*time trend			-8,0E-05	*8,3E-07*
inc. gr.7*time trend			-8,0E-05	*8,1E-07*
inc. gr.8*time trend			-7,8E-05	*7,9E-07*
inc. gr.9*time trend			-7,6E-05	*7,6E-07*
inc. gr.10*time trend			-7,4E-05	*7,3E-07*
inc. gr.11*time trend			-7,2E-05	*7,0E-07*
inc. gr.12*time trend			-7,1E-05	*6,8E-07*
inc. gr.13*time trend			-7,0E-05	*6,5E-07*
inc. gr.14*time trend			-7,4E-05	*5,9E-07*
Income group dummies	YES		NO	
Control for marital status	YES		YES	

Notes: Regression are weighted by income

3 The elasticity of taxable income among top incomes

Our baseline estimates along with previous studies show that the elasticity of taxable income is primarily driven by top incomes responses. In this section, we take advantage of the quality of our dataset to further investigate the problem of the elasticity of top incomes to taxation. We explain how we constructed an exhaustive panel of the top .1% of richest taxpayers in France, and then present our empirical strategy, which is slightly different from that of our baseline estimates. Finally, we present our results.

3.1 Data: Exhaustive panel of the richest taxpayers

The samples of the tax administration provide with exhaustive sampling at the upper-end of the income distribution. Very rich taxpayers whose taxable income is greater than 175,000 euros are present every year in the sample. Based on variables which clearly identify taxpayers every year (taxable income of year $n-1$, marital status of year $n-1$, date of birth of household head and date of birth of dependants), taxpayers with taxable income above the threshold for consecutive years can be identified and matched in order to construct an exhaustive panel of taxpayers belonging to the P99.9-P100 fractile. Practically, if a taxpayer has a taxable income in year n that is above the threshold, her probability of being sampled is one, so that she enters our panel. If her taxable income in year $n+1$ is still above the threshold, then she remains in the panel. If to the contrary her taxable income is below the threshold, then we know with certainty that her taxable income in period $n+1$ is below the threshold, so that Δz is left-censored. We show that this censoring limitation of our panel data can be dealt with to estimate the elasticity of top income to taxation in the next subsection.

Our panel gives us the opportunity to investigate in depth the problem of the elasticity of top incomes to taxation. First, because we get the exhaustive responses of all taxpayers belonging to the top .1% of the income distribution, a part of the distribution whose responses are critical for tax policies. Second, because contrary to the whole sample, our panel structure for top incomes gives us the opportunity to enlarge the time-span (and look at longer-run responses) and to estimate broad income elasticities in addition to taxable income elasticities.

3.2 Empirical strategy: censored quantile regressions

The estimation faces two issues. First, the censoring problem on Δz. Second, the fact that all taxpayers in the panel face the same top marginal income tax rate, and therefore have the same variations in $\Delta ln(1-t)$ for a given year.

Taxpayers with low taxable income in period $n+1$ tend to disappear from our panel. Indeed, the probability of staying in the top .1% income group after 2 years is about 50%. Without controls for this selection, estimated elasticities will overestimate substantially the true response of top incomes. Indeed, the selection is nothing but a censoring mechanism on the variable Δz, with the censoring point on Δz being conditional on first period income z_0. To deal with censoring with minimal assumptions on the distribution of the error term, we use a censored quantile regression technique proposed by Buchinsky and Hahn.

The functioning of this estimator can be summarized briefly as follows. We start from the censored model

$$Y_i^* = X_i'\beta_\theta + \varepsilon_{i\theta}$$

$X_i'\beta_\theta$ is the θ-th conditional quantile of Y_i^* given X_i. Because of left-censoring, we only observe:

$$\begin{cases} Y_i = Y^* & \text{if } Y_i^* > C_i(X_i) \\ Y_i = 0 & \text{if } Y_i^* \leq C_i(X_i) \end{cases}$$

We define $h_0(x) = Pr[Y^* > C|X_i = x]$. Then the conditional probability that $Y^* < X_i'\beta_\theta$ given $Y_i^* > C_i$ and $h_0(x) > 1-\theta$ is :

$$\pi_\theta(X_i) = \frac{h_0(X_i) - (1-\theta)}{h_0(X_i)}$$

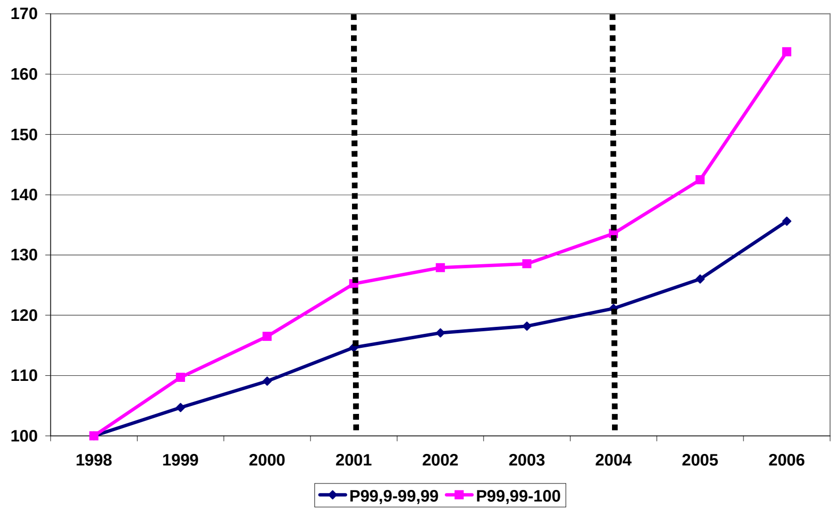
This means that $X_i'\beta_\theta$ is the π_θ-th quantile of Y_i, conditional on $Y_i^* > C_i$ and $h_0(x) > 1-\theta$. With a first step estimation of the probability of not being censored $\hat{h_0}(.)$, an estimator of the parameter β_θ is provided by:

$$\hat{\beta}_\theta = argmin_\beta[\frac{1}{n}\sum \hat{\pi}_\theta(X_i)(Y_i - X_i'\beta)^+ + (1-\hat{\pi}_\theta(X_i))(Y_i - X_i'\beta)^-]$$

on the population with $\hat{\pi}_\theta(X_i) > 0$ (the population for which the estimated probability of being censored is superior to $1-\theta$), and where the $a^+ \equiv \max\{a, 0\}$ and $a^- \equiv \max\{-a, 0\}$.

The second issue when estimating elasticities of income with respect to tax rates for our panel of top incomes is that almost all taxpayers in the panel ($\approx$ 98% every year) face the top marginal tax rate. Estimations of the form 3 are thus not applicable, because year dummies tend to be collinear with the term $\Delta ln(1-t)$, destroying identification.

Figure 3: *Evolution of mean real incomes for the P99.9-100 income group (1998-2006), basis* $= 1998$



SOURCE: Exhaustive tabulations (Etats 1921) and sample of income tax returns. Definition of income excludes realized capital gains.

However, if year dummies cannot be directly introduced in our specification, this does not exclude the possibility of introducing rich time controls. Our strategy therefore consists in replacing year dummies by several time controls. To choose a set of adequate controls, we first display the evolution of incomes in our panel of top income taxpayers. Figure 3 reveals that the evolution of incomes exhibits a clear 3 time period pattern, with income increasing rapidly between 1998 and 2001, then stagnating between 2001 and 2004, and eventually increasing again strongly in 2005 and 2006. We take advantage of this pattern to test different specifications including a 3-piece time trend or 3 period dummies (1998-2001/2002-2004/2005-2006).

Note also that, since all taxpayers now face the same top marginal τ, there is no endogeneity problem. If a taxpayer has an increase in income, there is no risk of an increase in τ' creating a spurious correlation between Δz and τ. Variations in $ln(1-\tau)$ are now directly brought by tax reforms, and instrumentation is no longer necessary.

We must eventually still control for mean reversion and possible underlying trends in the income distribution within top incomes. We control for that in several ways. We introduce the log of period 1 income. We also test a specification with a set of 20 income group dummies. If for instance, incomes among the P99.99-100 income group increase faster than incomes among the P99.9-99.95 income group, then this will be captured by these income group dummies. We also interact time controls with these income controls without loss of robustness.

To summarize, we display in section3.3 the elasticity estimate for 3 specifications. The first specification includes 3-time period dummies and the log of initial income.

$$\begin{aligned} \Delta logz = & -\zeta^c * \Delta ln(1-\tau') + \eta * \Delta ln(z - T(z)) + \gamma log(z_0) \\ & \sum_i \theta_i PERIOD_i + X'\beta + \varepsilon \end{aligned} \tag{4}$$

The second specification includes 3-time period dummies interacted with the log of initial income.

$$\begin{aligned} \Delta logz = & -\zeta^c * \Delta ln(1-\tau') + \eta * \Delta ln(z - T(z)) \\ & \sum_i \theta_i log(z_0) * PERIOD_i + X'\beta + \varepsilon \end{aligned} \tag{5}$$

The third specification includes 3-time period dummies, the log of initial income, and a set of 20 income group dummies among top incomes.

$$\begin{aligned} \Delta logz = & -\zeta^c * \Delta ln(1-\tau') + \eta * \Delta ln(z - T(z)) + \gamma log(z_0) \\ & \sum_i \theta_i * PERIOD_i + \sum_j \mu_j Incomegroup_j + X'\beta + \varepsilon \end{aligned} \tag{6}$$

Controls X include age, marital status, and income type. As mentioned for our baseline estimates, our original specification includes income effects (η), but given that these effects are second-order, we present our results excluding income effects.

3.3 Results

Computation: probit as step 1. Then smoothing algorithm on step 2. Bootstrapped standard errors. Interest of our method: computationally not too heavy and unknown censoring point.

Figure 4 displays 2-step censored quantile regression estimates of the elasticity of top incomes to taxation, according to 3 different specifications. We display the 95% confidence interval of the elasticity estimate for all quantile index between .5 and .95. Panel A presents the result with 3 time period dummies and the log of first period income. Panel B interacts the time controls and the income controls. Panel C adds 20 income group dummies. And Panel D follows the same specification as panel A but the elasticity estimates are income weighted. Results appear very similar across these 4 specifications. The short-run elasticity of taxable income among the top .1% of incomes in France is around .15 and

.2. This level may seem low compared to previous studies that focused on top incomes. Goolsbee (2000) finds a short-term elasticity of 1 for the 1993 tax reform in the US on top compensated corporate executives. In fact, Goolsbee had only one tax change, and showed that the short-term elasticity was primarily driven by the optimization of stock-option exercises between 1992 and 1993. Note however that Goolsbee finds a long-term elasticity of .1, which is very similar to our result. In France, stock-options exercises are considered as capital gains and are subject to a 16% flat tax. There is thus no stock-option optimization in top incomes short-term responses, and we basically exclude capital gains from our definition of taxable income. This may explain why the short-term response of top incomes in France is very comparable to the longer-term elasticity found by Goolsbee. Moreover, the income weighted elasticity is not different from the unweighted elasticity. This suggests that the elasticity is not heterogeneous with respect to income in the panel.

Figure 5 presents the elasticity for self-employed and for earners of all other income types. Top incomes responses appear to be largely driven by the elasticity of self-employed taxpayers. The elasticity of taxable income among self-employed is around .5. For wage earners and capital income earners, the elasticity is around .1 to .15. This reflects the fact that self-employed taxpayers have greater opportunities to control their reported income through short-term optimization with respect to tax changes.

Finally figure 6 displays results for different length of the income "differencing window". Panel A shows the short term elasticity (2-year span) and panel B shows results for a 3-year "differencing window". The longer-term elasticity of top incomes appears to be zero. This may be due to the fact that much of the short-term response was induced by reported income optimization among self-employed. Nevertheless, figure 1 shows that identification for top incomes is largely brought by the 2005 and 2006 tax reform. It is therefore difficult to take properly into account the longer-term response to these 2 tax reforms with data covering years 1998 to 2006.

3.4 Robustness

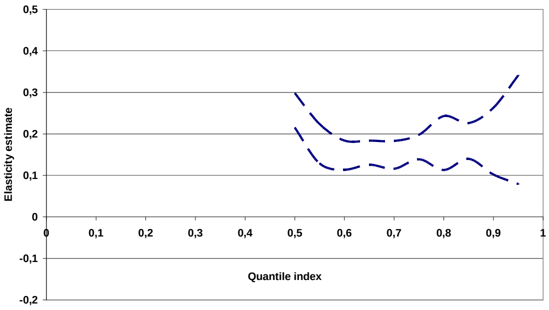
Even though the results displayed in the previous subsection are robust to a wide range of time controls, one could still want to add year dummies to control more accurately for year to year variations in Δz that are uncorrelated with tax changes. To do so, we propose a robustness check based on a specification which is directly derived from our functional form . More precisely, we get from equation (1) that:

$$\Delta z = -\zeta^c z * \Delta ln(1-\tau') + \eta z * \Delta ln(z - T(z)) \tag{7}$$

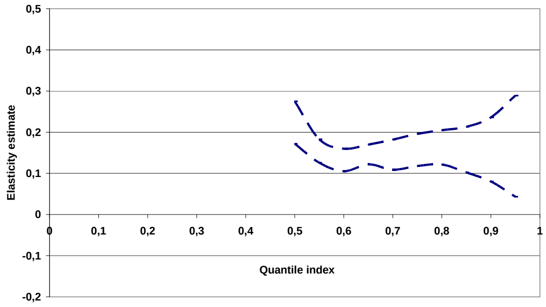
The idea is that $z * \Delta ln(1-\tau')$ now exhibits sufficient variations across taxpayers for a given year to identify the parameter ζ^c in the presence of year dummies. We still control

Figure 4: *2-step censored quantile regression estimates: 95% confidence interval of the elasticity of taxable income of top incomes (P99.9-100)*

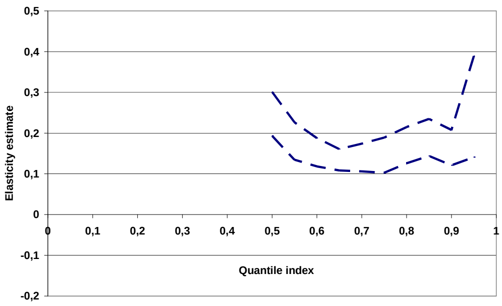
A-3 TIME PERIOD DUMMIES
AND LOGZ



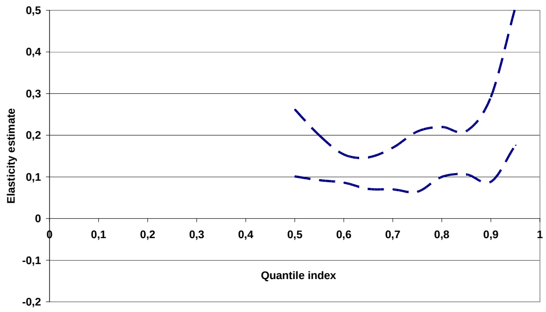
B-3 TIME PERIOD DUMMIES
INTERACTED WITH LOGZ



C-3 TIME PERIOD DUMMIES
LOGZ AND 20 INCOME GROUP DUMMIES



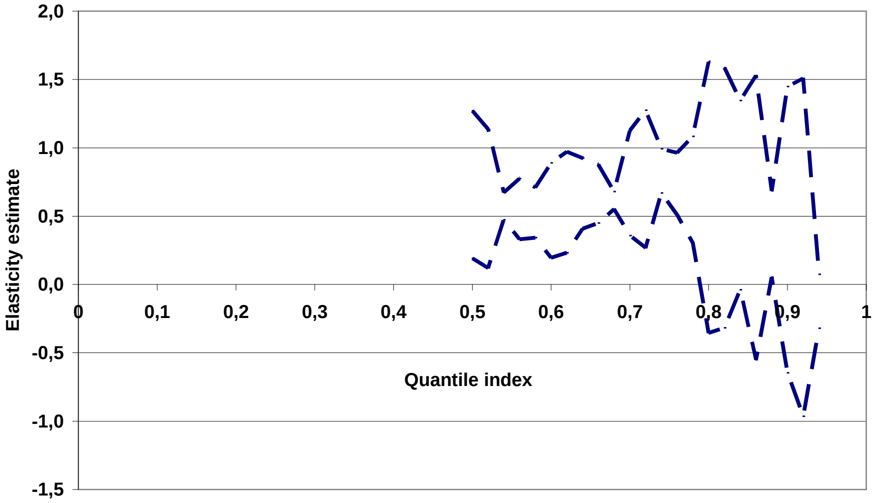
D-3 TIME PERIOD DUMMIES & LOGZ
INCOME WEIGHTED



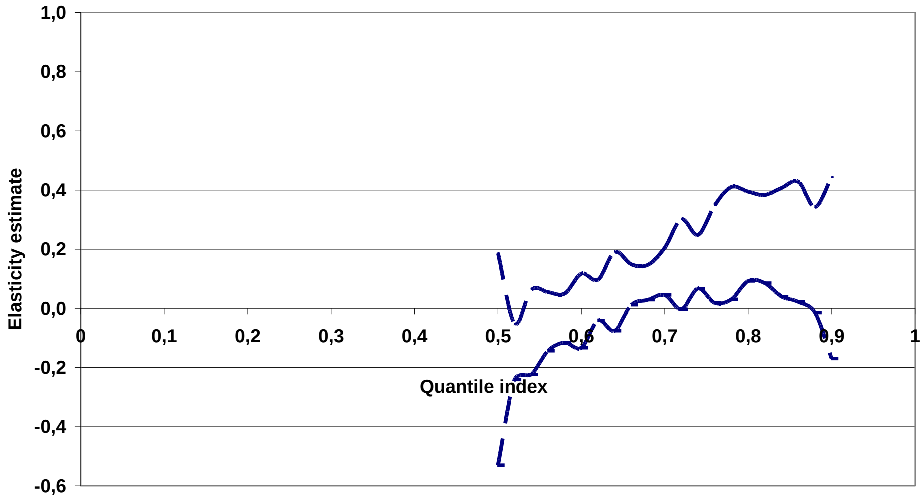
SOURCE: Echantillons Lourds DGI.

Figure 5: *Elasticity of taxable income of top incomes (P99.9-100)* ***by income type****(95% confidence interval)*

A-SELF EMPLOYED



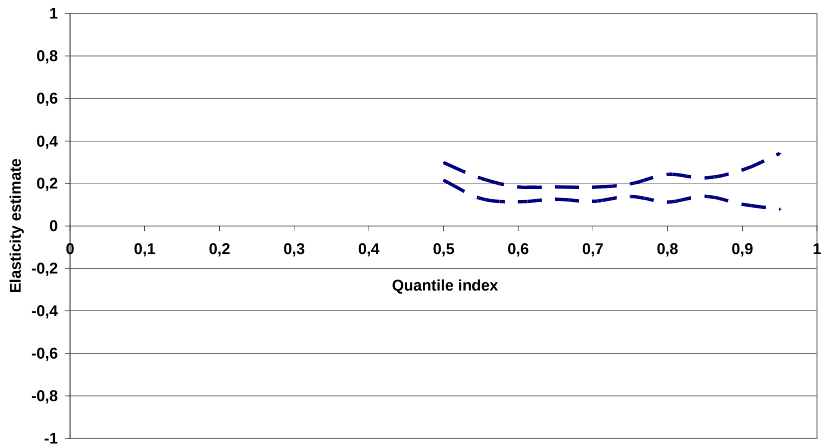
B-WAGE EARNERS AND CAPITAL INCOME EARNERS



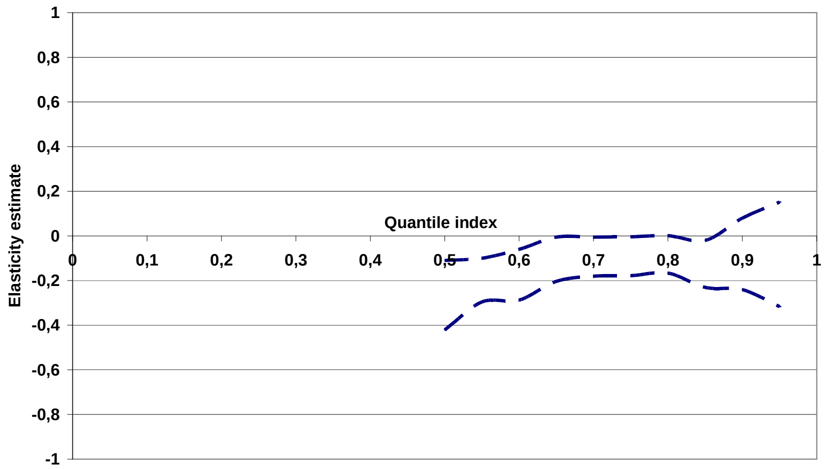
SOURCE: Echantillons Lourds DGI. 2-step censored quantile regression estimates.

Figure 6: *Elasticity of taxable income of top incomes (P99.9-100)* ***by length of the time differencing window****(95% confidence interval)*

A-2 YEARS



B-3 YEARS

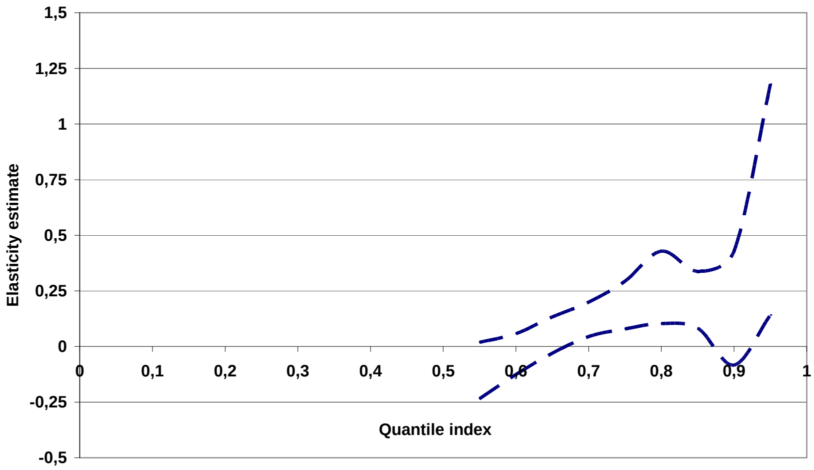


SOURCE: Echantillons Lourds DGI. 2-step censored quantile regression estimates.

for mean reversion and possible underlying trends in the income distribution within top incomes by introducing the log of period 1 income and a set of 20 income group dummies. The model that we estimate is as follows:

$$\Delta z = -\zeta^c * z * \Delta ln(1-\tau') + \eta * z * \Delta ln(z - T(z)) + \gamma log(z_0) \\ \sum_i \theta_i YEAR_i + \sum_j \mu_j Incomegroup_j + X'\beta + \varepsilon \tag{8}$$

Figure 7: *95% confidence interval of the elasticity of taxable income of top incomes (P99.9-100): Robustness estimate, specification with year dummies and dependant variable=Δz*



SOURCE: Echantillons Lourds DGI.

Figure 7 presents the elasticity estimates for this new specification. The results are very similar to those displayed in figure 4. The elasticity of taxable income among top incomes appears to be around .15 to .2. This confirms that our estimates are robust to a very wide set of specifications and time/income controls.

4 Implications for the optimal taxation of top incomes in France

The elasticity of taxable income is a key parameter to derive optimal tax policies. In this section, we discuss the issue of optimal taxation of top incomes, taking advantage of the estimates of the previous section to assess the relevance of further tax reforms on top incomes tax rates. We demonstrate that the deadweight loss of taxing top incomes in France may be substantially smaller than commonly thought, and that under some credible assumptions on the redistributive tastes of the government, top optimal income tax rate could be as high as 45 to 50%.

Deadweight loss of income taxation

As pointed out by Feldstein (1999), the elasticity of reported taxable income is a key parameter to tax policies because it can provide with easy calculations of the deadweight loss of income taxation in the presence of tax avoidance or tax evasion. The underlying idea can be easily summarized as follows[7]. Imagine that individuals can consume some composite good e that is deductible from the tax base. A can be simple tax avoidance (legal deductions), but it can also represent some tax evasion. This activity has a cost for individuals, so that the program of the taxpayer is $u(c,z,A) = c - \psi(z) - g(A)$ subject to budget constraint$c = R + (1-t)(z-A) + A$. The quasi-linear utility function has the advantage that the indirect utility function is a money metric. Welfare is then defined as the sum of the indirect utility of taxpayers and of tax revenues.

$$W = \{u(c^*,z^*,A^*)\} + t(z-A) = \{R + (1-t)(z^* - A^*) + A^* - \psi(z^*) - g(A^*)\} + t(z-A)$$

Given the enveloppe theorem, the effect of a change in the tax rate has only first-order effect on the utility of the taxpayer, so that:

$$\frac{dW}{dt} = -(z-A) + (z-A) + t\frac{d(z-A)}{dt} = t\frac{d(\text{taxable income})}{dt}$$

In this framework, the elasticity of taxable income is a sufficient statistic to compute deadweight loss because the implicit price of additional earning (z) or of additional avoidance (A) is the same and is equal to $1-t$. Following this approach, and using Feldstein's formula with our estimated elasticity of .15 on top incomes, we can calculate that the marginal cost of public fund levied on top incomes in France (the deadweight loss per dollar of additional tax revenue raised on top incomes) is .11, which is rather small compared to Feldstein's figures.

Besides, Feldstein's calculations rely on the assumption that all the costs of tax avoidance are lost for social welfare. But in fact, part of these costs does not reduce total surplus because they are transfers to other agents in the economy (deductible investments in SMEs for instance), or because they are shifts to other tax bases (as is very probably the case for self-employed taxpayers). Slemrod (1998), Saez (2004) or Chetty (2008) all

[7] We use in this subsection the comprehensive framework of Chetty (2008).

provide evidence that the deadweight loss of taxation for top income could be small if resource costs of sheltering are smaller than top marginal tax rate, even if taxable income is very elastic to taxation. This means that the marginal cost of public funds levied on top income taxpayers could be in fact rather small.

High Income Optimal Tax Rate

Our estimates of top incomes elasticity give us the opportunity to go one step further than deadweight loss analysis, and we study in this subsection the issue of optimal tax rates applicable to high income earners in France, following the seminal work of Saez (2001). We focus on the case of an optimal income tax, with no commodity taxation on C.

We consider that the government wants to set a constant top marginal tax rate τ for all top income taxpayers above a level of income $\bar{z}$. To derive the optimal τ, it is necessary to take three effects into account.

- The first one is a mechanical **effect on tax revenues**, when all behavioral responses are let aside. Increasing τ by $d\tau$ leads to levy $(z-\bar{z})d\tau$ on all taxpayers. If we normalize the population above $\bar{z}$ to one and we denote the mean of incomes above $\bar{z}$ by z_M , then total tax revenues increase by:

$$T = (z_M - \bar{z})d\tau$$

- The second effect consists in the **behavioral response**. As shown in in Saez (2001), taxpayers will change their earnings by:

$$dz = -(\zeta^u z - \eta\bar{z})\frac{d\tau}{1-\tau}$$

  Tax revenues will therefore decrease by τdz summed on the whole population of top incomes. Calling $\bar{\zeta^u}$ the weighted average of the elasticity and $\bar{\eta}$ the average income effect, we get that behavioral responses decrease tax revenues by:

$$R = -(\bar{\zeta^u} z_M - \bar{\eta}\bar{z})\frac{\tau d\tau}{1-\tau}$$

- The third effect is the **welfare effect**, which depends on the function $\Psi(.)$ which weights the utility of taxpayers summarizing the redistributive tastes of the government. We denote the social weights of taxpayers by $\bar{g}$ which is equal to $\frac{\int_{\bar{z}}^{\infty}\psi'(u)dz}{\int_0^{\infty}\psi'(u)dz}$, and stands for the ratio of social marginal utility for the Rich to the marginal value of public funds. Given the enveloppe theorem, Saez shows that the loss in utility due to the tax change for a rich taxpayer is $u_c(-zd\tau + dR) = -u_c(z-\bar{z})d\tau$. And total welfare loss on rich taxpayers is then $\bar{g}(z_M - \bar{z})d\tau = \bar{g} * T$

At the optimum, the sum of the 3 effects described above is zero, so that the optimal rate verifies:

$$\frac{\tau}{1-\tau} = \frac{(1-\bar{g})(z_M/\bar{z}-1)}{\bar{\zeta^u} z_M/\bar{z} - \bar{\eta}}$$

The interest of this set-up, proposed by Saez is to illustrate the link between the optimal top marginal tax rate and the ratio $z_M/\bar{z}$, which depends on the shape of the earnings distribution. The optimal rate is an increasing function of $z_M/\bar{z}$. In this setting, the zero tax rate at the top appears to be a special case applicable only when the income distribution is bounded (and therefore $z_M/\bar{z} = 1$ for the highest income earner). In practice, it is well-known that the upper-end of the income distribution is well approximated by Pareto distributions, which have the characteristic of exhibiting a constant ratio $z_M/\bar{z}$. To be more specific, Pareto distributions have cumulative distribution function F of the form

$$1 - F(z) = (k/z)^a \ \ (k > 0,\ a > 1)$$

so that,

$$\forall \bar{z}, \int_{z>\bar{z}} z f(z) dz / \int_{z>\bar{z}} f(z) dz = \frac{az}{a-1}$$

$z_M/\bar{z}$ is therefore equal to a constant $b = a/(a-1)$.

We display in figure 8 the ratio $z_M/\bar{z}$ for the distribution of taxable income and the distribution of broad income in France for year 2006. As we can see, for incomes above 100,000 euros, the ratio $z_M/\bar{z}$ is constant and a little inferior to 2, between 1.8 and 2. This suggests that the distribution of top incomes in France can be well approximated by a Pareto law of parameter $2.25 \leq a \leq 2$. Interestingly, the Pareto parameter a is a little superior in France to the level found by Saez (2001) in the US, which means that the thinness of the distribution at the upper-end is a little higher in France than it is in the US. The value of this parameter is critical because, given the Pareto shape of the income distribution and following Saez, the optimal top tax rate formula can be rewritten as:

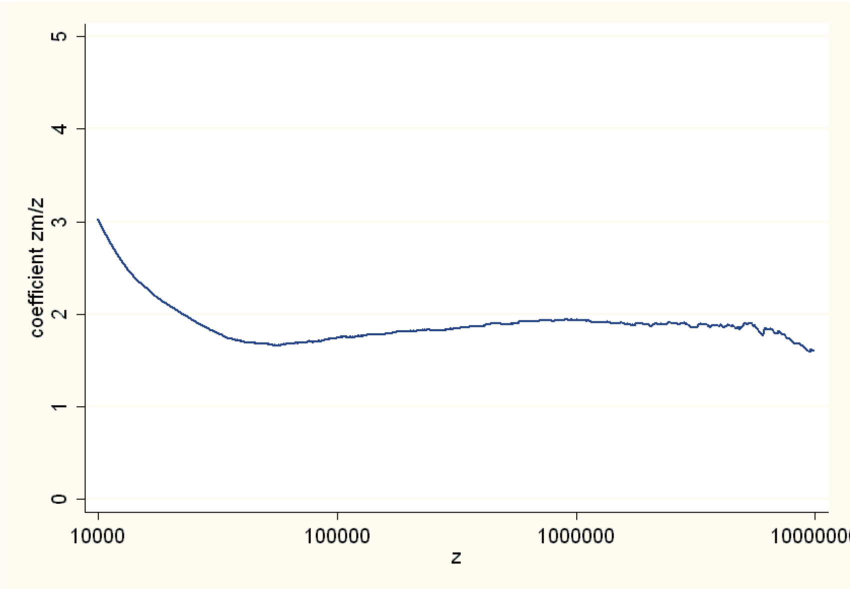
$$\tau = \frac{1-\bar{g}}{1-\bar{g}+\bar{\zeta}^u+\bar{\zeta}^c(a-1)}$$

This means that the top rate depends negatively of a.

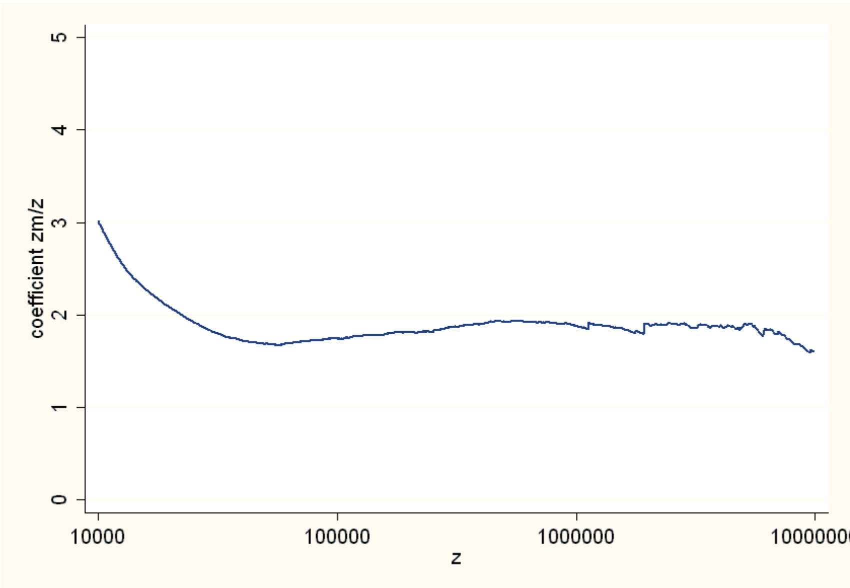
Table 5 displays the value of this optimal top tax rate in France for different values of the parameter of interest $\bar{g}, \bar{\zeta}^u, \bar{\zeta}^c$. We focus on two possible values of the social weight of the Rich. $\bar{g} = 0$ corresponds to a Rawlsian criterium, where the marginal utility of the Rich does not count in the social welfare function, so that the tax rate derived is a revenue maximizing tax rate. We then show the value of the optimal top tax rate for $\bar{g} = 0.5$ which corresponds to a strongly regressive welfare function, where the marginal

Figure 8: *The Pareto shape of the income distribution: Ratio mean income above z divided by z in France (2006)*

A-TAXABLE INCOME



B-BROAD INCOME



SOURCE: Echantillons Lourds DGI. Broad income is defined as total reported market incomes excluding realized capital gains. Taxable income is defined according to 2006 tax law (excluding "*avoir fiscal*" and excluding the 20% deduction on wages.

utility of the top .1% of taxpayers accounts for half of the total social marginal utility. Concerning elasticities, our baseline scenario, derived from our elasticity estimate is for an uncompensated elasticity of .15 and a compensated elasticity also equal to .15. In this case, the revenue maximizing top tax rate is around .75 to .8 depending on the value of the Pareto parameter. This demonstrates that the top marginal tax rate of 40% in France is not too close to the top of the Laffer curve.

5 Conclusions

This paper focuses on the estimation of the elasticity of taxable income with respect to taxation in France. We have identified the effect of taxation using three important tax reforms between 1998 and 2006 on data coming from a sample of tax forms oversampling rich taxpayers. Using Gruber & Saez's framework to control for endogeneity, mean reversion and underlying trends in the income distribution we have showed that the overall short-term elasticity of taxable income is weak, around .05 and is largely driven by top income responses, due to the important progressivity of the French income tax scheme. Then, we have proposed a two-step censored quantile regression technique *à la* Buchinsky and Hahn to estimate the elasticity of top incomes using an exhaustive panel of top .1% income earners. Our results demonstrate that short-run responses to taxation are quite small among French top incomes, and primarily driven by independent or self-employed taxpayers. This suggests that the deadweight loss of taxing the rich may not be that high in France.

Table 5: *Optimal tax rates for top incomes in France: simulations derived from our elasticity estimates*

		Uncompensated elasticity 0,05			**Uncompensated elasticity** 0,15			**Uncompensated elasticity** 0,3		
		Comp. elasticity			**Comp. elasticity**			**Comp. elasticity**		
		0,05	0,1	0,15	0,15	0,2	0,25	0,3	0,4	0,5
Social Weight of the Rich $\bar{g}$=0										
	2,25	0,90	0,85	0,81	0,75	0,71	0,68	0,60	0,56	0,52
Pareto parameter	2	0,91	0,87	0,83	0,77	0,74	0,71	0,63	0,59	0,56
	1,8	0,92	0,88	0,85	0,79	0,76	0,74	0,65	0,62	0,59
Social Weight of the Rich $\bar{g}$=0.5										
	2,25	0,82	0,74	0,68	0,60	0,56	0,52	0,43	0,38	0,35
Pareto parameter	2,1	0,83	0,76	0,70	0,61	0,57	0,54	0,44	0,40	0,37
	2	0,83	0,77	0,71	0,63	0,59	0,56	0,45	0,42	0,38

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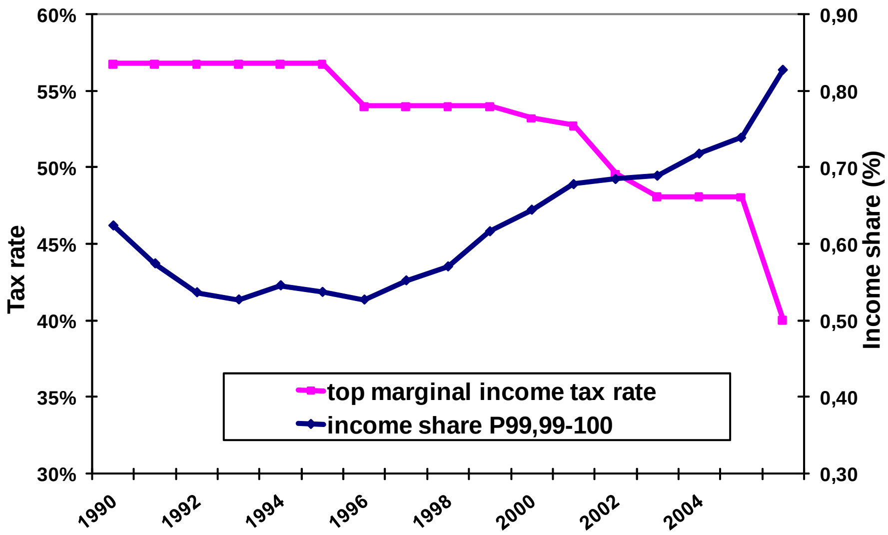
Figure 9: *Evolution of top marginal income tax rate and income share of P99.99-100 (France 1998-2006)*



SOURCE: Echantillons Lourds DGI. Income groups are computed according to broad income (total reported market incomes excluding realized capital gains).

Figure 10: *Evolution of marginal net of tax share and of taxable income: example of P99-100 vs P90-95 income group (France 1998-2006)*

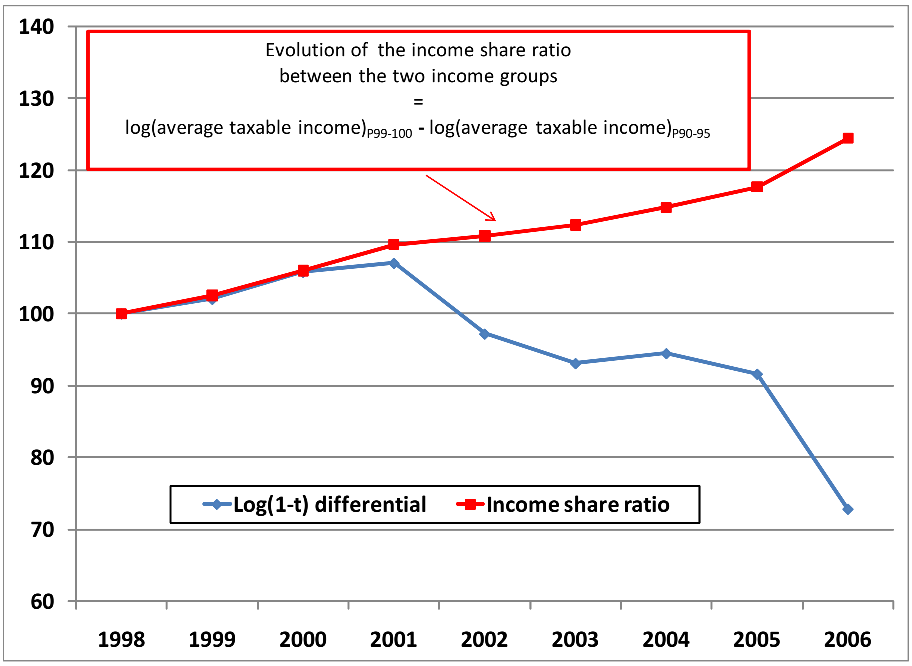


Figure 11: *Identification: Dividend tax reform (1)*

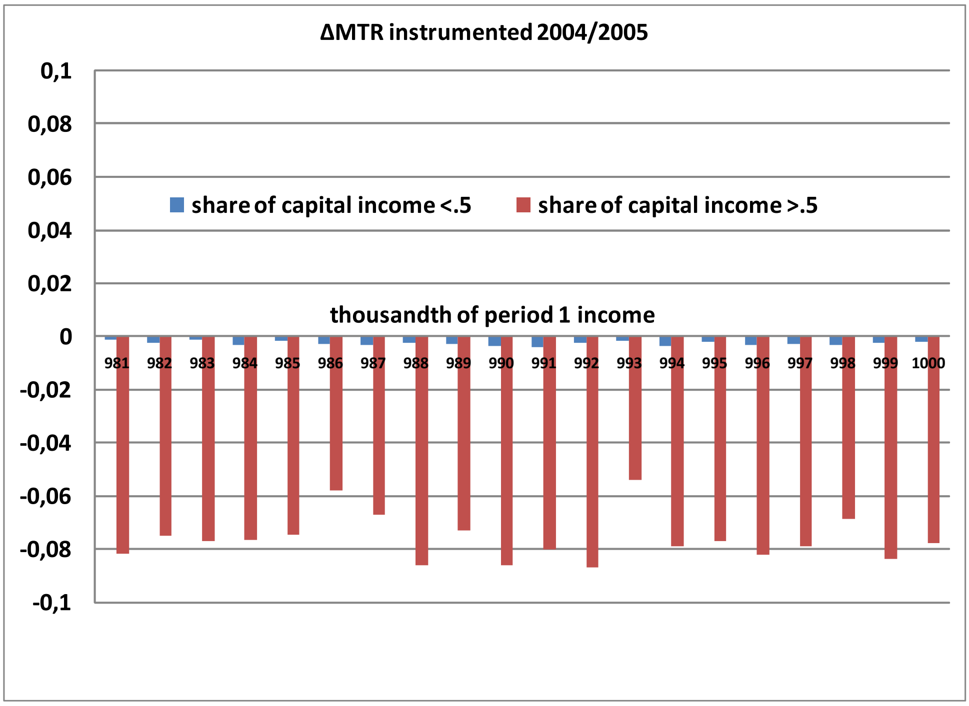


Figure 12: *Identification: Dividend tax reform (2)*

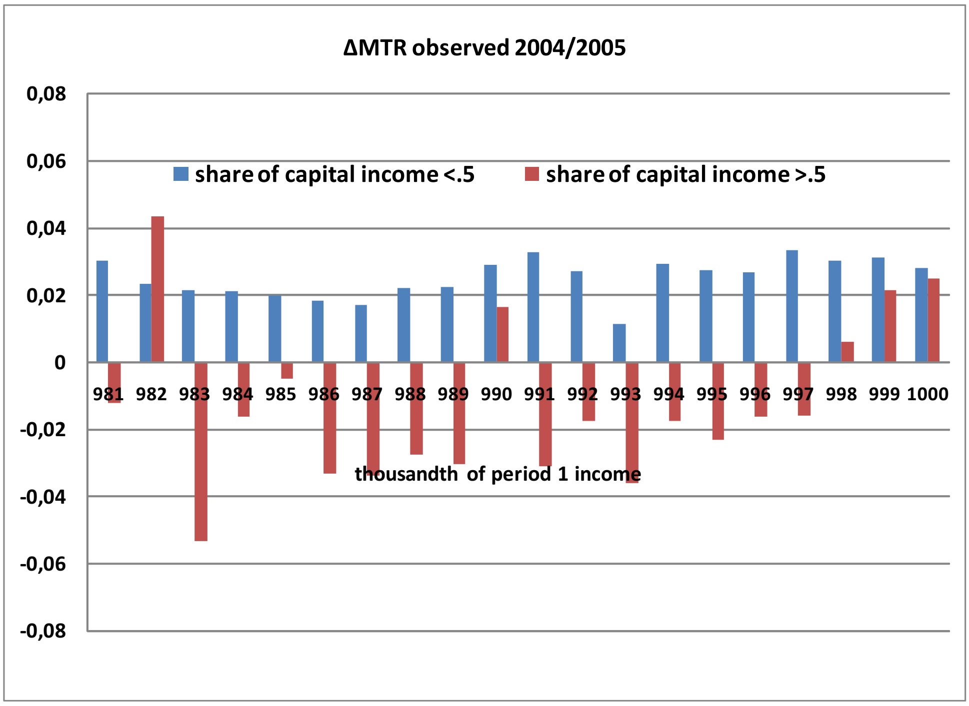


Figure 13: *Identification: Dividend tax reform (3)*