Are Fiscal Incentives Towards Charitable Giving Efficient? Evidence from France

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Abstract

This paper proposes new estimations of price and income elasticities of charitable contributions that avoid the usual empirical pitfalls (simultaneity and endogeneity of price and income variations) encountered in previous literature, by focusing on the French tax reduction system, where every taxpayer gets the same reduction rate whatever its income or the level of its gift may be. We use time variations of the reduction rate in order to identify the elasticity of charitable giving to tax incentives on data coming from a unique sample of the French Fiscal Administration with more than 500,000 taxpayers every year. Our estimation technique investigates distributional effects using the three-step censored quantile regression estimator proposed by Chernozhukov and Hong (2002) which deals with heavy censoring with minimal assumptions. Our results demonstrate that the elasticity of charitable giving with respect to tax subsidy is weaker than previously found, and is also strongly heterogenous, in particular with the level of income. This suggests that a tax subsidy scheme varying with income might be more efficient than a unique reduction rate for all taxpayers.

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Introduction

In many countries, charitable contributions benefit from a favorable tax treatment that may take the form of a deduction from taxable income or of a direct tax reduction. Assessing the efficiency of these tax treatments is critical: in France, as in the US, the social benefits of charitable contributions in several fields like education (universities), research, culture and fine arts, are extensively acknowledged. Compared to the US, France has been suffering from a very low level of private gifts: expressed in percentage of GDP, charitable contributions reported in tax files in France are ten times weaker than those reported by US taxpayers [2]. This striking weakness of charitable contributions in France explains the implementation of several reforms to increase fiscal incentives to give to charities. Table 1 gives a comparison of fiscal incentives towards philanthropy in several developed countries and shows that the actual French system now stands out as the most generous schedule. The reduction rate of 66% is not only the highest rate, but it is also higher than the marginal tax rate for the higher tax bracket in any other country. This implies that any other incentive system working as a deduction from taxable income (US, UK, etc.) is necessarily less generous than the French fiscal system. This generosity of the French system results from several reforms that took place during the last fifteen years and that have dramatically increased the reduction rate. These reforms provide us with an exogenous change in the subsidy rate of charitable contributions that can be exploited as a natural experiment to estimate the efficiency of charitable contributions. The efficiency of fiscal incentives toward charitable giving is indeed still debated and the empirical studies have so far produced mixed results. Given the strong effort made towards charitable contributions through fiscal incentives, it is of particular importance to evaluate the efficiency of these fiscal measures, from a public policy point of view. Are fiscal incentives the solution to foster in Europe the same benefits of private contributions that the US have experienced?

In order to estimate the efficiency of fiscal incentives as a way of boosting private philanthropy, empirical papers have focused on the estimation of the “price” elasticity of charitable contributions. Early studies (like Feldstein & Taylor, (1976) [14]) used cross section data to estimate both price and income elasticities of charitable giving. They found that the elasticity of giving with respect to the tax-defined price was greater than one in absolute value. However, studies on panel data (like those of Randolph (1995) [19], Barett & al (1997) [6], or Bakija (2000) [4]) have called into questions these estimates, arguing that they failed to distinguish between the transitory changes in prices caused by fluctuations in income and the permanent

[2] See 11 in Appendix. Appendix A also gives precise explanations of the construction of homogenous series of charitable giving in US and UK and details on the fiscal treatment of charitable contributions in the US and UK.

Table 1: *Comparison of fiscal incentives towards charitable contributions in different countries (2006)*

Deduction from taxable income	Tax reduction	No incentive
Australia	Canada (*29%*)	Austria
Belgium	**France (*66%*)**	Finland
Denmark	Italy (*19%*)	Sweden
Germany	New Zealand (*33%*)	
Greece	Portugal (*25%*)	
Ireland	Spain (*25%*)	
Japan		
Netherlands		
Norway		
Switzerland		
UK		
USA		

Source :Roodman & Standley

changes in prices. Indeed, when decomposing income and prices in transitory and permanent components, they found much lower estimates of the elasticity of giving to the permanent price of giving. These results suggest that taxpayers are highly responsive to transitory changes in the tax schedule, but much less to permanent changes, and that they tend to increase their gifts when they face higher transitory tax rates. The critical step in these estimates is the measurement of the permanent and transitory components of income. Auten, Sieg and Clotfelter(2003,[3]) have criticized the way previous studies had separated the permanent component of income from the transitory component. They argue that the typical method that consists in approximating the permanent income by an average of incomes in two or more years, might not yield reliable decomposition. Instead they propose a way to estimate the transitory and permanent parameters without decomposing income and price for every single individual, but by working on the variance-covariance matrix of income and prices[3]. Their estimates of the permanent price elasticity range between -0.79 and -1.26. These estimates are larger in absolute values than the previous estimates on panel data that range between -0.3 and -0.5. The estimates of the transitory price elasticity range between -0.40 and -0.61 and are, on the con-

[3] The main idea is that a permanent shock on income will affect all the succeeding periods, and hence cause changes in the variance of the growth rate of income, but not in its autocovariance, whereas a transitory shock will affect both the covariance and the autocovariance of the growth rate.

trary, lower in absolute value than those found in previous studies (all above 1 in absolute value). In particular, Randolph (1995), working on the same dataset as Auten & al., but with a more flexible specification using an "Almost Ideal Demand system" framework[4], had found a permanent price elasticity of -0.5 and -1.5 for the transitory price elasticity.

Some papers also recently focused on matching subsidies, as a special type of incentive to give. Karlan and List (2007, [16]) find in a natural field experiment, that matching subsidies have a large effect on donations, but that larger match ratio ($3:$1 or $2:$1) do not have a bigger impact than a smaller ratio of $1:$1. Although a tax deduction of rate t is equivalent, for taxpayers, to a matching subsidy of rate $m = t/(1-t)$, Eckel and Grossman (2003, [11]) show that, in a laboratory experiment, gifts are significantly higher with matching subsidies than with rebates. Falk (2007, [12]) also finds in a natural field experiment that sollicitations containing gifts (*i.e.* greeting cards) yields a large increase in the probability of giving.

Overall, the results for tax incentives are so far mixed. In this debate, much of the problem comes from the difficulty to disentangle transitory and permanent changes in prices in the US tax system, where the fiscal system towards charitable contribution is a tax deduction from taxable income. In such a system, the "price" of a gift varies with the marginal tax rate and transitory changes in income affect the price of charitable giving through changes in the marginal tax rate, causing a severe simultaneity problem for econometric analysis. As a result, the estimated elasticities of gifts with respect to price and income are dependant from the methods used to disentangle permanent from transitory changes. Estimates also suffer from a endogeneity concerns: taxpayers could tend to give more in order to fall in a lower tax-bracket. Working on French data helps us to avoid this problem, since the French system towards gifts is not a deduction from taxable income, but a tax reduction, which means that every taxpayer gets the same reduction rate t. Therefore, as long as households pay income taxes, they do not face transitory changes in the price of giving, but only permanent changes due to reforms in tax incentives.

In this paper, we use the 2003 and 2005 reforms, which increased tax reductions towards charitable contributions in France from 50% to 66%[5], as a pseudo-natural experiment framework to estimate the price and income elasticities of gifts. The French tax system, working as a tax reduction and not a deduction from taxable income gives us the opportunity to keep clear of usual empirical drawbacks encoun-

[4]This specification adopted by Randolph, following the seminal work of Deaton & Muellbauer (1980), allows elasticity to vary across price and income

[5]The first increase from 50% to 60% took place in 2003 and the further increase from 60% to 66% in 2005.

tered in previous literature. Moreover, we use a unique sample of 500,000 French taxpayers every year, between 1998 and 2006, which allows us to consider the whole distribution of households and not only itemizers, as the literature focusing on US data does. This unique data set and our estimation technique based on quantile regression estimators also enable us to look for the heterogeneity of responses among the distributions of income and gifts, a point on which little has been achieved in previous studies. Finally, we use the three-step censored quantile regression estimator proposed by Chernozhukov and Hong to treat the problem of censoring that has never been raised yet for the estimation of giving behaviors although it is of crucial importance. This estimator is very convenient for our purpose because it relies on minimal distributional assumptions and allows for possible heteroscedasticity while being easily computable.

Our results show that the overall effect of the reforms has been very small, since the estimated elasticity of gifts with respect to the tax reduction rate is well below the level that would make the actual French level of reduction rate optimal. Nevertheless, our results also point out that the elasticity of gifts to the tax reduction is very heterogenous among taxpayers, according to the level of income. The responsiveness of charitable contributions to tax incentives tends to increase with income. This suggests that an optimal tax scheme should allow the tax reduction to vary according to the level of income.

The paper is organized as follows. In the next section, we present the theoretical framework that we adopt in order to investigate the efficiency of fiscal incentives towards charitable contributions. Then, in section 3, we describe the French tax treatment for charitable contributions, we present our data, and display some descriptive statistics concerning the impact of the reform. We explain our estimation strategy in section 4. Results are presented in section 5 and robustness checks in section 6.

1 Evaluating tax incentives

The theoretical justifications and the optimal design of subsidies to charitable contributions vary with the modeling of philanthropy in itself. Charities have first been modeled as public goods, with donors motivated by purely altruistic considerations. Indeed, charitable services may be considered as public goods even if their recipients are in fact given private goods (such as food, medical care, housing...), if other individuals value theses outcomes in general. In this case, the total amount of charities donated enters in individuals' utilities in the same way as public goods.

However, this model yields very unrealistic predictions[6]. If charities are simply assimilated to public goods, there is perfect crowding out between public spending and private charitable contributions and there is no justification for a specific tax treatment of charitable contributions[7]. The model also predicts that individual contributions asymptotes to zero in large populations. In fact, empirical evidence shows that crowding out is not complete and that individuals donate even if their gifts are very small compared with the size of charitable contributions, suggesting that they benefit from their own voluntary gifts.

In order to take into account this second motivation, models of "warm-glow of giving" include the size of the individual gift in the utility. In these models, a person benefits not only from the total amount of public goods G, but also from her own contribution g. With this warm-glow motive, the crowding out between charitable contributions and government spending is not perfect anymore. Saez [21] and Diamond [10] have investigated the optimal tax treatment of charitable contributions with warm-glow of giving motives[8]. In a non linear taxation model with additively separable preferences, Diamond shows that it might be optimal to finance public good production with a favorable tax treatment of private contributions, setting a higher tax subsidy for higher income individuals. This comes from two effects. Firstly, the incentive compatibility constraint is eased when more productive individuals are incited to donate more with a more favorable tax treatment of their charitable contributions, because these individuals would then suffer from a drop in public good provision if they decided to take a lower paid job. Secondly, some of the costs of the public good provision are now supported by the reduction in consumption of the higher paid individuals.

We follow here another setting, devised by Saez. This set-up is more appropriate to the French fiscal subsidy scheme, because it does not tie the price of charitable contributions to the level of earnings and in particular to the marginal tax rate. It is important to point out that this assumption of independence between earnings and the subsidy rate cannot hold in the model with additive utility function used by Diamond (where earnings are not independent of the price of contributions). Consider a model where individuals derive utility from three goods, private consumption c, earnings z and their own charitable contributions g (the warm-glow motive), plus

[6]For a discussion of the various implications of this model see Andreoni [2].

[7]In a setting where revenue is not sensitive to charitable taxation.

[8]Diamond presents models with and without warm glow, discusses whether the warm-glow motive should be counted in social welfare and concludes against it. The warm glow motive therefore enters the individuals'utility function but not the social welfare function. To the contrary, Saez allows for warm glow motives to be counted in the welfare function.

the aggregate level of charitable contributions G. Individuals therefore maximize:

$$\max \; U(c, g, z, G)$$
$$s.t. \; c + g(1-t) \leq z(1-\tau) + R$$

where t is the subsidy rate (we usually consider that $t > 0$, but do not exclude cases where $t \leq 0$) and τ is the tax rate on earnings that is used to finance a lump-sum transfer R to all individuals and the subsidy on g. The number of individuals is large enough so that G is considered as fixed by individuals when maximizing their utility. The marshallian demand function for charitable contributions is then of the form:

$$g = g(1-\tau, 1-t, R, G)$$

and the indirect utility function is noted:

$$\nu = \nu(1-\tau, 1-t, R, G)$$

If we allow for different utility functions among individuals, and individuals are indexed by i ($i \epsilon I$), then defining the density of individuals over I by f, and normalizing the total population to 1, we have that average contributions of private agents is equal to :

$$G^P = \int g^i f(i) di$$

It is then possible to introduce crowding-out effects: if we consider that the government can contribute directly to the public good by an amount G_0, then $G = G^P + G_0$, and G^P is therefore directly affected by G_0, since G is a component of the marshallian demand function of every individual $g^i(1-\tau, 1-t, R, G)$. To clarify this crowding-out concept, Saez introduces the average private contribution for given tax parameters and a given G_0, noted $\overline{G} = \overline{G}(1-\tau, 1-t, R, G_0)$. The crowding-out effect of increasing G_0 is therefore $\partial\overline{G}/\partial G_0$ which we denote $\overline{G}_{G_0}$ and which is usually considered as negative but superior to -1 (complete crowding out). The government program can then be expressed as the maximization of a social welfare function with respect to the tax rate τ, the subsidy rate t, the lump sum transfer R, and the public contribution G_0:

$$\max W = \int \mu^i \nu^i(1-\tau, 1-t, R, \overline{G} + G_0) f(i) di$$

$$s.t. \; \tau\overline{Z} - t\overline{G} \geq R + G_0$$

where μ^i stands for the redistributive tastes of the government and $\overline{Z}$, exactly like $\overline{G}$, is the average earning for a given level of tax parameters and of public contributions.

It is also very useful to introduce the parameter e representing the social marginal value of contributions in terms of public funds:

$$e = \int \beta^i \frac{\nu_G^i}{\nu_R^i} f(i) di$$

where β^i is the social marginal value of consumption by individual i in terms of public funds, and stands explicitly for the social weight of individual i in the government program[9]. This social marginal value is important since it is in fact this externality that justifies the existence of a subsidy.

In order to derive quantitative tax policy recommandations, Saez shows that in this set-up, it is useful to make three important assumptions:
(i) that there are no income effects on earnings at the individual level,
(ii) that the level of the contributions and that the subsidy rate on charitable contributions do not affect earnings ($\overline{Z}_{G_0} = 0$ and $\overline{Z}_{1-t} = 0$) and
(iii) that the compensated supply of contributions does not depend on the tax rate on earnings (in other words, that contributions are affected by a change in the tax rate on earnings only to the extent that it affects disposable earnings).
The latter two assumptions are indeed implicitly made in the empirical literature on charitable contributions and Saez's model can be used to relate the empirical findings to a more general theoretical framework. Under these assumptions, Saez shows that the optimal subsidy rate is equal to the social external effect of contribution e minus a standard commodity tax component, since g is introduced as a consumption in individual utility functions. Moreover, when we allow for some crowding out by letting the government freely choose a public contribution G_0, we can explicite the link between the optimal subsidy rate (t) and ϵ_{1-t}, the elasticity of charitable contribution to its price $(1-t)$ [10]. Indeed, the optimal subsidy rate t is such that the following efficiency rule is verified :

$$\epsilon_{1-t} = (1 + \overline{G}_{G_0})(1 - \beta(G)) \tag{1}$$

where $\beta(G) = \int g^i \beta^i f(i) di / \overline{G}$ is the social weight weighted by contributions levels.

However, Saez criticizes the focalization of the empirical literature on the estimation of the average price elasticity of charitable contribution, treated as a constant parameter, because it does not allow to derive an explicit expression of the optimal subsidy rate, even if it gives a rule to assess whether the current tax system provides

[9]Precisely, β^i is defined as $\beta^i = \mu^i \nu_R^i / \lambda$, where λ is the Lagrange multiplier in the government program.

[10]This elasticity is defined as $\epsilon_{1-t} = (1-t)\frac{\frac{\partial G}{\partial(1-t)}}{G}$ with G the total amount of charitable contributions and $(1-t)$ the price of charitable contributions after the deduction of the subsidy rate t.

too much or too little subsidy [11]. In his calibrations, Saez allows the elasticity to vary and chooses rather to fix the size of the price response of aggregate contributions as the exogenous immutable parameter[12]. In our estimation, we adopt another perspective. We choose to focus on the elasticity of charitable contributions to the *subsidy rate* ϵ_t rather than on *price* elasticity ϵ_{1-t}, because it allows us to see how the optimal subsidy rate should vary with the value of the elasticities. The two elasticities are related, since $\epsilon_t = -[t/(1-t)]\epsilon_{1-t}$, but by focusing on the former, we assume that as the subsidy increases, the same absolute increase has less and less effect, whereas the price elasticity implicitly gives more and more weight to absolute reductions in prices[13]. If we introduce ϵ_t instead of ϵ_{1-t} in equation (1), we have that the optimal subsidy rate is equal to:

$$t = 1 - \frac{(1+\overline{G}_{G_0})(1-\beta(G))}{(1+\overline{G}_{G_0})(1-\beta(G)) + \epsilon_t} \tag{2}$$

From the preceding equation, it appears that in the absence of crowding out between charitable contributions and government spending ($\overline{G}_{G_0} = 0$), and when the welfare of contributors is not taken into account by the government($\beta(G) = 0$), subsidies to charitable contributions should be:

$$t = 1 - 1/(1+\epsilon_t) \tag{3}$$

If there is some crowding out however ($\overline{G}_{G_0} \leq 0$), t should be greater than this landmark level. The intuition is that, if there are some important crowding out effects, it is better to rely more on private contributions, so that the subsidy rate must be increased to higher levels, even if private contributions respond a little less to these higher subsidies.

It is interesting to mention that this optimality condition can be reconciled with a simple public finance objective under the assumptions that we made above, if we go just a step further and consider that financing the subsidy by the tax rate

[11] It is immediate from the preceding equation that in the absence of crowding out between charitable contributions and government spending ($\overline{G}_{G_0} = 0$), and when the welfare of contributors is not taken into account by the government, subsidies to charitable contributions should be increased when the elasticity is above unity in absolute value and reduced when it is below unity. This threshold of one for elasticity is extensively used in the empirical estimation to assess the efficiency of tax subsidies. But following equation 1, the theory predicts that the subsidy should be either negative and infinite if ($e_{1-t} < 1$)or equal to minus one (if $e_{1-t} > 1$).

[12] That is $-G_{1-t}/G$ (with G_{1-t} the derivative of private donations G with respect to the price of the subsidy $(1-t)$).

[13] Starting from a subsidy rate of 0.5, a first increase of the rate to 0.6 corresponds to an equal decrease in price and a increase in subvention of 20% but a second increase from 0.6 to 0.72 corresponds to 20% increase in subvention but a 30% decrease in price.

τ has only second-order effects on charitable behaviors and earnings (we neglect all income effects of the tax reduction t). In this partial equilibrium framework, where the government only wants to promote charitable contributions, increasing the subsidy rate would be efficient in a public finance point of view if the total increase in charitable contributions is greater than the loss in tax revenues, or in other words, if it yields a positive increase in money really given by taxpayers, net of the subsidy. At the optimum, this condition can be summarized as

$$\Delta[(1 - t^*)G] = 0 \tag{4}$$

Assuming that there is no crowding out, and that changes in the subsidy rate do not affect earnings, it is obvious by a very simple partial calculation that the public finance objective leads to the same efficiency rule (1) as in Saez framework, where crowding out and redistribution are excluded:

$$\begin{aligned} \Delta[(1 - t)G] &\approx G\Delta(1 - t) + (1 - t)\Delta G \\ &= G\Delta t(\epsilon_t \frac{(1 - t)}{t} - 1) \end{aligned}$$

for small changes of t. Therefore the condition (4) stands that:

$$\epsilon_t = \frac{t^*}{(1 - t^*)} \tag{5}$$

which is equivalent to (3). Hence, if we want to assess the efficiency of the reform not according to a first-best criterium, but according to a simple public finance objective, excluding crowding out effects and redistribution, we are led to the same landmark in terms of policy recommandations, that is: "subsidy could be increased if $\epsilon_t \geq \frac{t}{(1-t)}$ and should be decreased if $\epsilon_t \leq \frac{t}{(1-t)}$". Moreover, if we consider that ϵ_t does not vary significantly according to variations of t, the optimal subsidy rate that maximizes Saez efficiency rule and a simple public finance objective is the same:

$$t^* = 1 - 1/(1 + \epsilon_t)$$

2 The French Tax System and Charitable Contributions

One important feature of our study is to focus on the French tax system to estimate the price elasticity of charitable contributions, because it avoids usual empirical pitfalls encountered in previous literature. We present in this section the details of this tax system, which has two very important characteristics that we would like to emphasize : first, the fiscal incentive is a tax reduction (and not a deduction from taxable income), and second, the reduction rate has changed several times because of fiscal reforms. We present at the end of this section time series showing the crude impact of the 2003 and 2005 reforms.

2.1 French tax incentives towards philanthropy

The French tax system is today one of the most generous system ever seen in favor of charitable giving. This system is the heir of a very long effort made by private foundations towards the recognition of their social utility beside public action.

Deduction vs reduction

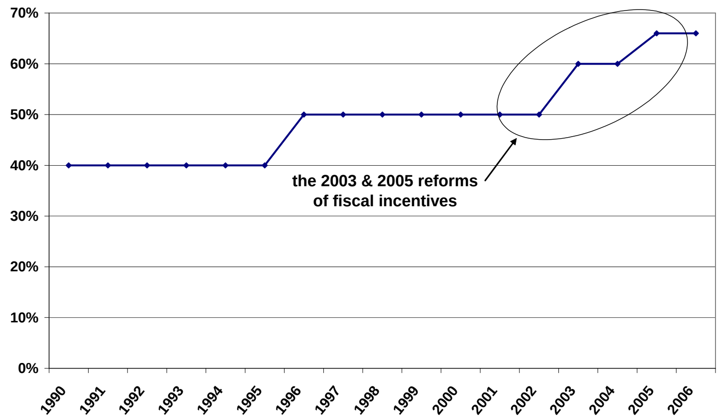
A tax incentive scheme towards charitable giving exists in France since 1954 but it has been strongly refined since then: in particular, the old deduction mechanism has been replaced in 1989 by a tax reduction. This modification is very important: in the deduction system, a taxpayer may deduct the amount of her gift from her taxable income. Therefore, for a \$ 1 gift, she is granted a reduction of τ cents, τ being her marginal tax rate. Calling $(1-\tau)$ the price of a charitable contribution, and given that income tax schedules are progressive, taxpayers with higher incomes will benefit from higher reductions rates (or, to say it differently, from smaller prices). The tax reduction system is somewhat different, since the price of one's gift is equal to $(1-t)$, t being the tax reduction rate, whatever the level of taxable income. Therefore, the price and the income effects in giving behaviors can be easily separated and endogeneity problems disappear. Moreover, there is no "transitory" price as opposed to a "permanent" price. Note that the French tax incentive is truly a tax reduction and not a "tax credit", which means that the deduction, which is equal to $(1-t)$ times the gift, cannot exceed the income tax that is due[14]. As a consequence, the tax incentive only concerns taxable households.

Reforms in the tax incentives towards charitable giving:

The French system has experienced a certain number of reforms that exogenously changed incentives towards charitable contributions. In fact, since the late 1980s, governments in France have tried to boost private philanthropy by various means. After simplifying the law applicable to private foundations of public interest, French governments have turned to fiscal incentives, implementing three main reforms :

[14]One must add that the gift can be deducted up to a ceiling of 20% of taxable income. Moreover, if the gift exceeds the ceiling, its reporting can be spread out over 5 years.

Figure 1: *Evolution of fiscal incentives in France: tax reduction rate for a gift*



- 1996 : rate raised from 40 to 50%
- 2003 : rate raised from 50 to 60%
- December 2005 : rate raised from 60 to 66%

We exploit the variations in the price of charitable contributions induced by the 2003 and 2005 reforms in order to estimate price elasticities of charitable contributions.

French tax system and timing of fiscal reforms

At this point, and to understand the timing of fiscal reforms in France, it is important to recall that the French Tax System is not functioning as a withholding tax: people fill a tax form on year n to declare the income earned in year $n-1$. Tax parameters applicable to current income are known only at the end of the year, in late December, when the Fiscal Law is voted, after incomes have been earned, and charitable contributions have been made.

For the 2003 reform, a law was voted in August in order to encourage private philanthropy and it was mentionned that the Fiscal Law for year 2004 (voted in December 2003, applicable to income earned in 2003) would include increased tax reductions for charitable contributions. Therefore, taxpayers could have changed their charitable behaviors in the second half of 2003, in expectation of an increase of tax reductions, even though the new tax reduction rate was fully operational only from year 2004 on. It seems, according to rough graphical evidence that nothing indeed happened in 2003. Nevertheless, we eventually decided not to include year

2003 in our baseline estimation[15]. The second reform was voted at the very end of 2005 as a part of the Fiscal law. We can therefore assume that taxpayers were not able to take into account the new rate before 2006.

Finally, it seems that people are well aware of the existence of a tax reduction scheme, and know quite well its level. Associations and foundations have a yearly opinion poll in which they ask household whether they know the tax scheme applicable to charitable contributions, and every year, approximately 85% are aware of its existence and of its functioning[16].

2.2 Data

The data we use in our study come from an original and unique sample of the French Direction Generale des Impots with more than 500,000 taxpayers every year, oversampling rich taxpayers. This sample of tax files is called "Echantillon lourd" and is drawn every year by the Tax Administration in order to forecast the evolution of tax revenues[17]. 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 interest of this data set is not only its large number of observations, and the quality of its information regarding income and giving, but lies in the fact that, because filing a tax form is compulsory in France, we get a picture of the whole distribution of households. Studies confronted to US or UK fiscal data are to the contrary compelled to focus solely on itemizing households. Concentrating estimation on such a subset of taxpayers has little reason to be insignificant for the results, since the selection process is by no mean orthogonal to the giving behavior. Besides, selected samples of itemizers are never representative of the whole distribution of households. In Auten & al. for instance, the weighted sample mean of income for 1980 is 68,744 $ and 85,803 $ in 1993 (current dollars), while Saez & Piketty (2007) show that the average income among all US taxpayers was 16,379 $ in 1980 and 29,357 $ in 1993 (current dollars)[18]. Hence the fact that estimated elasticities are usually made on a very definite and special fraction of taxpayers. Our dataset allows us to consider the whole distribution of taxpayers, which is critical for our purpose of evaluating the impact of a fiscal measure applicable to all taxpayers, but which is also interesting for it gives us the opportunity to look at variations of income and

[15]We checked however that removing (or not) year 2003 from our sample does not change our estimates

[16]See for instance, *La générosité des Français*, Cerphi, 2007

[17]It is in fact the first time that researchers were allowed to conduct a study on charitable giving with this database.

[18]We used table A0 available at the following address *http : //elsa.berkeley.edu/ saez/*

price elasticities among taxpayers, and in particular, over the income distribution. Another very important feature of our dataset is that, although it has not a panel structure[19], it provides oversampling of rich taxpayers, and exhaustive sampling at the upper-end of the income distribution. Oversampling rich taxpayers is important for our study because the giving behavior is truly concentrated among the richest taxpayers.

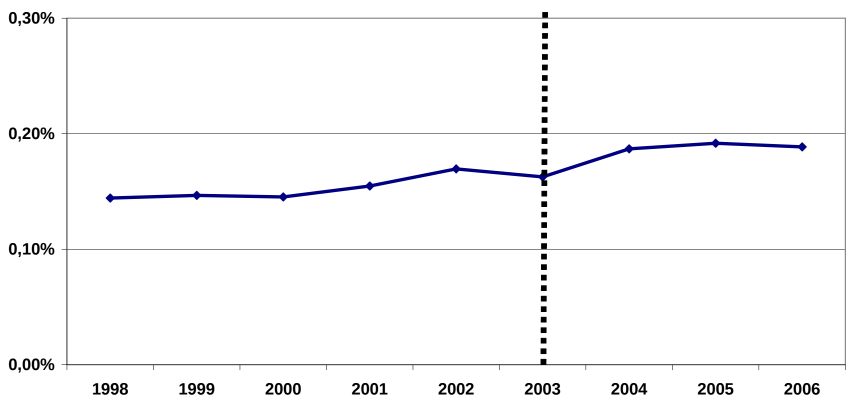
2.3 The impact of the reform: first evidence

France, as we said previously, is characterized by a modest level of private charitable contributions. In 2005, total contributions amounted to 1.6 bn euros, and mean gift among French households was therefore around 36 euros.

2.3.1 Graphical evidence

Figure 2 displays the evolution of charitable contributions in France since 1998 as a percentage of total taxable income.

Figure 2: *Evolution of charitable contributions as a percentage of total taxable income in France (1990-2005)*



Source : Echantillons Lourds, DGI, computed from tax files.
Note : All gifts declared through tax files are counted.

[19]The absence of a panel structure is truly of limited importance as compared to studies on US data, because we do not need here to decompose the evolution of price and income into transitory and permanent components.

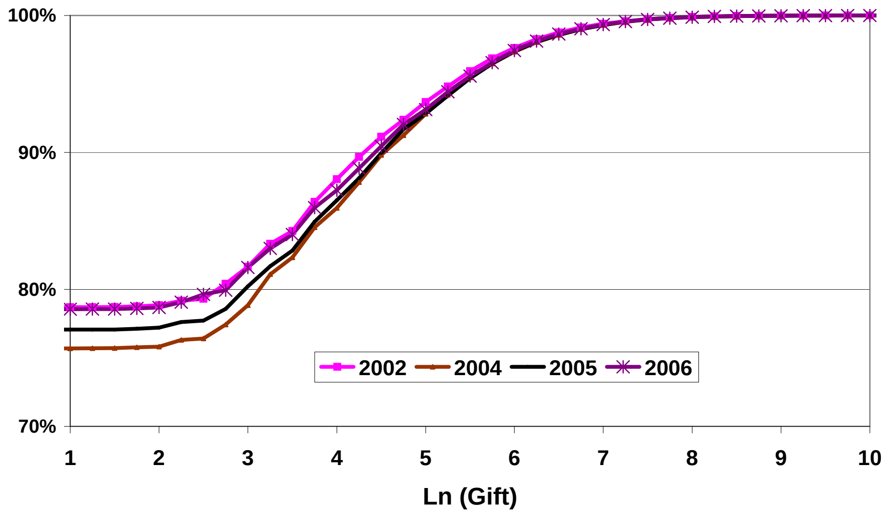
The figure reveals that charitable contributions have been fairly stable between 1998 and 2003, and have experienced a shift in 2004, but there is no further increase in 2006 following the second reform. Noticeably, nothing has been observed for year 2003.

Considering the evolution of the whole distribution of contributions is also interesting. Figure 3 shows the cumulative distribution of the logarithm of gifts in constant euros among all taxable households and among top income households for years 2000 to 2006. It seems that the whole distribution of gifts shifted in year 2004 and 2005 as compared to 2002, but this shift remains relatively modest. The most striking fact is the marked shift of the lower part of the gift distribution in year 2004 and 2005 while the upper part of the distribution shifts less markedly. This shift of the lower quantiles occurs for all taxable households, and for top income households as well. In 2006, the effect on the lower part of the distribution seems to disappear, even though less seriously for top incomes for which the distribution of gifts seem to have shifted more noticeably as compared to its 2002 level.

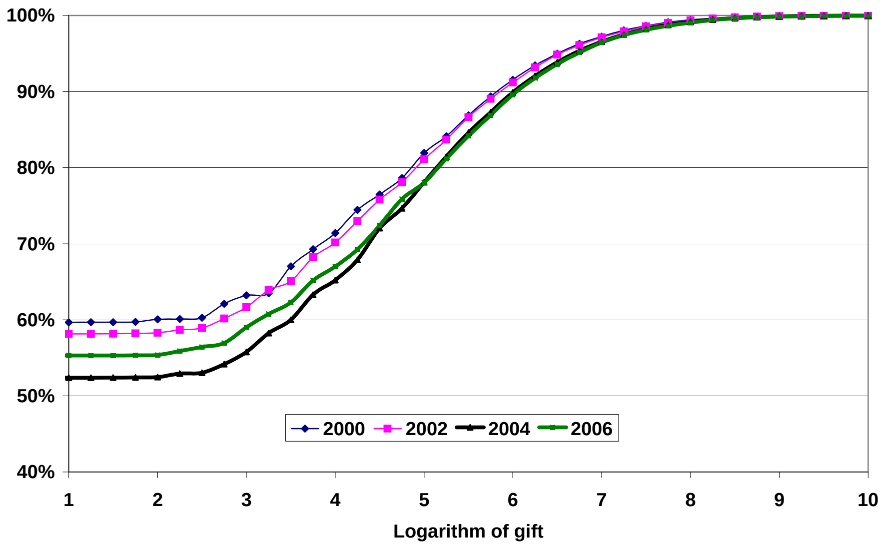
To summarize, it seems that the level of gifts and the distribution of gifts have been affected by the 2003 reform, even though the impact does not seem to be truly sharp. Moreover, the 2005 reform does not seem to have induced a further increase in gifts. Two important aspects are also to be kept in mind. First, higher income households have seen a larger shift of their gift distribution. And second, it seems that important distributional effects have occurred in the lower part of the gift distribution, and this could be an effect linked with the Asian tsunami which occurred on December 2004, and yielded considerable amounts of very small contributions. As we want to control for these important distributional effects, our quantile regression estimation technique, as we shall see, will be of considerable help. Moreover, it is not clear-cut for the moment whether the shift of the lower part of the distribution due to Tsunami gifts, cannot be considered as an indirect effect of the 2003 tax reduction reform. Considering for instance the evolution of the fraction of household giving to charities (figure 4), we clearly see that this fraction has increased in 2004 and 2005 for taxable households while non taxable households who did not see any change in their incentives to give do not appear to have reacted sizably to the Asian tsunami. Therefore, it seems necessary to also investigate to what extent the effect of the tsunami on low quantiles of gifts is attributable to the 2003 reform. We examine thoroughly this question in the robustness checks section.

Figure 3: *Evolution of the cumulative distribution function of the logarithm of gift (France 2000-2006)*

A-All taxable households

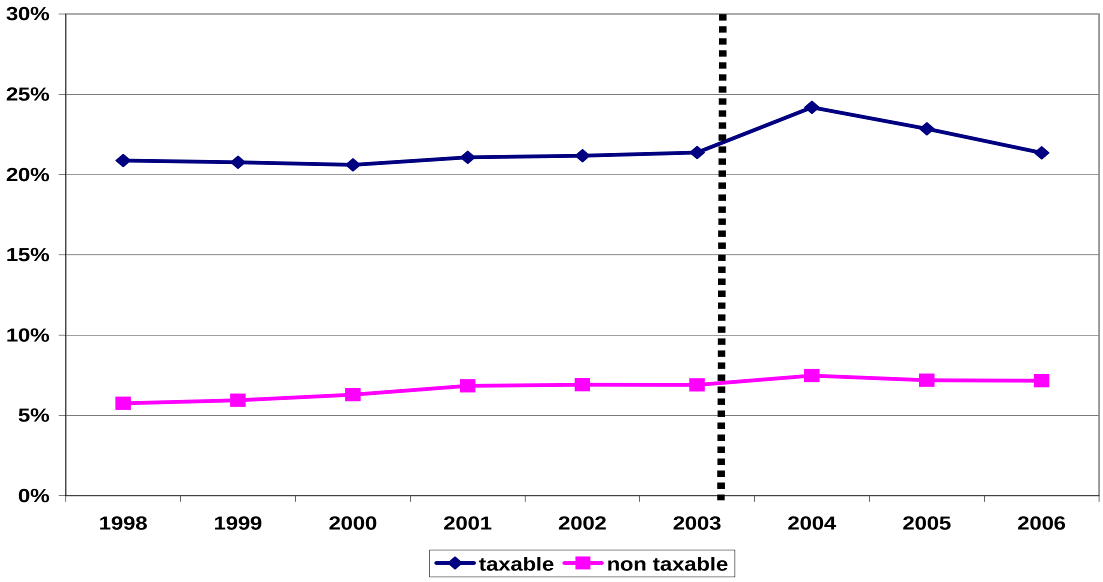


B-Top income households (5% of taxpayers with highest taxable income)



Source: Echantillons Lourds DGI. Taxable households only.
Note: Logarithm of gifts are computed from gifts expressed in constant 2004 euros.

Figure 4: *Evolution of the fraction of households reporting a gift (France)*



SOURCE : Echantillons Lourds DGI

3 Estimation strategy

This section describes our estimation strategy. First, we emphasize that some aspects of charitable behaviors (heavy censoring and heterogeneity) have important implications for our estimation. In the first part of this section, we explain their meaning for our econometric specification, and the reason why they have never been raised in the empirical literature yet. Then we present our censored quantile regression estimation technique that addresses these features, and enables us to investigate for heterogenous treatment effects. We finally describe our strategy: we use the 2003 and 2005 reforms as exogenous time variations of the reduction rate, that can be exploited to estimate the elasticity of giving to the reduction.

3.1 Modeling charitable giving:

First of all, the peculiarity of the giving behavior imposes that the econometric specification that we adopt holds some special characteristics. Since a high fraction of the population does not give any money to charitable institutions, the giving behavior observed by the econometrician is characterized by heavy censoring. Among taxable households, the fraction of taxpayers reporting a gift to charities is about

20% in France[20]. Therefore dealing with the censoring process should yield considerable attention for empirical estimation. Still, in the previous literature which has mainly focused on US data, little has been done in this area. One reason is that empirical studies focus on sample of itemizing taxpayers, where the fraction of households reporting a gift to charities is obviously larger. Most studies even exclude from their sample people who did not report amounts of giving because they did not itemize deduction. This artificially solves the problem of censoring but with the limit of an endogenous selection of the sample. Randolph is the only author who truly raises the issue of endogenous selection, but in fact he only restricts the sample to those taxpayers who would have itemized personal deductions even without charitable deduction. There is unfortunately little evidence that this restriction is exogenous: itemizing personal charitable contribution and itemizing other deduction might well be correlated with an unobservable variable affecting gifts such as, for instance, the level of education, the level of wealth, etc. However, Randolph does not further address the question of people with zero gift in his estimation, letting aside the question of censoring. Moreover, on US data, the censoring problem is perhaps considered of secondary importance compared to endogeneity and simultaneity difficulties that have monopolized the debates on behavioral responses to taxation[21].

Another important aspect which we paid attention to for our econometric analysis is the homogeneity of the giving behavior. Is the giving behavior homogeneous, or should we envisage elasticity to vary across the distribution of income, of gift, etc.? In most studies, where the log-log specification is adopted, homogeneity is *de facto* assumed. But some studies have clearly shown that price elasticities and income elasticities could be quite different among rich and poor taxpayers, or between large givers and small contributors[22]. As we have seen in the previous section, the data also suggest that the impact of the price reform has been heterogenous. This is why we need to adopt a very flexible specification, that allows for different behavioral responses.

Thus, we need an estimation technique that properly addresses these two characteristics of charitable behaviors, that is censoring and heterogeneity. We explain in the next subsection why using a censored quantile regression estimator appears to be sound.

[20]Surprisingly enough, it is not significantly greater in the US, according to the Statistics of Income displayed yearly by the IRS, showing that only about 25% of taxpayers report gifts to the tax administration in the US.

[21]See, R. K. Triest, 1998

[22]See, for instance, Feldstein & Lindsey 1981, and also the "Almost Ideal Demand system" chosen by Randolph, which is one possible response to deal with elasticities varying across price and income

3.2 The principle of censored quantile regressions:

When dealing with censored data as it is the case here since contributions are left-censored at 0, OLS estimates can immediately be excluded : the OLS estimator is inconsistent, and this inconsistency may be severe when censoring is heavy. That is why estimation strategies usually focus on the formulas of the censored conditional mean, as for instance in the Tobit model. But to compute proper expressions of the censored conditional mean and censored conditional density, one may be compelled to rely on very restrictive distributional assumptions.

To summarize this, consider a dependant variable (charitable contributions):

$$G^* = X'\beta + \varepsilon \tag{6}$$

and because of left-censoring we only observe

$$\begin{cases} G = G^* & \text{if } G^* > 0 \\ G = 0 & \text{if } G^* \leq 0 \end{cases}$$

When one first specifies the conditional distribution of G^* given the regressors $\mathbf{x}$, the censored conditional density can easily be computed. This is the reason why parametric estimation techniques have first been widely used in the case of censored data. Let for example $f^*(G^*|x)$ be the conditional density of G^* given the regressors $\mathbf{x}$, then if $G > 0$, $f(G|x) = f^*(G^*|x)$. When, to the contrary, $G = 0$, then the density is discrete with mass equal to the probability of observing $G^* \leq 0$, that is $f(G|x) = F^*(0|x)$. Introducing an indicator variable d for censoring, we get that the conditional density given censoring is equal to :

$$f(G|x) = [f^*(G|x)]^d * [F^*(0|x)]^{1-d} \tag{7}$$

The most popular parametric estimation technique following this kind of approach is of course the Tobit model which relies on the assumption that

$$\varepsilon \sim \mathcal{N}(0, \sigma^2)$$

Therefore, $F^*(0) = Pr[X'\beta + \epsilon \leq 0] = 1 - \Phi(X'\beta/\sigma)$ where Φ is the standard normal cdf. This leads to the canonical Tobin-Amemiya maximum likelihood estimator. As is well known, the greatest drawback of the Tobit MLE is that it so heavily relies on normality and homoscedasticity. With heteroscedastic errors for instance, the estimator becomes inconsistent.

For these reasons, we decided to implement censored quantile regression estimations. The advantage of quantile regression in our estimation problem is to be truly more flexible than parametric estimation technique, as for instance the Tobit model. In particular, our estimates have two main assets : they are distribution-free and allow for heteroscedasticity. The basic intuition behind quantile regression is to remember that the conditional **quantile** of the distribution of gifts is unaffected by the censoring mechanism. This is the reason why we can get a consistent estimation of β without specifying a complete parametric distribution of our error term, which is impossible when we rely on the conditional **mean** of the distribution (as is the case in the Tobit model). To understand this important feature of censored quantile regressions, we start from the basic quantile regression model where the (uncensored) $\tau - th$ conditional quantile of the distribution of gifts G^* given $\mathbf{x}$ can be modeled as:

$$Q_{G^*|x}(\tau) = X'\beta(\tau)$$

The principle of quantile regression is that this $\tau - th$ quantile is the solution of the following optimization problem [23]:

$$Min_\beta \sum_{i=1}^{n} \rho_\tau(G_i^* - X_i'\beta) \tag{8}$$

where ρ_τ is a function defined as $\rho_\tau(x) \equiv x(\tau - 1(x \leq 0))$ [24] and observations are indexed by the subscript i.

With censored observations, we slightly modify this baseline of quantile regression. To do so, we simply apply the important property of quantile regression model that is equivariance to monotonic transformation, and we easily obtain our censored quantile regression model. In our study, given that we observe $G = G^*$ if $G^* > 0$ and $G = 0$ if G^* is censored, then we obtain the following model:

$$Q_{G|x,C}(\tau) = max(X'\beta(\tau), 0) \tag{9}$$

0 being of course the censoring point.

Given this censored model, the most straightforward estimator of β would be to replace the linear form in 8 by the partially linear form

$$Min_\beta \sum_{i=1}^{n} \rho_\tau(G_i - max(X_i'\beta(\tau), 0)) \tag{10}$$

But unfortunately this estimator proposed by Powell suffers from very low computational efficiency. This is the reason why it has not experienced a great development in the empirical literature. However, many authors have proposed slight amendments to this original model which lead to very practical estimators[25]with

[23] See Koenker, R., Quantile Regression, *Econometric Society Monographs*

[24] Therefore, $\rho_\tau(G_i^* - X_i'\beta) = \begin{cases} \tau * (G_i^* - X_i'\beta) & \text{if } G_i^* > X_i'\beta \\ (\tau - 1) * (G_i^* - X_i'\beta) & \text{if } G_i^* \leq X_i'\beta \end{cases}$

[25] See for instance Buchinsky and Hahn, Khan and Powell among others.

only very little loss of generality as compared to the Powell estimator described in equation 10.
We use, in order to estimate the impact of fiscal incentives on charitable giving a three-step version of censored quantile regression models proposed by Chernozhukov and Hong. This estimator relies on structured modeling restrictions that are put on the censoring probability. These restrictions enable this three-step estimator to be very easily computable, and practical, and are not too strict, so that the essential features of censored quantile regression are preserved, namely the heteroscedasticity and distribution-free character. The idea behind this three-step estimator is to first select a subset of observations where one may ensure that the true propensity score $h(X_i, C) = P(G^* > C|X_i, C)$ is strictly superior to $1 - \tau$. This condition is necessary for the conditional quantile line $X_i'\beta(\tau)$ to be above the censoring point C. Therefore, on our selected subset, the standard quantile regression that will be carried out in step 2 gives us immediately a consistent (though inefficient) initial estimator $\hat{\beta}_0$[26]. This first selection step is carried out by estimating a probability model of not censoring:

$$\eta_i = p(X_i'\lambda) + \varepsilon_i \tag{11}$$

where η_i is the probability of being a donator, and which gives an (inefficient) estimator of the true propensity score $h(X_i, C)$. In our study, we used a simple logit to model the probability of giving, with the same set of explanatory variables. It happened to fit the data quite well, which is important for the selection process. As we said previously, to obtain in the next step a consistent quantile regression estimator for conditional quantile τ, we must ensure that this conditional quantile is defined, which means that we must select observations such that $h(X_i) > 1 - \tau$. Our estimation of the true propensity score (11) being possibly misspecified, we do not select all those observations with $p(X_i'\widehat{\lambda}) > 1 - \tau$ but instead, we select these observations that have:

$$p(X_i'\widehat{\lambda}) > 1 - \tau + c$$

where c is a trimming constant between 0 and τ. In practice, we chose c so that we could control the size of discarded observations from our subset $J(c) = \{i : p(X_i'\widehat{\lambda}) > 1 - \tau + c\}$. The rule we made use of was to select c so that:

$$\#J(c)/\#J(0) = 90\%$$

[26]Intuitively, think that to get a consistent quantile reg estimator to start with, you must ensure that the observations have covariates such that $X_i'\beta(\tau) > G > 0$. Otherwise, the minimization problem 8 would inevitably lead to $\beta(\tau) = 0$. But the probability that $X_i'\beta(\tau) > G$ given X_i and $G > 0$ is equal to $Pr(0 < G < X_i'\beta(\tau)|X_i)/Pr(0 < G^*|X_i) = [h(X_i) - (1 - \tau)]/h(X_i)$. Thus, it is defined if and only if $h(X_i) > 1 - \tau$

where $J(0)$ denotes the subset J where $c = 0$. Chernozhukov and Hong give a demonstration that J does not need to be the largest subset of observations where $h(X_i) > 1 - \tau$.

The next (2nd) step consists in running a standard quantile regression estimation on $J(c)$:

$$Min_\beta \sum_{i \in J(c)} \rho_\tau(G_i - X_i'\beta_0(\tau)) \quad (12)$$

The estimate β_0 that we get is consistent as we said, but not efficient. Therefore, we next select all observations that have covariates X_i such that $X_i'\hat{\beta}_0(\tau) > 0 + \xi$ where ξ is a small positive number (with $\xi_n \to 0$). This step, practically, selects asymptotically all the observations with $X_i'\beta(\tau) > 0$, which brings efficiency to the QR estimation that we proceed with in step 3.

In step 3, we simply run a QR estimation on the observations selected during step 2. We then get a consistent and efficient estimation $\hat{\beta}_1(\tau)$ of $\beta(\tau)$. Note that step 3 can be repeated several number of times. In practice, rehearsal after the fourth step did not happen to be necessary. To summarize briefly, the great interest of this estimation procedure is to first select observations and then run consistent QR (with fewer and linear constraints) where the Powell estimator imposed simultaneity. Thus, the estimation procedure is milder in terms of computational requirements, which is truly convenient for our rich data set and our model with numerous regressors and several dichotomous regressors. Furthermore, it gives an estimator which deals with heavy censoring with minimal distributional assumptions, and allows for heteroscedasticity.

It is also interesting to compare our estimation setting with selection models. Our censored quantile regression technique is devoted to censoring mechanisms, but does not consider the fact of giving as a selection process, determined by some (potentially unobservable) individual characteristics correlated with our regressors. The reason is that it is difficult to find some variables that would affect the participation process without influencing the level of contributions. However, it is interesting to note that we were able to draw a panel out of the richest taxpayers of our sample that are present every year in the dataset. Running panel regressions on these taxpayers with fixed and random individual effects, Hausman tests concluded that the individual effects were not significantly correlated with our control variables, meaning that the unobserved heterogeneity in our model is orthogonal to the regressors we use in our CQR [27]. Therefore, a selection model does not seem truly appropriate. Besides, 3-step CQR gives the opportunity to look at the effect of the tax reduction on

[27] Results for this set of regressions on a panel of the richest taxpayers are not displayed in this paper, but are available on request

the whole distribution of gifts, which means on lower quantiles, that are near the censoring point, and on higher quantiles, what may in a way be as informative as looking at the effect of a variable at both the intensive and the extensive margins in selection models.

3.3 Exogenous variations of the tax reduction rate

Concerning our estimation strategy, we look at the effects of the variations of the tax reduction rate and consider these legal variations as exogenous variations to test the causal impact of the reduction rate on charitable giving.

We estimate our model by running three-step censored quantile regression estimations described in previous subsection. The dependant variable is the logarithm of gifts (*ln (gift)*). Since many households have not given to charities, we give every households an extra dollar of gifts so that *ln(gift)* is defined for every taxpayer and ranges from 0 to ∞. This method is widespread in previous literature on the subject[28]. Our core model can be written as follows :

$$Q_{ln(gift)}(\tau) = C + \alpha_1(\tau) * ln(reductionrate) + \alpha_2(\tau) * ln(income) + X_i'\beta(\tau) \quad (13)$$

where $Q_{ln(gift)}(\tau)$ is the τ-th quantile of the logarithm of gifts conditional on all the regressors. X_i is a set of control variables including age, family size ("quotient familial"[29]), main source of income (wage, pensions, entrepreneurial income or capital income), and matrimonial status. We consider disposable income as income less income tax less charitable tax reductions so that disposable income does not depend on the level of gift. Identification of the effect of the reform is obtained through the coefficient $\alpha_1(\tau)$ of the variable *"ln(reduction rate)"*. $\alpha_1(\tau)$ is therefore directly comparable to an elasticity and its interpretation is the following : when the level of the tax reduction rate is increased by 1%, the τ-th quantile of gifts increases of $\alpha_1(\tau)\%$, everything else held equal. And variations of $\alpha_1(\tau)$ with respect to τ enable us to investigate distributional effects of the reform. As stated previously, we exclude year 2003 from our sample, since the reform of the reduction rate was voted during year 2003, and it might be that taxpayer did not respond fully to the new incentives for the whole fiscal year[30]. We estimate equation (13) on taxable households. To avoid any type of manipulation of the taxability status which might

[28] See Andreoni [2]

[29] In France, income tax is paid at the household level, which means that income tax is paid for the whole household and not by individuals. "Quotient familial" is the number of tax units granted to an household according to its size. Single=1, Married couple=2, each child = 0,5, each child above 3 children=1. The taxable income is then calculated as the original taxable income of all the individuals in the household divided by the "Quotient familial".

[30] However, including/excluding 2003 does not change significantly our results

be correlated to charitable behaviors, we exclude people reporting previous deficits and determine taxability according to the level of taxable income. Therefore, some taxable households, according to our definition may not be taxed in practice if they benefit from high tax reductions or any other type of tax credits. This way of selecting taxable households eliminates a possible endogenous selection of the sample of taxpayers.

Our core analysis relies on a "simple-difference" estimation strategy. Therefore, we make some identifying assumptions of particular importance: the reforms are exogenous, there is no temporal trend and no unobservable variable affecting giving behaviors during the reforms. We pay in the robustness section a special attention to these assumptions. In particular, it seems that the occurrence of the Tsunami in December 2004 has created a demand side effect influencing gifts at the very same time that the tax reduction was increased. Although the overall level of gifts made because of the Asian tsunami remains small as compared to total annual charitable contributions, it seems to have impacted the lower part of the distribution of gifts [31], as mentioned above (figure 3 and 4). Therefore, it is important to check which part of this effect on low quantiles can be attributed to the variation of the reduction rate. We do that in the robustness checks section by controlling for the tsunami effect in double-difference estimates using non taxable households as a control group, affected by the Asian tsunami, but not by the variation of the tax reduction rate.

4 Results

In this section, we present the results, and discuss the overall effect of the 2003 and 2005 reforms on charitable giving, as well as the impact of income on giving behaviors. Results for all taxable households are displayed in figure 5 which summarizes graphically the quantile coefficient estimates[32]. Note that because of heavy censoring it was not possible to estimate quantile coefficient below quantile .70 for the overall population of taxpayers.

The impact of the reforms on fiscal incentives is shown in the upper graph on the left. First, it appears that the overall effect of the reforms is very small. For all quantiles, the coefficient estimate is well below the elasticity that would be required for the reduction rate to be optimal. The effect of the reforms is also heterogenous as coefficients vary significantly across quantiles of gifts: higher quantiles seem to

[31]The average gift made for the tsunami is around 15 euros according to *L'aide française aux victimes du Tsunami, rapport de la Cour des comptes*, Paris, 2007.

[32]The tables presenting the results are displayed in the Appendix.

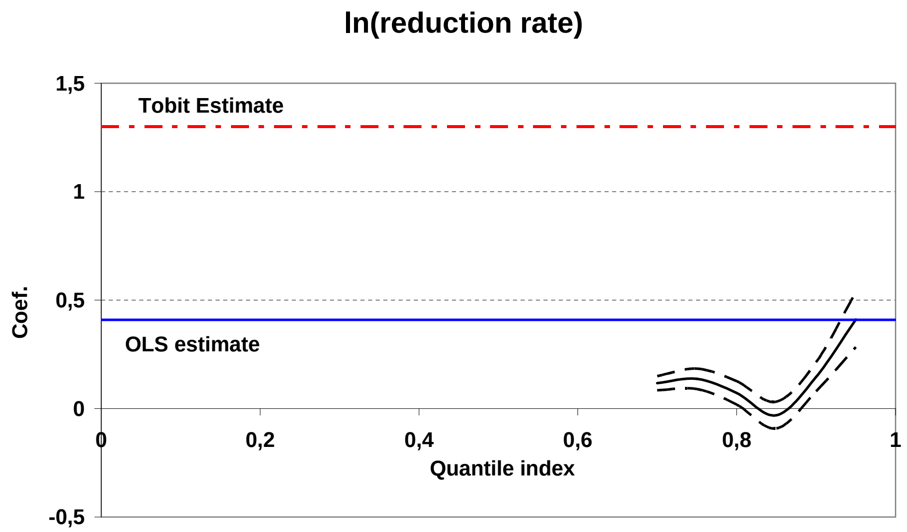
have reacted more to the reforms. If the tax reduction variation had led to homogenous behavioral responses, the whole distribution would have shifted the same way, and the coefficient estimate would have been equal across all quantiles. In our case, the homoscedasticity assumption of the Tobit estimator is evidently violated, which strongly supports our estimation strategy. The results can be interpreted as follows: the reforms led large contributors to contribute more, while average contributors did not really change their habits. The effect of the reforms on small contributors is small, and reflects the fact that the increase in small gifts for 2004 and 2005 was not sustained in 2006. These distributional effects are interesting: they show that the reforms mainly affected those who where already involved in substantial charitable giving.

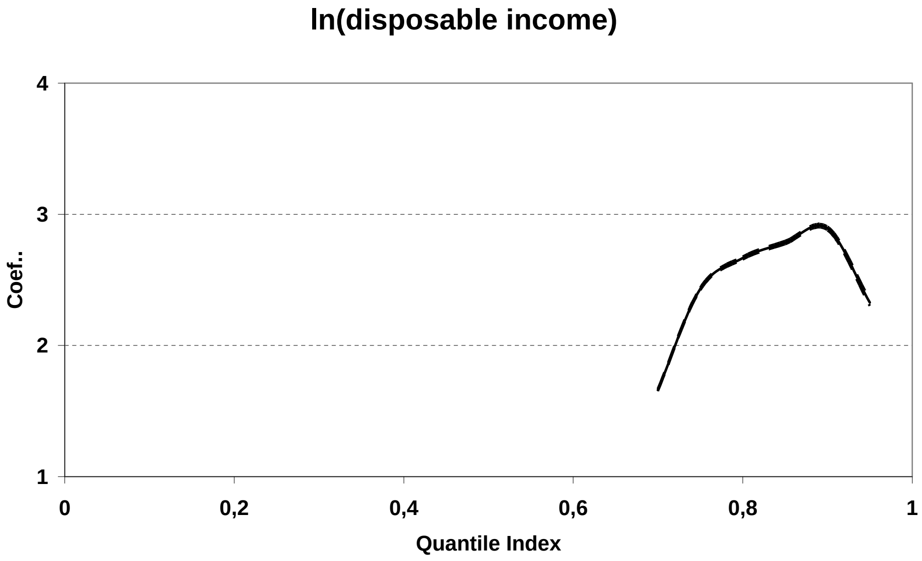
It is also interesting to compare our estimate with the naive OLS and the Tobit estimates, as shown in figure 5. Because of heavy censoring, the OLS estimate is biased, and leads to a larger elasticity estimate. The Tobit estimate is even more biased, with an elasticity that is completely out of the range of the quantile estimates. The existence of important distributional effects is therefore a serious drawback for traditional Tobit estimation in the case of heavy censoring because it tends to extrapolate to the whole distribution the aspect of the distribution on a few uncensored observations, whereas quantile regressions do not need to consider the shape of the distribution below the censoring threshold.

The income elasticity is shown on the upper right graph. The effect of income is quite large: everything else held constant, having a greater income leads to a much higher probability of giving. The income effect first increases with the level of gifts but seems to decrease among large contributors. Overall, the estimated income elasticity appears to be quite large compared to results available in previous studies. One explanation might be that our income effect is not polluted by the price endogeneity that may often minors the pure effect of income in US estimates, since, as we pointed out, the tax deduction mechanism makes it particularly difficult to disentangle price and income effects on US data. But the main explanation is that charitable behaviors are very concentrated among the richest taxpayers[33], and that we look here at the whole distribution of taxpayers whereas the samples of US itemizing taxpayers used by most studies focus on richer taxpayers. This is the reason why we investigated how price and income elasticities vary with respect to the level of income. To do so, we ran the same three-step censored QR on subsets of taxpayers according to their level of income. The first subset focus on taxpayers of the 7-th decile of taxable income. We chose this decile because in lower parts of the income distribution, charitable contributions are negligible. Besides, because enlarging the

[33]See figure 12 in appendix C

Figure 5: *Coefficient estimates using a three-step censored quantile regression estimation on all taxable households*

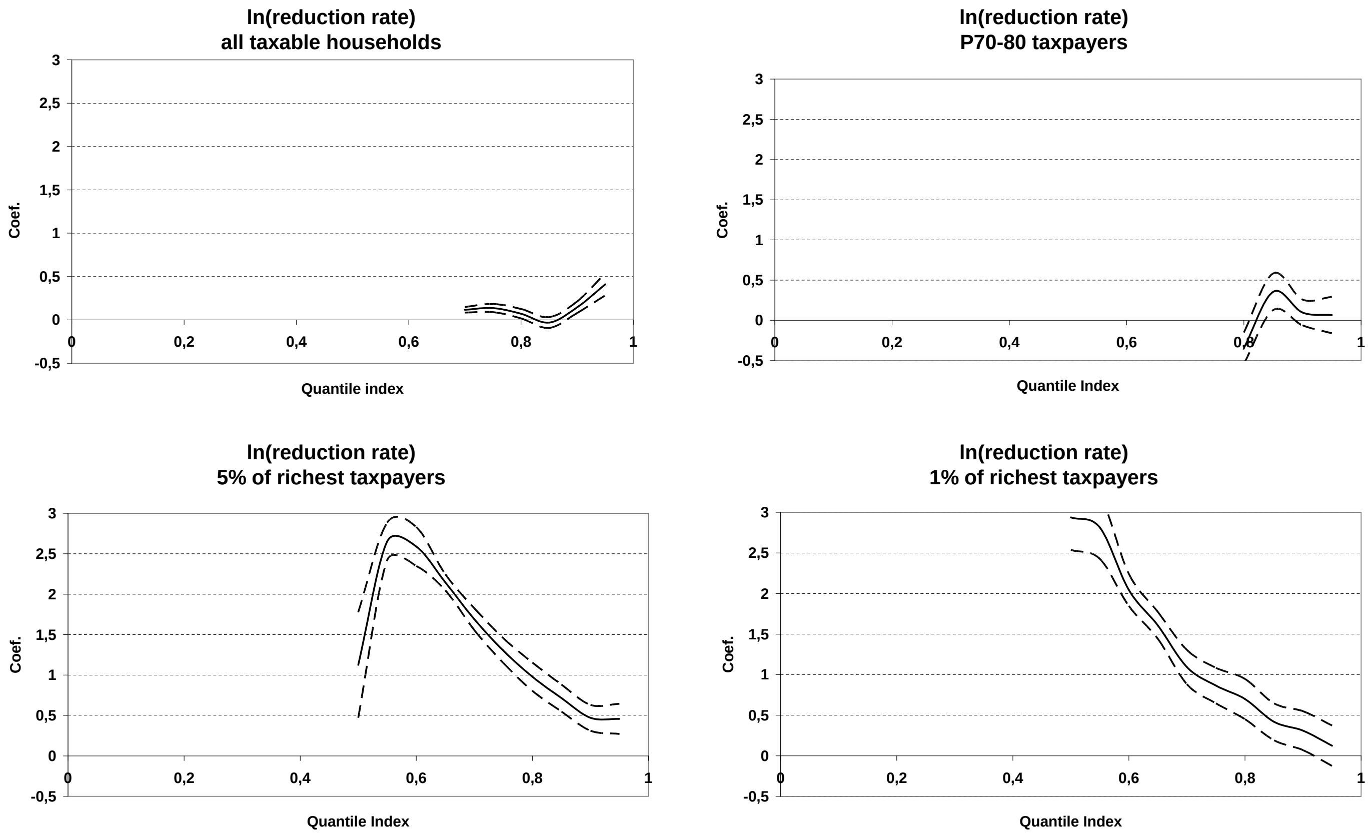




Source : Echantillons Lourds DGI

subset too much would considerably increase the computational burden, we decide to restrict the size of the subset to a decile. The second subset includes taxpayers belonging to the first 5% of the income distribution. The third sample consists of the French top percentile of richest taxpayers.

Figure 6: *Estimates of the elasticity of gift to the tax reduction rate for selected populations of taxpayers*



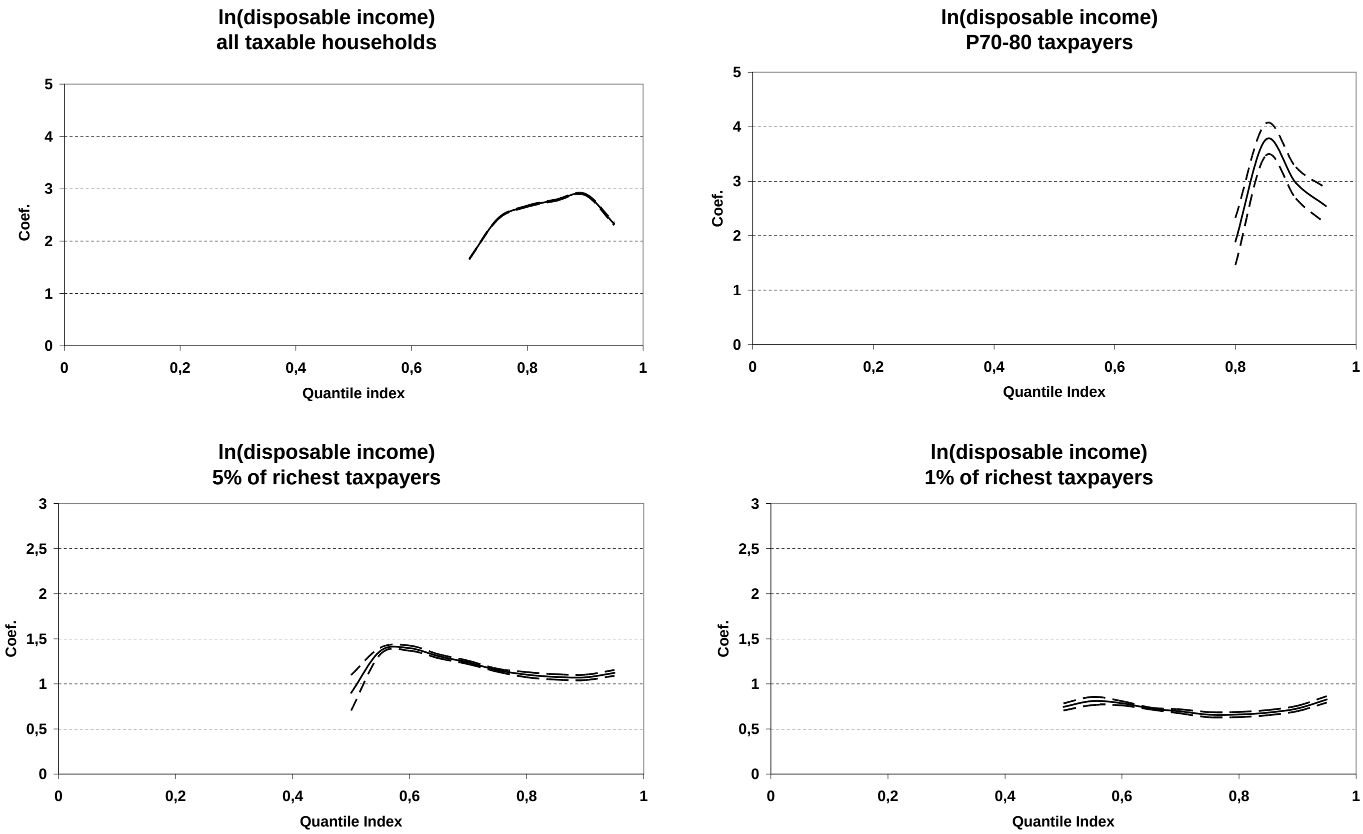
Source : Echantillons Lourds DGI
Note : We chose to begin with the 7-th decile of income because contributions are negligible for lower levels of income. We restricted the size of subsets to a decile, half a decile, and a percentile to avoid increasing the computational burden too much

Results of the estimated effect of the reform for different income levels are displayed in figure 6. The first noteworthy point is that elasticity of gifts with respect to tax reduction shows different patterns for different levels of income. Households in the 7th decile of the distribution show almost no reaction to the reform, whereas higher levels of income are much more responsive to the variation of the reduction rate. The effect of the reform is even superior to 1 for a certain number of quantiles among the 5% and the 1% richest households. The shape of the distributional effects is also interesting with a huge peak for lower quantiles of gifts. It seems that the reform was most effective in inducing some rich taxpayers to start giving. The effect decreases with the quantile of gift: among the richest taxpayers, those who were already contributing a lot did not respond strongly to the increase in the reduction rate. Even if the reform appears more efficient for the richest taxpayers, who are also the largest contributors, their share of total gifts is not sufficient to ensure the overall efficiency of the reform. The estimated income elasticity on our three different subsets are presented in figure 7. Not only their shape but their size are different. This suggests that income elasticities estimates are quite sensitive to the level of income of the sample. It seems that among middle income taxpayers, the effect of income is very large: having a greater income is a particularly important prerequisite to become a donator. To the contrary, the income elasticity for the 5% and 1% of richest households is much smaller, and the effect is almost stable among quantiles, suggesting that income has only a location shift effect: income in itself does not seem to have so important distributional effects on gifts among rich taxpayers. Which means that, for rich households, although having a greater income leads to more contributions, the shape of the distribution of charitable gifts is quite unaffected by income.

It is also interesting to try to compare our estimated income and price elasticities to the estimates made by previous studies. Since our results focus on distributional effects in order to avoid dealing with the (censored) mean, we do not immediately provide with a unique figure of income and price elasticity comparable to other estimates in the literature. One might nevertheless be interested in computing mean effects. In an uncensored quantile regression framework, mean effects can easily be computed as $\int_0^1 \alpha_1(\tau)d\tau$. For our purpose, one can argue whether the appropriate way of computing and interpreting mean effects is to consider the price effect on censored quantiles as zero, or to simply focus on defined quantiles.

On a public policy point of view, one is more often interested in knowing the average effect among the donators and it may be more appropriate to calculate the average effect on defined quantiles only. In this case, the mean elasticity of charitable contributions with respect to tax reduction is .14. If, to the contrary, we want to consider the impact of the reform on the whole distribution of taxpayers, and therefore consider that the effect on lower (undefined) quantiles is systematically zero, then the mean elasticity in France is .04. Staying away from mean effects, we now only look at the size of income and reduction rate effects *over* the uncensored part of the distribution. Concerning the reduction rate effect, it seems undeniably very small over the population of taxpayers, not superior to .5, which represents

Figure 7: *The income effect on conditional quantiles of gifts for selected populations of taxpayers*



Source : Echantillons Lourds DGI
Note : We chose to begin with the 7-th decile because contributions are negligible for lower levels of income.

the lower bound of what was found in other studies. The income effect is quite large to the contrary, and even larger than previously found in empirical literature. Looking at richer subsets of taxpayers, which are more compatible with sample used in US empirical literature, softens part of these discrepancies: income elasticities decrease, and tax reduction elasticities increase with the level of income, with a mean elasticity superior to one for the richest donators (the value of the elasticity calculated over the defined quantiles is respectively 1,4 and 1,3 for the 5% and 1% richest households). However, the broad picture is left unchanged: tax reduction elasticities remain modest, inferior to the elasticity that would match an optimal tax subsidy of 60% or 66% for the majority of the population and truly questions the efficiency of the 2003 and 2005 reforms.

Assessing the efficiency of the tax reduction rate reforms How can our results of tax reduction elasticities of charitable giving help assessing the relevance of the 2003 and 2005 reforms? As we showed previously, based on Saez' "efficiency rule" formula (1), and neglecting crowding out effects, we know that the tax reduction rate is optimal if:

$$t = 1 - 1/(1 + \epsilon_t) \tag{14}$$

Given previous tax reduction rate of $t = 50\%$, the tax scheme can therefore be considered as optimal if the elasticity of gifts with respect to the subsidy rate is equal to $t/(1-t) = 1$. If the elasticity is below one, the tax reduction rate is too great. If the elasticity is above one, the reduction rate may be increased. According to the mean elasticities of .04 (all taxpayers) and .14 (defined quantiles only) that we computed in the previous paragraph, it seems obvious that the subsidy is above the optimal level, and that increasing the tax reduction rate is not socially desirable.

Given our mean estimates of ϵ_t of approximately .14 for all defined quantiles, and neglecting crowding-out and redistribution, the optimum would be reached for a subsidy of $t^* = 1 - \frac{1}{1+\epsilon_t} \approx .12$[34] Even if the governement had not a first best optimal taxation criterium in mind, but a much simpler public finance objective, we showed that the same efficiency rule apply, if we neglect crowding out and redistribution. Therefore, if the government only wants to promote charitable contributions in a partial equilibrium framework it seems that the subsidy rate is too high.

If we allow for a large crowding out, and in the absence of redistributive tastes in the social welfare function, it seems also hardly credible that the subsidy rate is optimal. From equation 2, we know that, at the optimum:

$$1 + \overline{G}_{G_0} = \frac{1-t}{t}\epsilon_t$$

[34] Under the implicit assumption that ϵ_t is not subject to large variations when t varies.

Therefore, with a subsidy equal to .6, and $\epsilon_t = .14$, the level of crowding-out that would make the subsidy optimal would be: $\overline{G}_{G_0} = -0.9$, which is very large. If we do not think that -0.9 is a reasonable level of crowding-out, the only way to justify the French current subsidy rate is to consider that private contributions are more efficiently used than public direct contributions. In this case, the total level of contributions is: $G = s.G^P + G_0$ and we can show, in that case, that the optimal subsidy rate becomes:

$$t = \frac{s\epsilon_t}{\epsilon_t + (1 + s\overline{G}_{G_0})}$$

which is strictly increasing with s. Following this equation, for a reasonable level of crowding-out of -0.25, considering the current subsidy rate as optimal is equivalent to assessing that $s \simeq 2.4$, which means that private contributions would be more than twice as efficient as public contributions. This assumption seems hardly credible too. These calculations suggest that the actual reduction rate is suboptimal, even after taking into account crowding out and allowing private contribution to be more efficiently used than public funds.

Finally, our results highlight the heterogeneity in charitable giving behaviors, in particular with respect to income. In a public policy perspective, this would suggest that a subsidy scheme varying with the level of income might be more effective to target donors according to their responsiveness to tax incentives.

5 Robustness

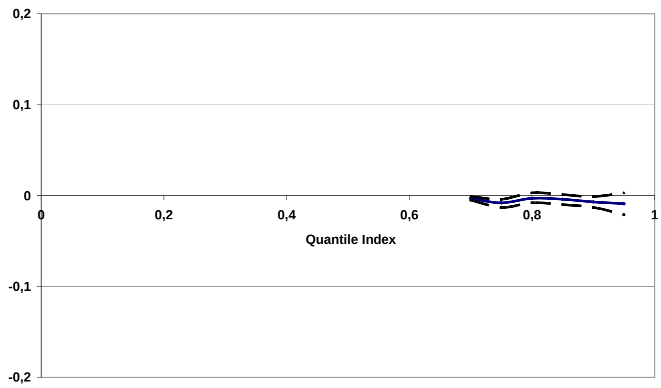
5.1 Temporal trend and placebo

Because of our pseudo-natural experiment framework, our core "simple difference" estimation relies on some identifying assumptions that we discuss in this section.

First, our estimates rely on the fact that the shape of the distribution is not affected by a temporal trend that might reflect the action of unobservable variables correlated with time (and therefore with our identifying variable *ln(reduction rate)*) and which would pollute our estimate of the 2003 and reforms. To make sure that this important assumption is not violated, we run the same 3-step quantile regressions for the years before the reform, and incorporate in the regressors a temporal trend. If the conditional quantiles of gifts were affected by unobservable variables correlated with time, the coefficient estimates of the temporal trend before the reform would be non zero. The results are displayed in figure 8: the estimated coefficient of the trend appears not significantly different from zero for almost all conditional quantiles of gifts. These findings show that the estimation of the impact of the reform displayed on figure 5 does not seem to be attributable to an underlying temporal trend.

Reasoning in terms of simple difference also requires that one makes sure that the distribution of gifts is not subject to sudden shifts or erratic variations that would be spuriously captured in our estimates. To test this assumption of stability of the distribution before or after the reform, we used so-called "placebo" techniques. The principle is to check that attributing artificially the variation in the reduction rate to another year (before the real reform) leads to no significant result for the reduction rate elasticity. For instance, let us falsely consider that the reform was in 2001. As nothing have truly happened in 2001, when creating a fake variation of the reduction rate, and running the same quantile regressions with years 1998 to 2000 against year 2001 to 2002, we should not find that the coefficient for the variable $ln(reductionrate)$ is significantly different from zero. And, in fact, as for the temporal trend, we found that the elasticity of gift with respect to the reduction rate was never significantly different from zero when falsely attributing the reform of the reduction rate to year 2000, 2001 or 2002Results are not displayed but are available on request..

Figure 8: *Temporal trend estimate*



5.2 Double-difference estimates

We have checked so far that no underlying unobservable variable has affected the distribution of gifts before the reform. But, as mentioned previously, it seems that lower quantiles of gifts were affected by a sudden shift in 2004 and 2005, which may be attributable to the important charitable mobilization in response to the tsunami of December 2004. Our aim in this subsection is to investigate to what extent this demand side effect has impacted gifts. In particular, we want to know whether the increase of small gifts after the tsunami would have also occurred without the increase in the reduction rate or whether the reduction rate fostered this large reaction.

To investigate this question, we need to disentangle the Tsunami effect from the effect of the variation in the reduction rate. The principle is therefore to find households that were affected by the Tsunami but not by the tax reduction variations and which could stand for a reasonable control group. To do so, the idea is to compare taxable and non-taxable households, the latter having been affected by the tsunami, but not by the tax reduction reform. The main problem is that we cannot compare all taxable and non taxable households for the reason that taxability is linked to household's incomes and the support of the covariates of our model is very different for the taxable and the non-taxable households. It is thus necessary to find variations of the taxability status that are orthogonal to income, stable in time and not affected by the tax reduction rate variations, to design credible treatment and control groups. We take advantage of the existence of a mechanism of family tax-splitting in the French tax system which creates discontinuities in the taxability status according to the number of person in the household. More specifically, the principle of this tax-splitting mechanism called "quotient familial" is as follows: each household is granted a "quotient familial", that is a number n, which increases with the size of the household. A single person gets n=1, a married couple n=2, the first two children stand for .5 each, and children beyond the third child count for 1. When computing the income tax of the household, the tax scheme is applied to Y/n. Households are taxable if Y/n is superior to the tax allowance, and non taxable if Y/n is inferior to this threshold (Figure 13 in Appendix displays the evolution of the income threshold above which households become taxable according to their quotient familial n). As a result, some households with the same level of income but different family sizes have a different tax status, and this difference can be exploited in a double-difference strategy. Our method is to compare within stable income groups households that are taxable and households that are non taxable because they have one additional unit of "quotient familial" (QF). For instance, we compare, within the income group P54-P62 (corresponding to the 54^{th} to 62^{th} percentiles of the income distribution), households with QF=2 (treatment) versus households with QF=2.5 (control). We did also compare within the income group P62-P68, households with QF=2.5 (treatment) versus households with QF=3 (control), and within the income-group P68-P76, households with QF=3(treatment) versus households with QF=4 (control).

To observe graphically the principle of a double-difference framework in our quantile regression setting, figure 9 shows the distribution of the logarithm of gifts for one treatment group and its associated control group in 2002 and 2004. The intrinsic effect of an increase in the tax reduction can be estimated by comparing the difference of every quantile before and after the reform for the treatment and the control group. Noticeably, the lower part of the distribution of gifts has shifted both for taxable and non-taxable households, reflecting somehow the impact of the tsunami, which has fostered little gifts in the whole population of households. However, it is also significant that upper parts of the distribution of gifts do not seem different in 2002 and 2004 for non-taxable households, while upper parts of the distribution in 2004 have significantly shifted for taxable households. Our estimates extend this graphical distributional analysis to a censored quantile regression model with control covariates. In order to focus on the respective effect of the 2003 reform and the tsunami, we do not include the changes due to the 2005 reform (i.e. we do not include year 2006 in the regression).

The specification becomes:

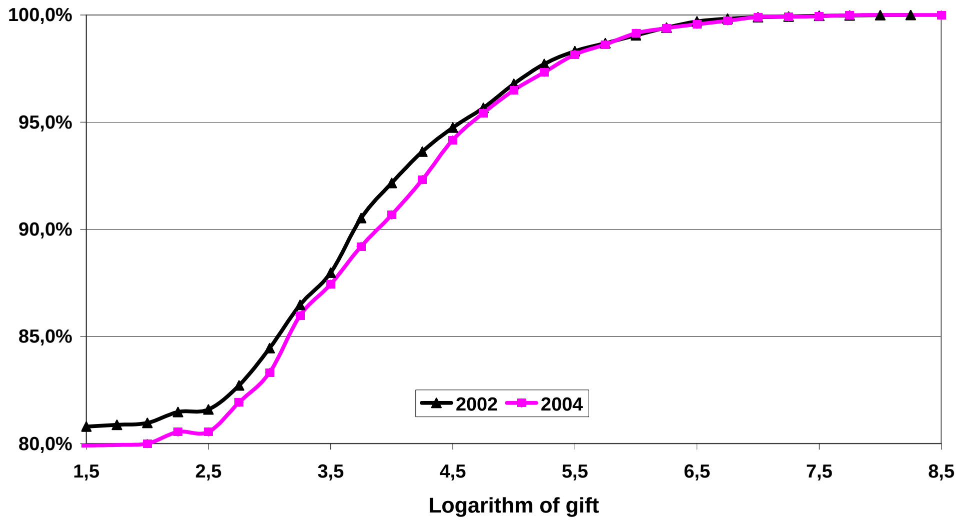
$$Q_{lndon}(\tau) = C + \alpha_1(\tau) * after03 + \alpha_2(\tau) * txb + \alpha_3(\tau)(after03 * txb) + X_i'\beta(\tau) \quad (15)$$

where $after03$ is a dichotomous variable equal to 1 after the 2003 reform and 0 before 2003, txb is a dichotomous variable equal to 1 for taxable households (the treatment group) and 0 for non-taxable-households (the control group). We use in X_i' the log of disposable income and the same control variables as previously. Identification of the impact on contributions of the reduction rate variation in this double-difference framework is brought by the coefficient α_3. We estimate this model following our 3-step CQR estimation technique on every pair of taxable/non-taxable households defined in the previous paragraph. All the results are reported in tables 5, 6 and 7 in appendix. We report here the estimated elasticity for income group P54-P62 in figure 10.

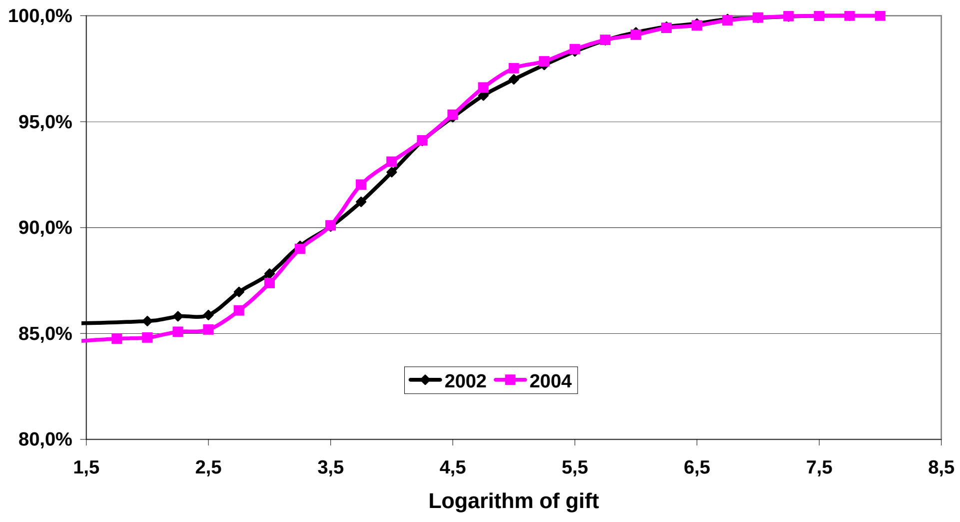
It is interesting to note that the double-difference estimates confirm the simple-difference estimates. The double-difference estimates can be compared with the simple difference estimates for income groups that are near the taxability threshold. If we look at the simple-difference effect on income group P70-80 displayed in figure 7, we find the same pattern and coefficients estimates as the double-difference estimates on income group P68-76 displayed in table 7. The impact on lower quantiles of gifts is just a little weaker when controlling fully for the Tsunami effect. But we are compelled to focus on particular income groups (near the taxability threshold) to compute our double-difference estimates, income groups among which the fraction of donators remains quite small. Therefore confidence intervals for our estimates are quite important. Moreover, these double-difference estimates only give some local

Figure 9: *Evolution of the cumulative distribution function of the logarithm of gift for taxable and non taxable households within income group=P54-P62*

A-Taxable households: QF=2

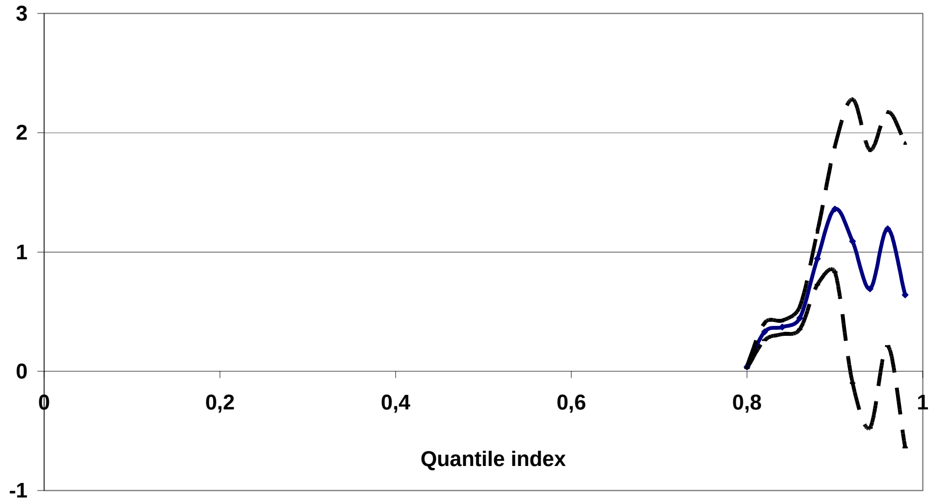


B-Non-taxable households: QF=2.5



Source: Echantillons Lourds DGI. Taxable households only.
Note: Logarithm of gifts are computed from gifts expressed in constant 2004 euros.
P54-P62 represent the group of households with taxable income lying between the 54th percentile and the 62nd percentile of taxable income

Figure 10: *Elasticity of charitable contributions to the reduction rate: Double-difference estimates, QF=2 vs QF=2.5, Income Group=P54-P62*



SOURCE : Echantillons Lourds DGI.

estimates of the impact of the reduction rate, whereas the elasticity that we computed in the simple-difference framework covers the whole distribution of households in terms of income. Finally, the fact that simple-difference and double-difference do not give substantially different results suggest that our baseline estimation strategy is robust.

6 Conclusion

This paper proposes new estimations of income and price elasticities of charitable contributions. To do so, we exploit two recent exogenous increases in tax incentives towards charitable giving provided by two reforms of the French tax system. The French fiscal incentives towards charitable giving, which consist in tax reductions, give us the opportunity to keep clear of usual empirical drawbacks encountered in previous literature, since in our setting, the price of gift is independent of income for all taxpayers. Our data set also enables us to estimates elasticities on the whole population of taxpayers and avoid the problem of sample selection bias that arises with US data, when the analysis is focused on itemizers. We study the heterogeneity of responses among the distributions of gifts using a three-step censored quantile regression estimator proposed by Chernozhukov and Hong. This estimation technique has also the advantage of treating the problem of censoring that has never been raised yet for the estimation of giving behaviors although it is of crucial importance. Our results show that the overall effect of the 2003 and 2005 reforms has been very low. The implied average elasticity of giving among donators in the whole population of taxpayers is 0.14. This estimate is well below the values previously found in the literature and suggests that the actual French reduction rate is too high. Nevertheless, our results also show that the tax reduction elasticity is very heterogenous among taxpayers, in particular according to the level of income. The richest taxpayers appear to be much more sensitive to tax incentives than the whole population. The estimated income elasticities on the whole population of taxpayers are also higher than previously found but decrease when we restrict the sample to the richest taxpayers. These results suggest that a tax subsidy scheme varying with income might be more efficient than a unique reduction rate.

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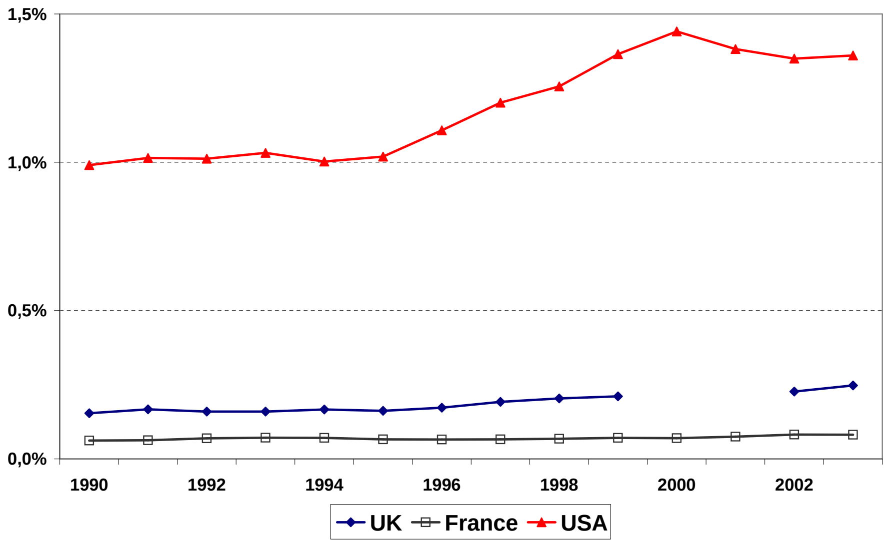
Appendix A : International comparisons concerning charitable contributions

Usually, international comparisons of charitable giving rely on comparative data produced by specialized institutes, like for instance, the John Hopkins Comparative Nonprofit Sector Project, the Charities Aid Foundation, or the National Center for Charitable Statistics. According to these statistics, France is characterized by a very low level of private contributions. But, in most studies, statistics suffer from a certain lack of homogeneity among countries. In particular, for a large number of countries, figures are drafted upon the basis of national surveys that are conducted without any definite common methodology. As a result, the ranking of countries according to their generosity displays some variations across studies.

Figure 11: *Gifts reported in income tax data (France, US, UK) as a percentage of GDP*



In order to produce data that would be more homogeneous and therefore trustworthy for international comparisons, we focused on income tax data for three countries : US, UK and France[35]. It should be emphasized that gifts reported in fiscal

[35]The data we collected are directly held from Income Tax services in each country. For the US, the IRS produces yearly the Statistics of Income (SOI), which display all fiscal aggregates, like Charitable Deductions (see *http://www.irs.gov/taxstats/indtaxstats/article/0,,id=96679,00.html#_grp8*). For the UK, we also have data on the various type of deduction permitted by the Income Tax system (covenants,

datasets account for a vast part of the total amount of gifts reported by the associations through annual surveys. For example, in the US, the annual survey made by Giving USA report in 2001 a total amount of charitable giving of 212 $ billions, when fiscal data report a total amount of gifts of 139 billions. The difference between those two amounts arises because very small cash gifts, gifts that are non itemized, or charitable bequests are not included in income tax data. However, our fiscal data still stands for approximately 65% of the total amounts received by charities each year. Thus, the evolution given in the present figures can be relied upon.

Results are presented in figure 11. The most striking fact is that, as compared to GDP, or to total adjusted gross income, the total amount of gifts reported by individuals in the United States is at least ten times bigger than in France and six times bigger than in the UK ! In 2001, the 129 millions of US taxpayers gave a total of 139 $ billions, while their 33 millions French counterparts gave only 1.120 billion euros. Those gifts represent in 2001 in the US, 2.2% of total adjusted gross income, and 1.4% of US GDP, while in France they represent 0.21% of total gross income and 0.08% of French GDP.

Appendix B : Other aspects of the French Tax system:

Two things must be added concerning our description of the French tax treatment of charitable contributions. First, the existence of a ceiling : the total amount of gift eligible for tax reduction must not exceed 20% of your taxable income. This ceiling is very high however, as compared to ceilings existing in other countries. The ceiling is also very high compared to the distribution of gifts given that the percentage of taxpayers who contribute more than 10% of their taxable income is less than 0.05%.

The other noteworthy detail concerning the tax reduction system is the existence of a special (higher) reduction rate for associations that help very poor people by providing them food or accommodations. For instance in 2006, gifts made for these associations ("Coluche Gifts"[36])are eligible for a tax reduction of 75%, while others gifts benefit from a tax reduction rate of 66%. Yet, this special treatment is

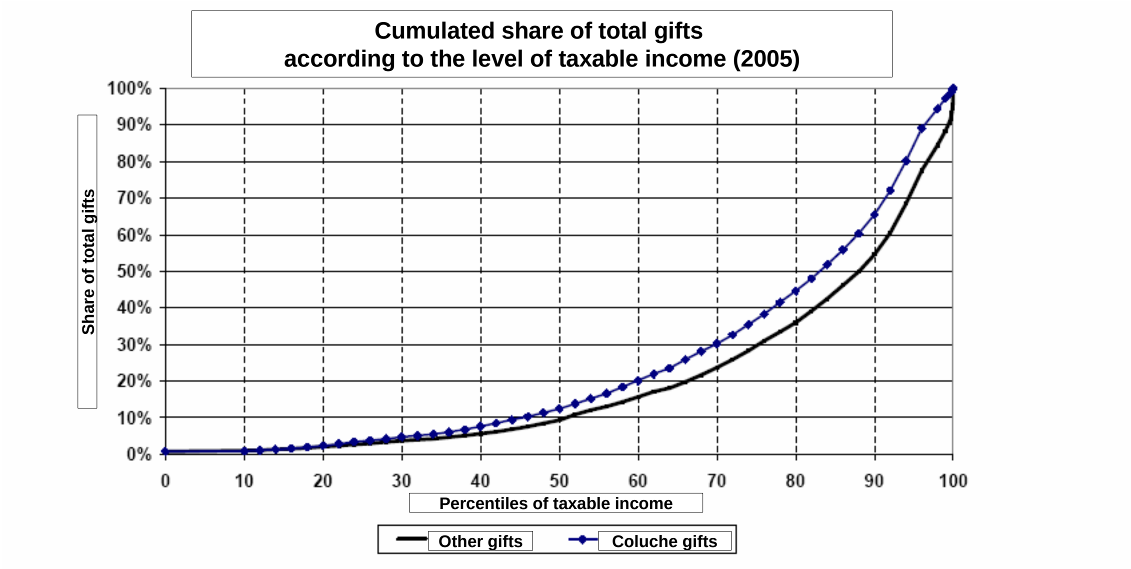
gift aids and give as you earn. (Source : *http://www.hmrc.gov.uk/stats/charities/menu.htm*). For France, the DGI produces through the "Etats 1921" each year the total amount of gifts made and reported by taxpayers in their income declaration.

[36]The special rate is often called "Coluche" rate because it has been created after intense lobbying made by the French humorist Coluche, when he created the charity called "Les Restos du Coeur" in 1988 in order to provide food to poor people.

granted only for the first 470 euros given to "Coluche associations". As far as our estimates are concerned, the existence of different prices is not important, because the "Coluche" reduction rate always moves similarly to the usual rate, and those gifts only stand for a little portion of all gifts (around 10 to 15 %). But, it is still true that those two types of gifts may not have the same price elasticity. In particular, we were able to remark that gifts for Coluche associations and "other" gifts, having different purposes, are not closely substitutable. However, we did not try to disentangle the two elasticities in practice, and only look at the aggregate elasticity of charitable contributions.

Appendix C : Descriptive Tables & Figures

Figure 12: *Share of total gifts according to the level of income*



Source: "Echantillons Lourds" DGI, author's computations
Reading : In 2005, 50% of taxpayers with the lowest taxable income represented only 12% of Coluche gifts and only 10% of all other gifts

Table 2: *Descriptive statistics : Echantillon Lourd DGI*

Full sample

fiscal year	% of taxable households	% of households reporting a gift	mean gift (2004 €)	disposable income	mean age	mean tax (2004 €)	"Quotient familial"	% of wage earners	% of pension earners	% of entrepreneurial income	% of capital income
1998	54%	13,9%	31,2	21 592	48,8	1 647	1,8	60%	29%	5%	2%
1999	53%	13,9%	32,4	22 059	48,8	1 693	1,8	60%	29%	4%	2%
2000	54%	14,0%	32,7	22 480	48,9	1 624	1,8	61%	29%	4%	2%
2001	53%	14,4%	35,4	22 871	48,9	1 495	1,8	61%	29%	4%	2%
2002	53%	14,5%	39,0	22 979	48,9	1 497	1,8	61%	29%	4%	2%
2003	52%	14,5%	37,0	22 762	48,9	1 418	1,8	61%	28%	4%	2%
2004	53%	16,3%	42,7	22 867	49,1	1 423	1,8	61%	28%	4%	2%
2005	54%	15,6%	44,2	23 027	49,2	1 427	1,8	61%	29%	4%	2%
2006	55%	14,9%	44,6	23 662	49,5	1 286	1,8	60%	29%	4%	2%

Taxable households

fiscal year	% of taxable households	% of households reporting a gift	mean gift (2004 €)	disposable income	mean age	mean tax (2004 €)	"Quotient familial"	% of wage earners	% of pension earners	% of entrepreneurial income	% of capital income
1998	100%	20,9%	50,7	31 060	48,0	3 080	1,8	68%	23%	6%	2%
1999	100%	20,8%	52,3	31 887	48,0	3 176	1,8	69%	22%	6%	2%
2000	100%	20,6%	51,8	32 355	47,6	3 078	1,8	70%	21%	6%	2%
2001	100%	21,1%	54,8	32 927	47,3	2 888	1,8	71%	21%	6%	2%
2002	100%	21,2%	60,6	33 070	47,4	2 892	1,8	71%	21%	6%	2%
2003	100%	21,4%	55,9	33 175	47,6	2 804	1,8	71%	20%	5%	2%
2004	100%	24,2%	64,8	33 315	47,9	2 805	1,8	71%	21%	5%	2%
2005	100%	22,8%	64,3	33 074	47,9	2 772	1,8	71%	22%	5%	2%
2006	100%	21,4%	61,6	33 752	48,0	2 507	1,8	71%	22%	5%	2%

"Quotient familial" = number of tax units granted to an household according to its size. Single=1, Married couple=2, each child = 0,5, each child above 3 children=1
Main source of income = type of income that stands for the majority of income. In 1998, for the full sample, wages were the main source of income of 60% of all households.
Incomes, gifts and taxes are expressed in 2004 euros

Appendix D : Regression estimates

Table 3: *Regressions on all taxable households: OLS and Tobit regressions*

	OLS	Tobit
quotient familial	-0.039	0.136
	(-0.044 - -0.034)**	(0.122 -0.150)**
ln(disposable income)	1.201	2.265
	(1.195 - 1.207)**	(2.247 -2.282)**
ln(reduction rate)	0.409	1.300
	(0.382 - 0.435)**	(1.223 - 1.378)**
age	0.023	0.077
	(0.022 - 0.023)**	(0.077 - 0.078)**
single	0.448	1.035
	(0.438 - 0.457)**	(1.006 - 1.065)**
divorced	-0.087	-0.165
	(-0.097 - -0.077)**	(-0.197 - -0.133)**
married	-0.042	0.084
	(-0.051 - -0.034)**	(0.061 - 0.107)**
wage earner	-0.082	10.356
	(-0.115 - -0.049)**	(10.260 - 10.453)**
pensionner	0.576	10.509
	(0.542 - 0.609)**	(10.412 - 10.606)**
Comm., trader	-0.569	3.877
	(-0.605 - -0.533)**	(3.768 - 3.986)**
Independant	-0.165	4.834
	(-0.201 - -0.128)**	(4.728 - 4.940)**
farmer	-0.119	4.156
	(-0.160 - -0.078)**	(4.032 - 4.280)**
real estate incomes	0.426	5.797
	(0.388 - 0.464)**	(5.689 - 5.904)**
capital income earner	-0.605	-2.681
	(-0.653 - -0.558)**	(-2.816 - -2.545)**
Intercept	-12.191	-38.085
	(-12.264 - -12.119)**	(-38.307 - -37.864)**
Observations	2241302	2241302

95% confidence intervals in parentheses. * significant at 5%; ** significant at 1%
NOTE : Reference for marital status is "widowed".

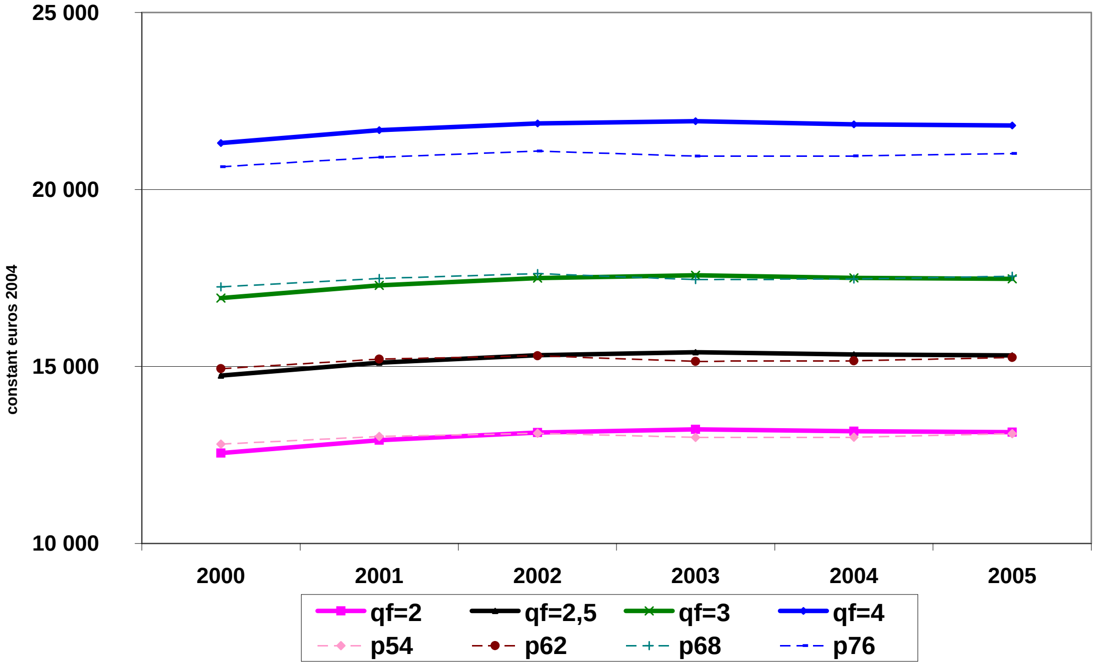
Table 4: *Regressions on all taxable households: Quantile regressions*

	65th Quantile	70th Quantile	75th Quantile	80th Quantile	85th Quantile	90th Quantile	95th Quantile
quotient familial	0.000	-0.092	-0.059	0.072	0.174	0.130	-0.053
	(-0.000 - 0.000)	(-0.098 - -0.086)**	(-0.068 - -0.050)**	(0.062 - 0.082)**	(0.163 - 0.185)**	(0.117 - 0.142)**	(-0.079 - -0.028)**
ln(disposable income)	-0.000	1.660	2.432	2.667	2.785	2.893	2.327
	(-0.000 - 0.000)	(1.653 - 1.668)**	(2.422 - 2.442)**	(2.656 - 2.678)**	(2.772 - 2.797)**	(2.879 - 2.906)**	(2.302 - 2.351)**
ln(reduction rate)	0.000	0.117	0.137	0.072	-0.031	0.146	0.410
	(-0.000 - 0.000)	(0.084 - 0.149)**	(0.090 - 0.184)**	(0.018 - 0.126)**	(-0.092 - 0.031)	(0.079 - 0.213)**	(0.283 - 0.537)**
age	0.000	0.027	0.043	0.053	0.062	0.073	0.051
	(-0.000 - 0.000)	(0.027 - 0.027)**	(0.042 - 0.043)**	(0.053 - 0.054)**	(0.062 - 0.063)**	(0.072 - 0.073)**	(0.050 - 0.053)**
single	-0.000	0.799	1.124	1.241	1.240	0.863	0.754
	(-0.000 - 0.000)	(0.786 - 0.812)**	(1.105 - 1.142)**	(1.220 - 1.261)**	(1.217 - 1.263)**	(0.836 - 0.889)**	(0.702 - 0.806)**
divorced	-0.000	-0.017	-0.077	-0.144	-0.190	-0.086	-0.069
	(-0.000 - 0.000)	(-0.031 - -0.003)*	(-0.096 - -0.057)**	(-0.166 - -0.121)**	(-0.215 - -0.165)**	(-0.114 - -0.059)**	(-0.121 - -0.016)*
married	0.000	-0.081	-0.170	-0.191	-0.194	-0.306	-0.312
	(-0.000 - 0.000)	(-0.090 - -0.071)**	(-0.184 - -0.156)**	(-0.207 - -0.174)**	(-0.213 - -0.176)**	(-0.326 - -0.286)**	(-0.350 - -0.275)**
wage earner	-4.195	-1.358	-0.010	0.386	0.529	0.628	0.123
	(-4.195 - -4.195)**	(-1.371 - -1.344)**	(-0.029 - 0.008)	(0.365 - 0.407)**	(0.505 - 0.552)**	(0.603 - 0.653)**	(0.076 - 0.170)**
pensionner	-0.898	1.243	1.959	1.890	1.641	1.209	0.521
	(-0.898 - -0.898)**	(1.229 - 1.257)**	(1.940 - 1.979)**	(1.868 - 1.912)**	(1.616 - 1.665)**	(1.182 - 1.236)**	(0.470 - 0.571)**
Comm., trader	-4.195	-3.023	-1.880	-1.559	-1.349	-0.992	-0.790
	(-4.195 - -4.195)**	(-3.040 - -3.006)**	(-1.902 - -1.858)**	(-1.584 - -1.535)**	(-1.375 - -1.323)**	(-1.020 - -0.964)**	(-0.843 - -0.737)**
Independant	-4.195	-0.920	0.044	0.285	0.368	0.456	0.196
	(-4.195 - -4.195)**	(-0.933 - -0.907)**	(0.026 - 0.063)**	(0.264 - 0.306)**	(0.344 - 0.391)**	(0.431 - 0.481)**	(0.149 - 0.243)**
farmer	-4.195	-1.447	-0.134	0.218	0.372	0.501	0.118
	(-4.195 - -4.195)**	(-1.464 - -1.430)**	(-0.158 - -0.110)**	(0.191 - 0.245)**	(0.342 - 0.402)**	(0.469 - 0.533)**	(0.057 - 0.178)**
real estate incomes	-1.366	0.700	1.382	1.418	1.285	0.996	0.486
	(-1.366 - -1.366)**	(0.686 - 0.714)**	(1.362 - 1.402)**	(1.395 - 1.441)**	(1.260 - 1.310)**	(0.969 - 1.023)**	(0.434 - 0.537)**
capital income earner	-1.154	-1.031	-0.942	-0.850	-0.759	-0.559	
	(-4.195 - -4.195)**	(-1.166 - -1.142)**	(-1.048 - -1.013)**	(-0.962 - -0.922)**	(-0.873 - -0.828)**	(-0.784 - -0.735)**	(-0.604 - -0.513)**
Intercept	4.195	-16.140	-25.551	-28.529	-29.958	-30.633	-21.570
	(4.195 - 4.195)**	(-16.231 - -16.050)**	(-25.676 - -25.426)**	(-28.667 - -28.392)**	(-30.105 - -29.811)**	(-30.786 - -30.480)**	(-21.856 - -21.285)**
Observations	1792861	1878578	1952020	2008465	2044639	2060718	2068910

95% confidence intervals in parentheses. * significant at 5%; ** significant at 1%

NOTE : Reference for marital status is “widowed”. Because of heavy computational requirements with a dataset of more than 3 million observations, we did not compute the coefficient for every percentile, but for the .65-th quantile, .7-th, etc. to the .95-th quantile.

Figure 13: *Taxability threshold given QF*



NOTE : Taxability threshold=income thresholds above which a household is taxable given its quotient familial.

LECTURE : In 2000, households with quotient familial=2 were taxable as long as they earned more than 12,553 euros; households with QF=2.5 as long as they earned more than 14,743 euros. The level of the 54th percentile of taxable income was then 12,803 and the level of the 62th percentile was 14,937. Therefore, within the income group P54-P62, households with QF=2 were taxable while households with QF=2.5 were not.

Table 5: *Double-difference estimates : Income Group P54-P62, QF=2(treatment) vs QF=2.5(control)*

	ols			**3** step CQR estimates			
		q index=0,8	q index=0,84	q index=0,88	q index=0,92	q index=0,94	q index=0,98
ln(disposable income)	0.965	0.062	0.505	1.482	3.954	3.111	2.145
	(0.879 - 1.050)**	(0.059 - 0.066)**	(0.487 - 0.524)**	(1.409 - 1.555)**	(3.607 - 4.301)**	(2.765 - 3.457)**	(1.747 - 2.543)**
taxable	-0.154	-0.007	-0.083	-0.111	0.168	0.037	-0.100
	(-0.190 - -0.119)**	(-0.008 - -0.006)**	(-0.090 - -0.076)**	(-0.139 - -0.082)**	(0.018 - 0.318)*	(-0.109 - 0.182)	(-0.257 - 0.057)
taxable*after2003	0.088	0.007	0.074	0.189	0.218	0.138	0.128
	(0.025 - 0.151)**	(0.005 - 0.009)**	(0.062 - 0.085)**	(0.145 - 0.234)**	(-0.020 - 0.456)	(-0.095 - 0.371)	(-0.128 - 0.383)
after2003	-0.014	-0.003	-0.020	-0.045	-0.025	-0.048	0.012
	(-0.068 - 0.039)	(-0.004 - -0.001)**	(-0.030 - -0.011)**	(-0.082 - -0.008)*	(-0.220 - 0.171)	(-0.241 - 0.145)	(-0.205 - 0.229)
age	0.017	0.001	0.007	0.024	0.070	0.055	0.041
	(0.016 - 0.019)**	(0.001 - 0.001)**	(0.007 - 0.008)**	(0.023 - 0.026)**	(0.063 - 0.076)**	(0.049 - 0.062)**	(0.034 - 0.048)**
single	0.214	0.025	0.141	0.198	-0.172	-0.061	0.897
	(0.088 - 0.341)**	(0.020 - 0.029)**	(0.115 - 0.167)**	(0.101 - 0.294)**	(-0.689 - 0.345)	(-0.589 - 0.467)	(0.384 - 1.410)**
divorced	0.088	0.003	-0.046	-0.005	-0.625	-0.274	0.557
	(-0.038 - 0.214)	(-0.002 - 0.007)	(-0.073 - -0.018)**	(-0.101 - 0.091)	(-1.139 - -0.111)*	(-0.793 - 0.246)	(0.053 - 1.061)*
married	0.040	0.000	0.009	-0.025	-0.712	-0.478	0.302
	(-0.079 - 0.159)	(-0.004 - 0.004)	(-0.015 - 0.033)	(-0.115 - 0.065)	(-1.189 - -0.235)**	(-0.967 - 0.010)	(-0.169 - 0.772)
wage earner	-0.217	-4.099	-3.966	-3.059	-0.439	-0.463	-0.523
	(-0.491 - 0.057)	(-4.102 - -4.095)**	(-3.982 - -3.949)**	(-3.132 - -2.987)**	(-0.780 - -0.099)*	(-0.800 - -0.127)**	(-0.824 - -0.223)**
pension earner	0.125	-0.617	-0.365	0.047	0.517	0.105	-0.055
	(-0.148 - 0.399)	(-0.620 - -0.613)**	(-0.382 - -0.349)**	(-0.020 - 0.114)	(0.206 - 0.828)**	(-0.209 - 0.418)	(-0.340 - 0.230)
comm.	-0.149	-4.134	-3.993	-3.002	-0.619	-0.445	-0.351
	(-0.440 - 0.142)	(-4.145 - -4.123)**	(-4.020 - -3.966)**	(-3.085 - -2.920)**	(-1.002 - -0.237)**	(-0.825 - -0.065)*	(-0.718 - 0.016)
indep.	0.142	-4.092	-3.782	-0.454	2.024	1.392	1.105
	(-0.229 - 0.513)	(-4.096 - -4.087)**	(-3.804 - -3.761)**	(-0.541 - -0.366)**	(1.613 - 2.435)**	(0.988 - 1.795)**	(0.715 - 1.496)**
farmer	0.015	-4.078	-3.798	-0.993	1.151	0.598	0.138
	(-0.285 - 0.316)	(-4.082 - -4.074)**	(-3.819 - -3.778)**	(-1.077 - -0.908)**	(0.760 - 1.543)**	(0.207 - 0.988)**	(-0.244 - 0.520)
real estate incomes	0.257	-1.016	-0.427	0.274	1.399	0.830	0.714
	(-0.056 - 0.570)	(-1.020 - -1.012)**	(-0.446 - -0.407)**	(0.194 - 0.353)**	(1.024 - 1.774)**	(0.455 - 1.205)**	(0.355 - 1.072)**
capital income earner	0.226	-0.873	-0.467	0.328	1.433	0.930	0.801
	(-0.267 - 0.719)	(-0.877 - -0.869)**	(-0.488 - -0.446)**	(0.240 - 0.416)**	(1.011 - 1.855)**	(0.511 - 1.349)**	(0.395 - 1.207)**
Intercept	-9.352	3.465	-1.046	-11.582	-38.041	-28.369	-17.762
	(-10.239 - -8.465)**	(3.430 - 3.501)**	(-1.235 - -0.856)**	(-12.330 - -10.833)**	(-41.538 - -34.543)**	(-31.841 - -24.898)**	(-21.740 - -13.784)**
Observations	57183	43800	47822	52847	53456	53572	54301
R-squared	0.082						

NOTE : 95% confidence intervals in parentheses. * significant at 5%; ** significant at 1%

Table 6: *Double-difference estimates : Income Group P62-P68, QF=2.5(treatment) vs QF=3(control)*

	ols	3 step CQR estimates				
		q index=0,9	q index=0,92	q index=0,94	q index=0,96	q index=0,98
ln of disposable	0.719	3.067	2.955	2.120	1.599	1.156
income	(0.633 - 0.805)**	(2.721 - 3.413)**	(2.042 - 3.869)**	(1.614 - 2.626)**	(1.112 - 2.086)**	(0.886 - 1.426)**
taxable	-0.126	-0.581	-0.480	-0.328	-0.340	-0.078
	(-0.163 - -0.089)**	(-0.729 - -0.432)**	(-0.939 - -0.022)*	(-0.582 - -0.074)*	(-0.602 - -0.078)*	(-0.219 - 0.062)
taxable*after2003	0.023	0.263	0.252	0.074	0.187	-0.016
	(-0.039 - 0.086)	(0.045 - 0.480)*	(-0.418 - 0.922)	(-0.298 - 0.446)	(-0.197 - 0.570)	(-0.218 - 0.186)
after2003	0.016	-0.078	-0.245	-0.084	-0.228	0.126
	(-0.030 - 0.062)	(-0.225 - 0.069)	(-0.688 - 0.199)	(-0.335 - 0.167)	(-0.490 - 0.034)	(-0.012 - 0.265)
age	0.012	0.040	0.041	0.032	0.021	0.023
	(0.011 - 0.014)**	(0.034 - 0.046)**	(0.023 - 0.060)**	(0.021 - 0.042)**	(0.010 - 0.032)**	(0.017 - 0.030)**
single	0.040	-0.101	-0.112	0.037	-0.077	-0.194
	(-0.072 - 0.152)	(-0.510 - 0.307)	(-1.374 - 1.149)	(-0.621 - 0.695)	(-0.751 - 0.597)	(-0.551 - 0.163)
divorced	0.030	-0.306	0.285	0.083	0.070	0.037
	(-0.070 - 0.129)	(-0.666 - 0.054)	(-0.832 - 1.402)	(-0.519 - 0.686)	(-0.546 - 0.685)	(-0.301 - 0.375)
married	0.047	-0.359	0.003	0.079	0.117	0.029
	(-0.036 - 0.130)	(-0.645 - -0.073)*	(-0.862 - 0.867)	(-0.365 - 0.524)	(-0.333 - 0.567)	(-0.207 - 0.264)
wage earner	-0.153	-1.351	-0.495	-0.386	-0.477	-0.792
	(-0.463 - 0.157)	(-1.665 - -1.036)**	(-1.463 - 0.473)	(-0.883 - 0.111)	(-0.978 - 0.025)	(-1.074 - -0.511)**
pension earner	0.482	1.023	0.394	0.382	0.404	-0.109
	(0.169 - 0.794)**	(0.706 - 1.341)**	(-0.611 - 1.399)	(-0.148 - 0.912)	(-0.142 - 0.949)	(-0.413 - 0.196)
comm.	-0.161	-1.258	-1.227	-0.504	-0.597	-0.979
	(-0.481 - 0.160)	(-1.609 - -0.907)**	(-2.418 - -0.037)*	(-1.072 - 0.065)	(-1.163 - -0.030)*	(-1.301 - -0.657)**
indep.	0.228	1.424	1.065	0.840	0.695	0.453
	(-0.153 - 0.608)	(1.065 - 1.784)**	(-0.030 - 2.160)	(0.271 - 1.408)**	(0.120 - 1.271)*	(0.139 - 0.767)**
farmer	0.016	0.739	0.473	0.158	-0.014	-0.537
	(-0.312 - 0.344)	(0.374 - 1.104)**	(-0.619 - 1.564)	(-0.414 - 0.730)	(-0.591 - 0.564)	(-0.862 - -0.212)**
real estate	0.299	1.472	0.832	0.604	0.710	0.227
incomes	(-0.073 - 0.670)	(1.087 - 1.857)**	(-0.319 - 1.983)	(-0.001 - 1.208)	(0.092 - 1.327)*	(-0.109 - 0.562)
capital income	0.321	1.469	1.039	1.070	1.095	0.677
earner	(-0.300 - 0.942)	(1.077 - 1.861)**	(-0.163 - 2.241)	(0.441 - 1.699)**	(0.453 - 1.736)**	(0.322 - 1.032)**
Intercept	-6.728	-27.663	-26.164	-17.437	-11.376	-6.545
	(-7.637 - -5.819)**	(-31.165 - -24.160)**	(-35.400 - -16.927)**	(-22.542 - -12.332)**	(-16.281 - -6.471)**	(-9.272 - -3.818)**
Observations	33898	31013	29867	30836	31896	32733
R-squared	0.077					

NOTE : 95% confidence intervals in parentheses. * significant at 5%; ** significant at 1%

Table 7: *Double-difference estimates : Income Group P68-P76, QF=3(treatment) vs QF=4(control)*

	ols	3 step CQR estimates						
		q index=0,86	q index=0,88	q index=0,9	q index=0,92	q index=0,94	q index=0,96	q index=0,98
ln of disposable	0.812	2.435	4.289	2.740	1.838	1.266	1.309	1.695
income	(0.712 - 0.912)**	(2.305 - 2.565)**	(3.735 - 4.843)**	(1.593 - 3.887)**	(1.142 - 2.535)**	(0.547 - 1.985)**	(0.805 - 1.812)**	(1.104 - 2.285)**
taxable	-0.101	-0.409	-0.243	-0.049	-0.292	-0.341	-0.262	-0.478
	(-0.145 - -0.058)**	(-0.456 - -0.361)**	(-0.482 - -0.003)*	(-0.569 - 0.471)	(-0.586 - 0.003)	(-0.642 - -0.040)*	(-0.453 - -0.070)**	(-0.783 - -0.174)**
taxable*after2003	0.058	0.484	0.349	0.150	0.200	0.416	0.239	0.358
	(-0.017 - 0.132)	(0.420 - 0.547)**	(0.034 - 0.664)*	(-0.542 - 0.841)	(-0.191 - 0.590)	(0.024 - 0.807)*	(-0.006 - 0.483)	(-0.045 - 0.761)
after2003	0.033	-0.091	0.300	0.227	0.024	-0.221	-0.046	0.080
	(-0.031 - 0.097)	(-0.141 - -0.041)**	(0.054 - 0.545)*	(-0.316 - 0.771)	(-0.286 - 0.333)	(-0.533 - 0.092)	(-0.242 - 0.149)	(-0.255 - 0.415)
age	0.021	0.038	0.103	0.115	0.075	0.063	0.046	0.048
	(0.019 - 0.023)**	(0.035 - 0.040)**	(0.092 - 0.115)**	(0.093 - 0.136)**	(0.062 - 0.088)**	(0.050 - 0.077)**	(0.036 - 0.055)**	(0.034 - 0.062)**
single	-0.121	-0.463	0.776	0.546	-0.071	0.305	0.386	0.648
	(-0.290 - 0.048)	(-0.639 - -0.287)**	(-0.129 - 1.682)	(-1.522 - 2.614)	(-1.181 - 1.040)	(-0.824 - 1.434)	(-0.258 - 1.030)	(-0.094 - 1.390)
divorced	-0.161	-0.747	-0.116	-0.119	-0.626	0.024	0.475	0.957
	(-0.357 - 0.034)	(-0.944 - -0.550)**	(-1.161 - 0.930)	(-1.988 - 1.751)	(-1.712 - 0.461)	(-1.034 - 1.081)	(-0.214 - 1.165)	(0.062 - 1.852)*
married	-0.175	-0.772	0.048	0.081	-0.250	-0.088	-0.133	0.233
	(-0.296 - -0.054)**	(-0.884 - -0.661)**	(-0.535 - 0.631)	(-1.233 - 1.395)	(-1.015 - 0.515)	(-0.831 - 0.655)	(-0.672 - 0.406)	(-0.239 - 0.705)
wage earner	-0.086	-1.787	0.324	-0.119	-0.393	-0.416	-0.291	-0.530
	(-0.417 - 0.245)	(-1.946 - -1.628)**	(-0.292 - 0.940)	(-1.292 - 1.055)	(-0.939 - 0.154)	(-0.952 - 0.120)	(-0.641 - 0.059)	(-1.022 - -0.037)*
pension earner	0.385	0.847	0.082	-1.129	-0.685	-0.691	-0.290	-0.561
	(0.044 - 0.726)*	(0.702 - 0.992)**	(-0.534 - 0.699)	(-2.388 - 0.131)	(-1.318 - -0.052)*	(-1.311 - -0.071)*	(-0.680 - 0.101)	(-1.168 - 0.046)
comm.	-0.184	-2.207	-0.725	-1.265	-3.001	-1.490	-0.856	-0.994
	(-0.526 - 0.159)	(-2.441 - -1.973)**	(-1.430 - -0.020)*	(-2.624 - 0.094)	(-3.634 - -2.369)**	(-2.123 - -0.857)**	(-1.268 - -0.444)**	(-1.569 - -0.419)**
indep.	0.277	0.926	2.247	1.301	0.747	0.490	0.793	0.731
	(-0.122 - 0.676)	(0.756 - 1.096)**	(1.577 - 2.916)**	(-0.006 - 2.607)	(0.115 - 1.378)*	(-0.129 - 1.109)	(0.388 - 1.198)**	(0.144 - 1.318)*
farmer	0.033	-1.271	0.914	0.520	-0.048	-0.251	-0.169	-0.285
	(-0.315 - 0.381)	(-1.446 - -1.096)**	(0.240 - 1.587)**	(-0.786 - 1.826)	(-0.673 - 0.577)	(-0.871 - 0.368)	(-0.577 - 0.239)	(-0.854 - 0.284)
real estate	0.120	0.083	1.033	-0.218	-0.141	-0.355	0.150	0.077
incomes	(-0.294 - 0.533)	(-0.096 - 0.261)	(0.314 - 1.753)**	(-1.656 - 1.221)	(-0.851 - 0.570)	(-1.038 - 0.328)	(-0.286 - 0.587)	(-0.518 - 0.673)
capital income	0.295	0.601	2.205	0.986	0.450	0.218	0.647	0.554
earner	(-0.369 - 0.959)	(0.425 - 0.777)**	(1.485 - 2.925)**	(-0.453 - 2.424)	(-0.242 - 1.143)	(-0.459 - 0.896)	(0.210 - 1.085)**	(-0.091 - 1.199)
Intercept	-7.709	-21.103	-43.333	-27.965	-16.324	-9.938	-9.308	-12.558
	(-8.766 - -6.653)**	(-22.493 - -19.714)**	(-49.106 - -37.561)**	(-39.572 - -16.358)**	(-23.297 - -9.351)**	(-17.108 - -2.769)**	(-14.340 - -4.276)**	(-18.503 - -6.613)**
Observations	32624	26451	27716	28219	30451	31071	30692	31292
R-squared	0.047							

NOTE : 95% confidence intervals in parentheses. * significant at 5%; ** significant at 1%