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ELASTICITY OF TAXABLE INCOME FOR SPANISH TOP TAXPAYERS

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ABSTRACT

This paper studies behavioral responses of taxpayers to marginal tax rates. Spain is an interesting case study, not only because over the last years there have been relatively large and frequent upward changes in the personal income tax, especially for top taxpayers, but also because these changes have not been homogeneous across regions. Using the recently developed bunching approach, we investigate whether these changes have provoked responses of taxpayers using a large administrative data set of individual tax declarations. We conclude taxpayers' responses – if any – are very small despite that, for example, for top taxpayers (those with taxable income above 300,000 euros) the marginal tax rate has increased up to 13 points (from 43 to 56%) in some regions during the period analyzed (2009-12). No differences seem to emerge either along time (no evidence of dynamic responses) or across types of income (self-employed income vs. labor income). To confirm these results, we perform a difference-in-difference regression model based on repeated cross-section data. In coherence with the bunching approach, the estimated responses are certainly very small, such that for top taxpayers, the elasticity of taxable income is as low as 1.4%.

Keywords: Spanish personal income tax, elasticity of taxable income, bunching, diff-in-diff regression model.

JEL Codes: H21, H24.

1. INTRODUCCIÓN

The optimal design of the personal income tax requires the development of theoretical models that are applicable (Diamond and Saez, 2011), which means that they should be based on reasonable assumptions and the resulting formulae should need just a few empirically estimable "sufficient statistics". Certainly the optimal formulae will always embody a inevitable efficiency-equity tradeoff, but a necessary condition to solve this tradeoff is having information about the efficiency costs of taxation. In this paper, we aim at obtaining some empirical evidence of these costs for the Spanish personal income tax by means among others of the estimation of the so-called elasticity of taxable income (from now on, ETI).

The literature on ETI initiated with Feldstein (1999). This will be briefly reviewed in Section 2.1, but basically acknowledges that taxpayers might not only respond to changes in taxes modifying their behavior (labor supply or saving decisions), but also eluding (transferring income from one source to another as long as there is a differential tax treatment, or along time in such a way they "choose" to pay taxes when it is most convenient to them) or evading them. Although a first step for optimal tax design is inferring the ETI as one of the "sufficient statistics" cited in the above paragraph (Saez, 2001), it is also useful to disentangle the components of the ETI; for example, as long as evasion is the predominant reaction of taxpayers to a variation in the tax burden, this could be used to redirect the efforts of the tax administration rather than modifying (or focusing on the modification of) the statutory tax parameters.

Nowadays, there is a great deal of empirical analyses that estimate ETI (see the recent review by Saez *et al.*, 2012). In some cases, the results look astonishing as – given the theoretical models employed and the empirical estimates obtained – top personal income marginal tax rates – the usual parameter the literature focuses on – can be as high as 75% depending on the emphasis given to equity (for example, just to quote one of the seminal analyses of the recent literature that is in accordance with the "principles" set a the beginning of this Introduction, Saez, 2001). However, for the Spanish case, despite the availability of microdata for a long period of time, as far as we know, there are very few papers published on this issue (Sanmartín, 2007; and Sanz-Sanz *et al.*, 2015). In contrast, there have been important tax changes – which will be reviewed in Section 3.2. – not only along time, but also across Autonomous Communities (*i.e.*, the state or intermediate layer of government in Spain; from now on ACs).

Thus, from a policy point of view, the Spanish case seems particularly interesting. While there have been important marginal tax rate increases even with some differences across regions, there has not been a proper evaluation of the efficiency consequences of these changes. In contrast, there is a long tradition in Spain for the analysis of the redistributive impact of tax changes (see, among others, Onrubia and Picos, 2012), which is no doubt relevant especially given the increasing trend in income inequality since 2007[1], when the economic crisis started, and the successive tax reforms that have favored capital income and capital gains.

Taking advantage of the richness of the Spanish microdata and of the frequent tax changes observed during the last years and across ACs, we aim at estimating the ETI. For this purpose, we will adopt the "bunching approach", which is primarily based on a graphical analysis; this aims at checking whether the smooth distribution of taxpayers along taxable income is distorted by kinks in the slope of choice sets due to jumps in the marginal tax rate. From this analysis, though, we are not able to clearly observe any non-smoothness of the distribution caused by jumps in the marginal tax rate. This is independent of the year under analysis, of the taxpayer prototype (defined according to her major source of income excluding capital income), or of the AC under analysis. There is no evidence of a sluggish response along time either.

To confirm this result of no apparent response, we have also estimated a regression model based on the differences in marginal tax rates from one year to another, which are not homogeneous across ACs. The results confirm those obtained under the bunching approach. The estimated response (i.e., ETI) is very small. For top taxpayers, those whose response should be a priori the largest one, the elasticity is 1.4%. This is very much in contrast with other elasticities for top taxpayers estimated in

[1] See, for example, *Statistics on Income and Living Conditions*, EU-SILC 2012 (Eurostat).

Spain. No doubt this merits further empirical research, and in the Conclusions will provide some further avenues of research on this topic.

The structure of the rest of the paper is the following. In Section 2, we will provide an overview of the literature on empirical estimation of taxpayers' responses to the personal income tax (Section 2.1) with an emphasis on the scarce evidence on the Spanish context (Section 2.2). In Section 3, we will explain the methodology – based on bunching - we propose to use (Section 3.1) and also the microdata available for the Spanish case (Section 3.2). In Section 4, we will show the results of the application of this methodology; in Section 5, as we will argue, we will go one step further in the estimation of the elasticity of taxable income performing a diff-in-diff regression model. In Section 6, we conclude and also propose further avenues of empirical research for the Spanish case

2. LITERATURE REVIEW

2.1. General Context

Under mild assumptions, which reliability can be in any case tested, the recent theoretical literature on optimal income taxation provides implementable formulae to calculate optimal (marginal) tax rates (Saez, 2001). Thus, in the easiest situation where the objective of the social planner is "soaking the rich" (i.e., the weight of the top taxpayers in the social welfare function is null), the optimal tax rate for top taxpayers inversely depends on the Pareto parameter – as has been extensively shown, the top tail distribution of taxpayers can be approximated by a Pareto distribution – and on the elasticity of taxable income. That is why, it is so relevant for tax policy to estimate the ETI.

It is not an easy task, though, to estimate this elasticity (see, for example, Slemrod, 1998; Saez *et al*. 2012). The obvious necessary condition is having a relatively important tax reform such that not all taxpayers are affected equally in order to disentangle the control and the treatment group. Tax changes have to be clear enough as the taxpayers understand the individual benefits from responding to the change; and ideally, only marginal tax rates should change. Once these conditions are met, there are technical difficulties to define the control group in order to avoid tax responses confound from other changes driven by nontax factors (i.e., the parallel trend assumption must hold); and the very definition of control and treatment groups might create a mean-reversion problem.

Despite the aforementioned problems, the greater availability of administrative data combined with tax reforms has made nowadays there are plenty of analysis estimating taxpayers' responses to taxation. As the review by Sanz-Sanz et al. (2015) shows there is a lot of variation in the estimated values of the ETI. Saez *et al.* (2012) consider 0.25 to be a mid-point of the estimates, at least for the US. However, this is compatible with estimated elasticities as low as 0.02 (only labor income) for a smaller tax reform in Denmark (Kleven and Schultz, 2014); even for the same case under study, when the reform is large, the elasticity is not very large either, 0.12.

All in all, the diversity of estimates (across countries, along time, depending on the employed empirical technique or depending on the source of income), on the one hand, make necessary to provide robust estimates taking into as many factors as possible (in our case, across regions, along time, checking different techniques and sources of income). On the other hand, precisely because of the diversity of results, this cannot be directly compared with other previous results.

2.2. Spanish Context

Despite the availability of microdata for Spain for a long period of time[2], as far as we know, there are only two published analyses of the efficiency cost of personal income taxation (Sanmartín, 2007; and Sanz-Sanz *et al.*, 2015). They both employ panel data and the same empirical technique, although obtain very different ETI, being six times larger the one obtained by Sanz-Sanz *et al.* (2015). Next, we explain the legal context, the methodology and results obtained by this latter paper.

[2] http://www.ief.es/recursos/estadisticas/fuentes_tributarias.aspx

Sanz-Sanz *et al.* (2015) take advantage of a tax reform that became into force in 2007. They consider both saving income (taxed at a proportional rate) and the rest of income (see fn. 8 below), which is taxed according to a progressive tax schedule. In order to have a synthetic measure of the marginal tax rate faced by each taxpayer, they construct a weighted average of both marginal tax rates, where the corresponding weight is the share of each source of taxable income over total income. As regards the proportional tax rate on saving income, with respect to 2006, this increased 3% (from 15 to 18%), while the 2006-7 comparison of the tax rates applicable to the rest of income is more difficult to carry out. In general, we could conclude marginal tax rates tended to decrease, in particular, for high-income individuals[3]. In 2007, the only AC that enacted a change in the regional tax schedule – more on this in Section 3.2.1 – was the AC of Madrid, which decreased the marginal tax rate of each income threshold applicable to non-saving income[4] such that the total decrease amounted to 1%; so a very small variation with respect to the rest of ACs.

The authors exploited the PIT returns panel, and followed the empirical methodology proposed by Auten and Carroll (1999)[5]. Basically, their endogenous variable is the variation of Gross Income[6] between 2006 and 2007, and this is regressed with respect to the 2006-7 change in the marginal tax rate and a set of control variables. As usual endogeneity of the marginal tax rate is an issue, but especially in this case because of the weighted construction of the total marginal tax rate, as we explained in the previous paragraph. They instrument the marginal tax by means of the so-called "virtual marginal tax rate". Somehow, this is the expected marginal tax rate, in our case, in 2007, and it is constructed applying the 2007 tax schedule to 2006 income inflated to be expressed in 2007€. In order to control for mean reversion, they control for the log of 2006 income and low income tax units were dropped from the panel.

The average elasticity – i.e., for all sources of income (including capital) and all range of taxpayers – is equal to 0.676; they show the income elasticity is null, and so that elasticity picks up a substitution effect. They also obtain an elasticity of 0.682 for business and capital income altogether, and – as expected and according to previous literature – much lower for labor income, 0.337. They also test for differential elasticities across ACs – arguing the authors that the source and distribution of income might differ –, and finally estimate an elasticity as large as 3.6 for those taxpayers whose income is larger than 100,000€. This latter value seems too high, but as there is no previous empirical evidence for the Spanish case we cannot have a benchmark to compare it with. In contrast the average elasticity, albeit a little bit large as well (also with respect to the 0.1 estimated by Sanmartín (2007)), is in accordance with other empirical studies carried our for other countries. Undoubtedly, it becomes a challenge to check the robustness of these analyses, and so be useful to guide future tax reforms in Spain based on solid efficiency grounds.

3. EMPIRICAL METHODOLOGY AND DATA

3.1. The Bunching Approach

The so-called "Bunching Approach" is being widely employed as to estimate behavioral responses, and so structural parameters useful for tax policy design[7]. This approach takes advantage of discontinuities in the slope of choice sets. In the case of taxation, the discontinuity can occur through the mar-

[3] In 2006, note those with income above 46,818€ faced a marginal tax rate equal to 45%. In 2007, the threshold changed such that those with income between 32,360 and 52,360€ faced a tax rate equal to 37%, and above this latter amount, the rate was 43%. That is why, we conclude the marginal tax rate decreased, at least for those with taxable income above 46,818€. At the bottom, in 2006, the marginal tax rate was 15% for taxable income below 4,161.6€; 24% for income in the range 4,161.6-14,357.2€; and 28% in the range 14,357.52-26,842.32€; in 2007, in the range 0-17,360€, the rate was 24%, and 28% for the range 17,360-32,360€. Thus, only for those with income below 4,161.4, the marginal tax rate increased a great deal, from 15 to 24%.

[4] In fact, ACs have never got legal power to vary the tax rates applicable to saving income, not even nowadays.

[5] Sanmartín (2007) also employed this empirical approach, but for a reform enacted in 1988.

[6] Apparently, this refers to the Base Imponible, that is, the sum of net income from each source and before the application of the itemized deductions (or Broad Income, according to the terminology employed by Gruber and Saez, 2002). If so, it does not account for potential responses with respect to those deductions, which might be important (Saez, 2010).

[7] See Kleven (2016) for an excellent and updated review on this approach.

ginal tax rate (kinks) or through the average tax rate (notches). In this brief review, we will focus on the former type of discontinuity, as this is the one we will exploit in our empirical analysis.

Basically, the bunching approach is based on the idea that, in absence of kinks, the distribution, in our case, of taxpayers along income should be smooth. However, this smoothness might be disrupted precisely because of a discontinuity in the slope of the choice set; again, in our case, as a consequence of an increase in the marginal tax rate. If we observe an abnormal increase in the density function at a (convex) kink (bunching), this would be evidence in favor of the fact that taxpayers respond to taxes (this very clearly shown by means of the Figure 1 in the review of Kleven, 2016). Hence, the necessary condition for this technique to be useful is that there are relatively large kinks; as will argue in Section 3.2.1 this is our case for our period under analysis. And obviously, that taxpayers respond, that is, there is bunching. In order to infer this, visual inspection of the histograms has to be carried out.

Then assuming taxpayers respond to these discontinuities, the next challenge is estimating the response obtaining in this way an elasticity of income with respect to the marginal tax rate. The added value of the paper by Saez (2010) lies on the fact that, by means of a theoretical development, the (compensated) income elasticity can be inferred from the response by the marginal buncher, and that this response is proportional to the amount of excess bunching. The excess bunching can be estimated by comparing the actual distribution with a counter-factual distribution assuming there is no bunching.

3.2. Spanish PIT Microdata

3.2.1. *Statutory Marginal Tax Rates Along Time and Across ACs*

During the period under analysis (2009-2012), there have been several important changes in the personal income tax schedule. In the graphs below, we show how the marginal tax rate varies along taxable income (in Spanish, *Base Liquidable General*)[8]. As the ACs are entitled to vary the regional tax schedule, we are showing the situation of each AC, which is the combination of the tax rates set by the central government (equal for all the ACs) and the tax rates set by each AC[9].

Precisely, in order to interpret the graphs below, it is convenient, first, to understand the structure of the personal income tax schedule of any AC. In 2009, according to the regional financing system, the marginal tax rates of the personal income tax schedule were split between the central and the regional governments. The split was not equal, but 35% for the AC and the rest for the central government. This split did not necessarily imply that the share of tax revenue collected were 35:65, since both layers of government could legislate over their personal income tax schedule. In 2010, the original split became 50:50.

As regards the top marginal tax rate, and supposing the corresponding AC did not legislate over its tax schedule, the total rate was 43% from a taxable income equal to 53,407.2€ in 2009 and 2010[10]. From 2011, there was a surge in the top marginal tax rate having all ACs passed their corresponding tax schedule; this is in contrast to previous year where only La Rioja, the AC of Madrid, the AC of Murcia and the AC of Valencia had done it. By now just focusing on the central government, it set new thresholds: between 53,407.2 and 120,000.2, between this latter amount up to 175,000.2 (one point in-

[8] It includes labor and self-employed income, real state property rents (including an imputation for non-rented dwellings excluding the first-residence of the taxpayer) and short run capital gains. Labor income accounts for about 93% of the *Base Liquidable General*; if we also take into consideration saving income (taxed in the so-called *Base Liquidable del Ahorro*), the share of labor income is 87%, approximately. Therefore, by far, labor income is the most important source of income taxed in the Spanish personal income tax. General aggregated tax statistics can be looked up at: http://www.agenciatributaria.es/AEAT.internet/datosabiertos/catalogo/hacienda/Estadistica_de_los_declarantes_del_IRPF.shtml

[9] Note, though, the microdata only includes information from the so-called Common Regime ACs, that is, data from the Basque Country and Navarre – which have their own tax system and own tax administration – are not included in the database, and so we cannot analyze tax changes occurred in those ACs.

[10] Just to have an idea of the kind and importance of taxpayers included in the top threshold, note – from aggregate tax statistics (see fn. 2) – the percentage of taxpayers with taxable income above 60,000€ in 2009 was 3.82% and the share of taxable income declared by that group of "top" income taxpayers was 17.88%. Hence, the top marginal tax rate was far away, for example, from the top 1% group of taxpayers.

crease in the marginal tax rate), and from 175,00.2 onwards (two points increase in the tax rate). In 2012, because of the crisis of the public finances, the central government split the last threshold into two: from 175,000.2 to 300,000.2 (6 points increase in the rate), and from 300,000.2 onwards (7 points in the rate). Let see what happened in each particular AC and the total marginal tax rate faced in these top thresholds.

In 2011, the surge in the top marginal tax rate supposed for those between 120,000.2 and 175,000.2€, their marginal tax rate increased from 43% up to a range of 47% (Andalusia and Extremadura) to 43.9% (Madrid and La Rioja); and for those with a taxable income above 175,000.2€, the marginal rate increased again from 43% up to a range of 49% (Catalonia) to 44.9% (Madrid and La Rioja). Hence, in 2011, there was an important increased for all top income taxpayers, but in particular for those residing in Catalonia, whose marginal tax rate increased 5%. In 2012, the surge was even more pronounced, for those located at the 53,407.2-120,000.2€ threshold, the marginal tax rate also increased from 43% to a range between 46.9% (Madrid and La Rioja) and 48.08% (Canarias); for those between 120,000.2€ and 175,000€, the marginal tax rate increased from, recall, a range between 43.9%-47% to a range between 48.9% (Madrid and La Rioja) and 53% (Andalusia); those between 175,000.2 and 300,000.2€, the marginal tax rate increased up to a range between 50.9% (Madrid and La Rioja) and 55% (Andalusia and Catalonia); finally, for those above 300,000.2 (recall, a new 2012 threshold), their marginal tax rate was as high as 56% (again, Andalusia and Catalonia), and at least it was 51.9% (Madrid and La Rioja). Therefore, again we can see great differences across ACs, and in any case note the large surge in top marginal tax rates such that for those with a taxable income above 300,000.2€, in 3 years, the marginal tax rate increased up to 13% (from 43% up to 56% in ACs like Catalonia and Andalusia).

As regards the tax rates faced by the bottom threshold, the lowest tax rate was 24% for levels of taxable income up to 17,707.2 with minor variations among ACs. This tax rate increased up to 24.75% in 2012, again with minor differences among ACs. In the graphs above, it can be checked that the tax rates faced by the intermediate thresholds also tended to increase.

Figure 1
Marginal Tax Rates for Catalonia (2009-12)

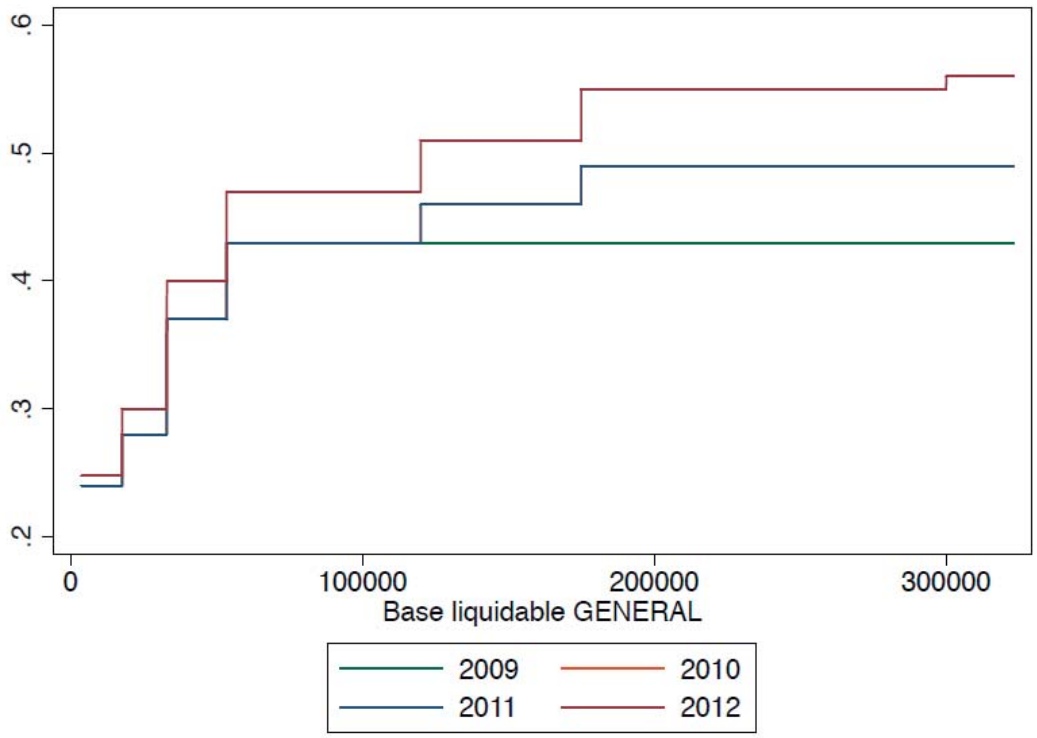


Figure 2
Marginal Tax Rates for the AC of Madrid and La Rioja (2009-12)

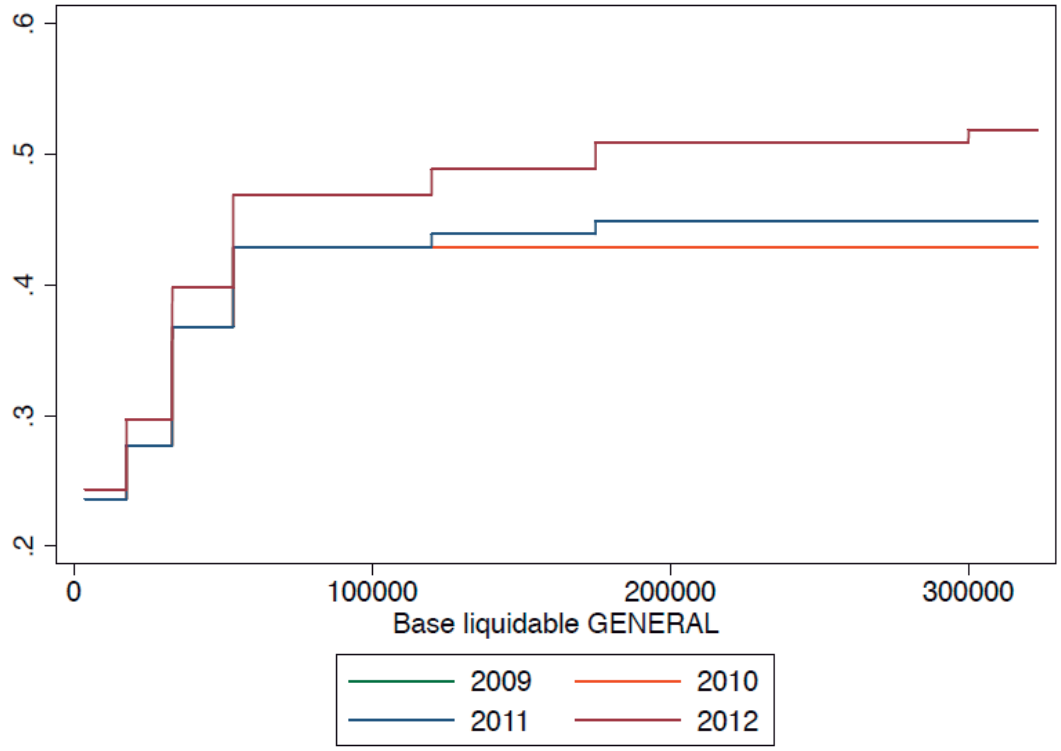


Figure 3
Marginal Tax Rates for the AC of Murcia (2009-12)

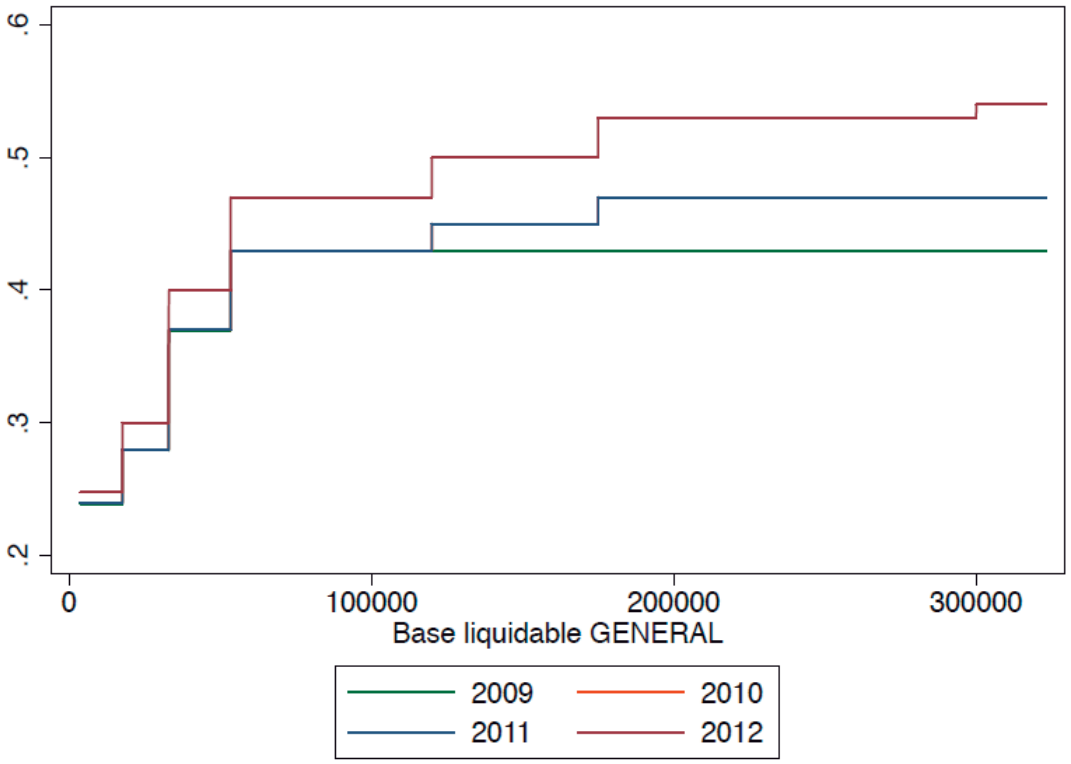


Figure 4
Marginal Tax Rates for the AC of Valencia (2009-12)

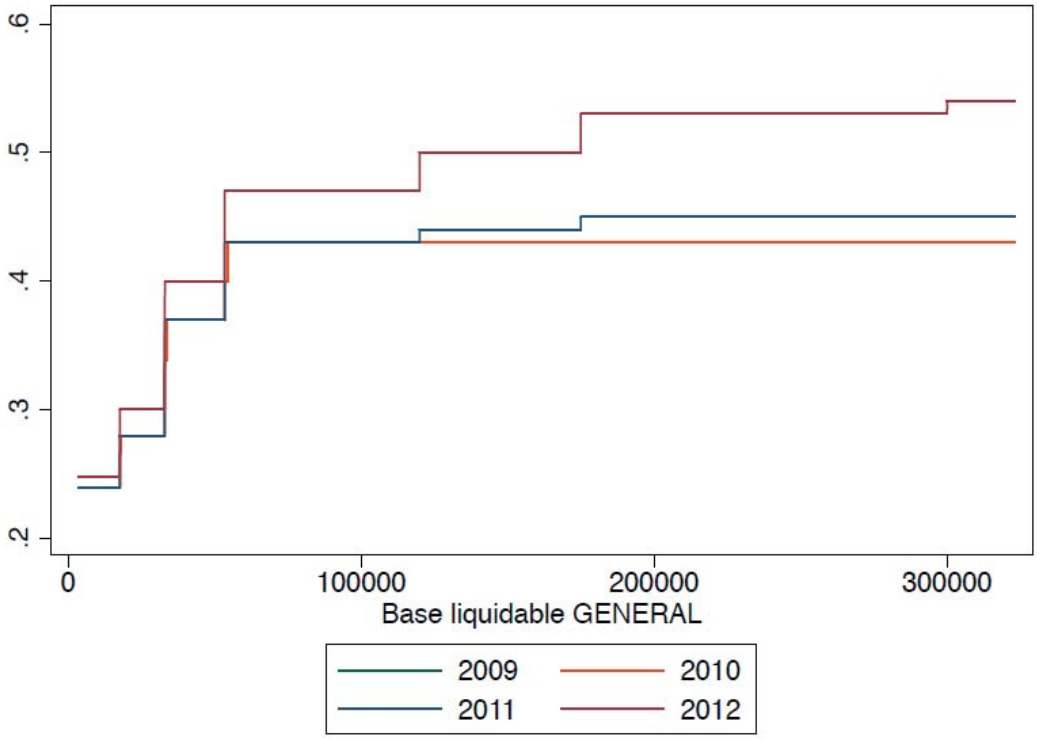


Figure 5
Marginal Tax Rates for Aragón, Baleares, Castilla-La Mancha, Castilla-León and Galicia (2009-12)

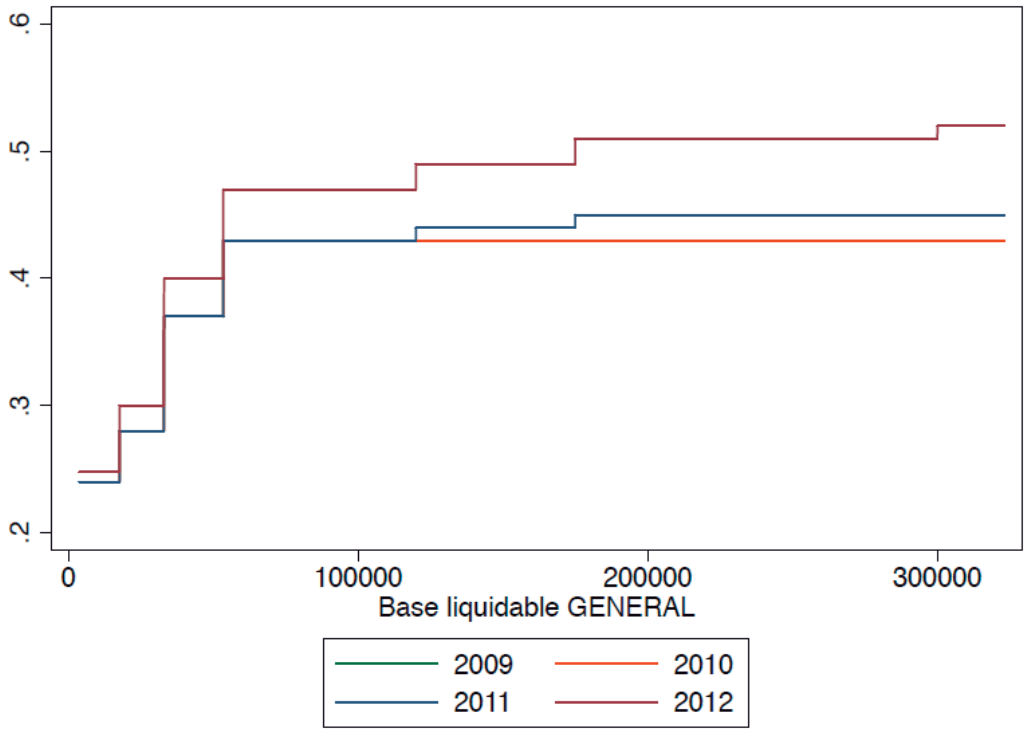


Figure 6
Marginal Tax Rates for Canarias (2009-12)

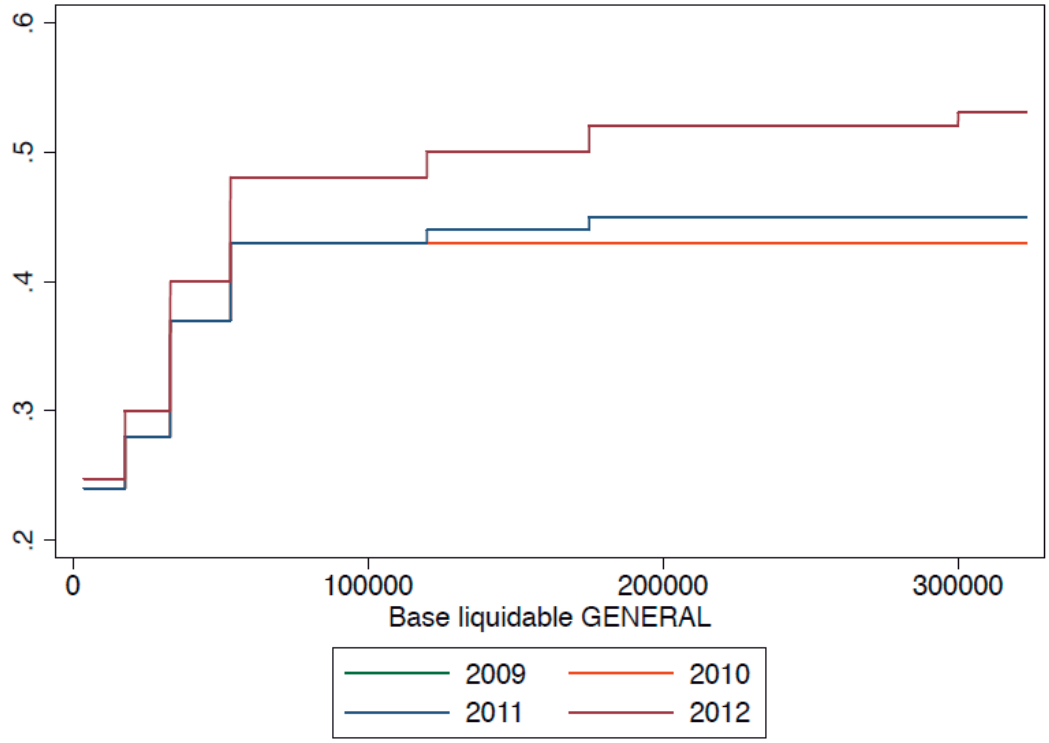


Figure 7
Marginal Tax Rates for Asturias (2009-12)

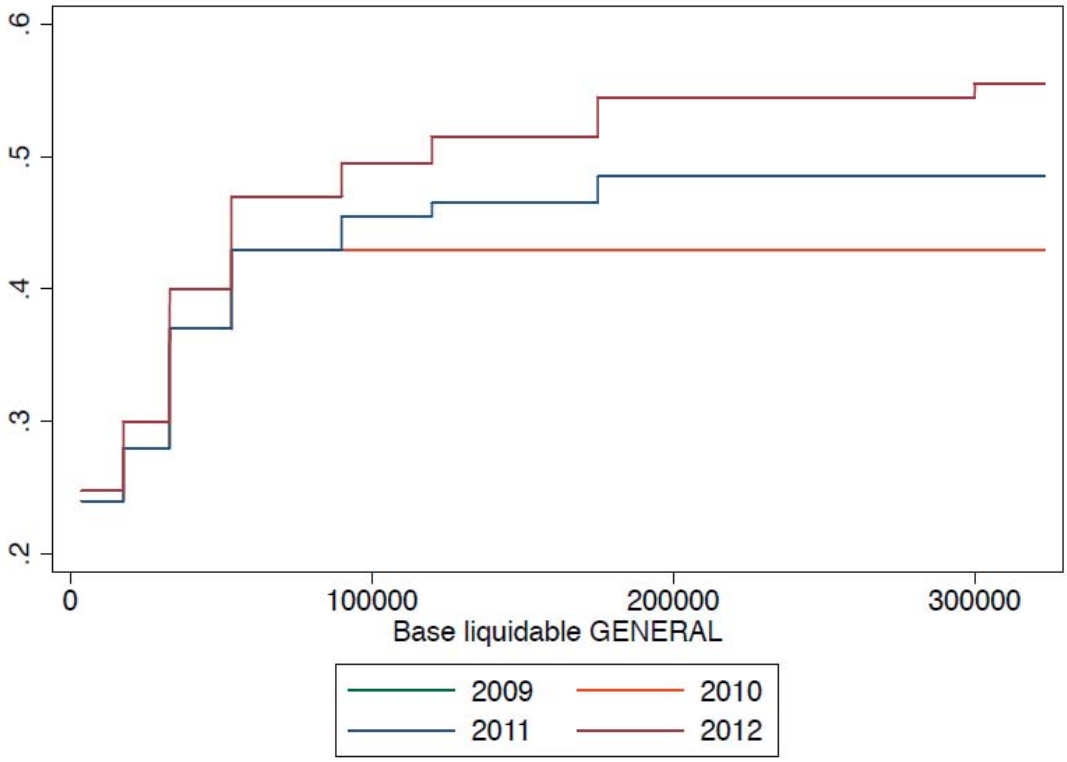


Figure 8
Marginal Tax Rates for Cantabria (2009-12)

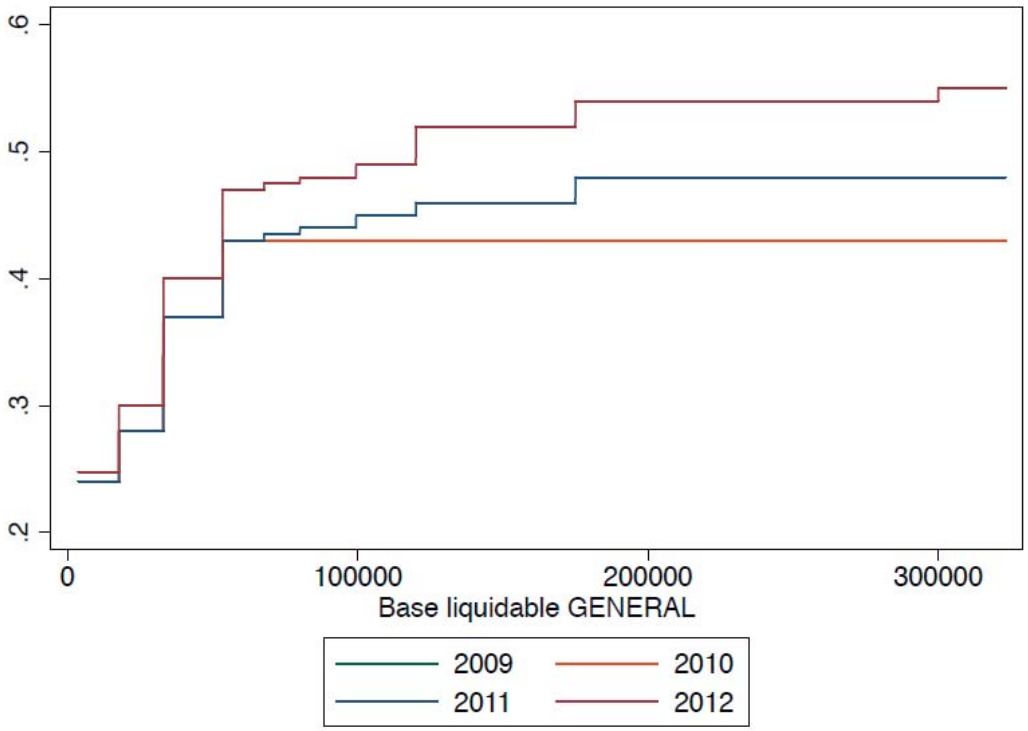


Figure 9
Marginal Tax Rates for Extremadura (2009-12)

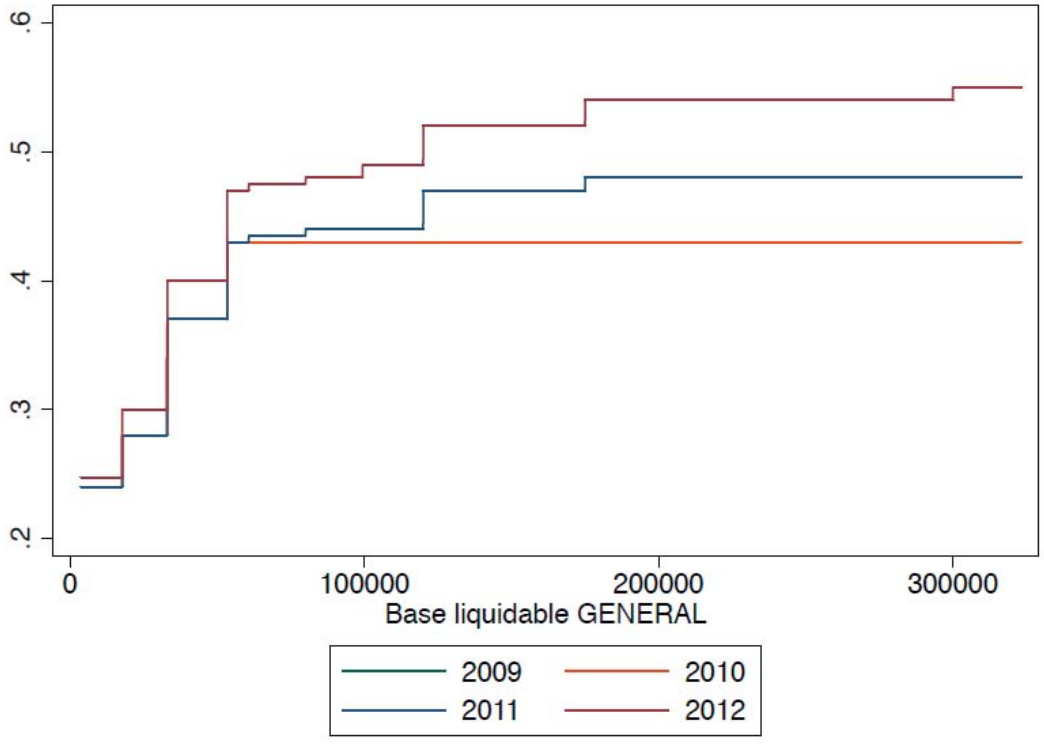
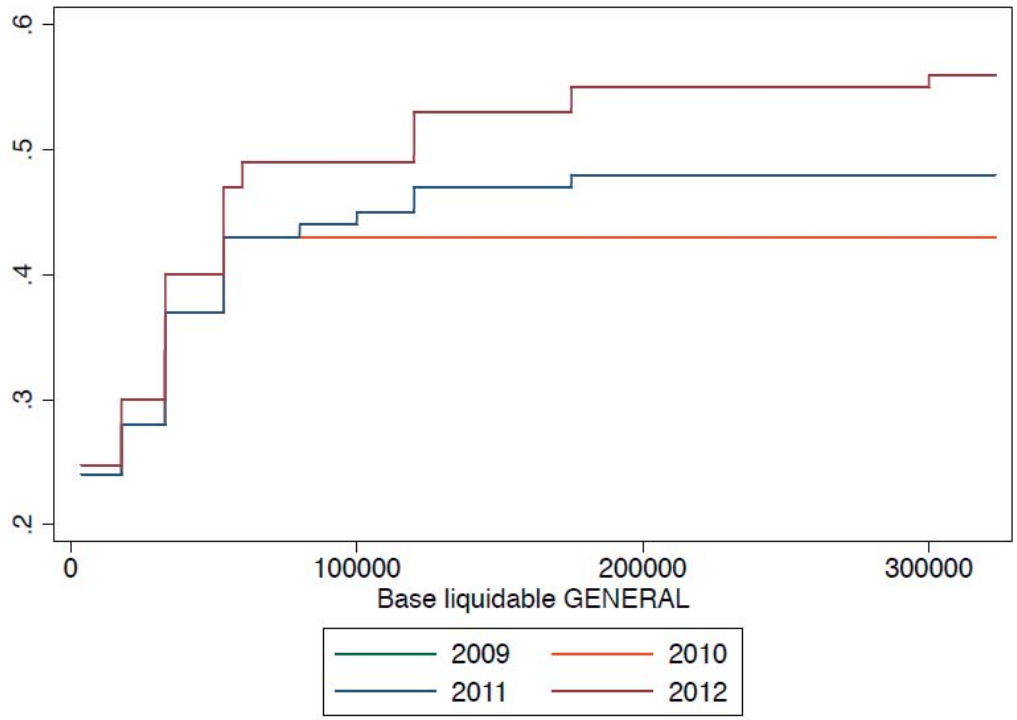
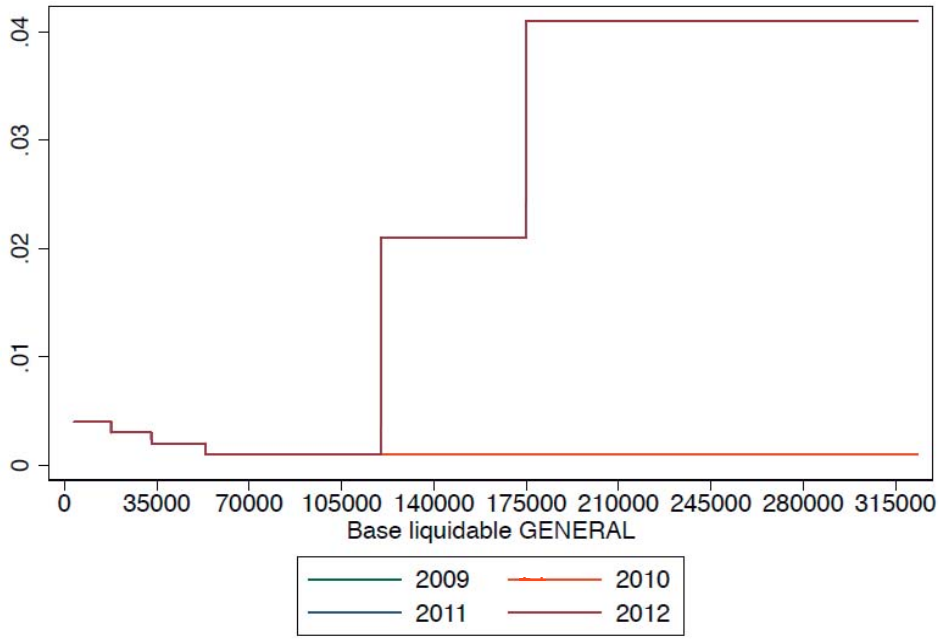


Figure 10
Marginal Tax Rates for Andalusia (2009-12)



In the Figure 11 below, we compare the situation of two of the wealthiest AC: Cataluña and Madrid. The former has tended to be one of the most proactive ACs in rising tax rates, while the latter has done right the opposite. In particular, according to the figure, we clearly see that for the lowest thresholds, there has been a decreasing difference (i.e., greater marginal tax in Catalonia) of 0.4 and 0.1%. In 2011 and 2012, Cataluña increased the top marginal tax rates such that for the threshold 120,000.2 to 175,000.2€ the difference was +2.1%, and for 175,000.2€ onwards the marginal tax rate in Catalonia was 4.1% higher than in Madrid. In the previous two years, the difference of marginal tax rates was very small, 0.1%.

Figure 11
A Comparison of Marginal Tax Rates (2009-12): Catalonia vs. AC of Madrid



These differences along time, across income thresholds and between ACs are the ones we want to empirically exploit to estimate the efficiency costs of personal income taxation.

3.2.2. *Description of the Spanish PIT Microdata*

We use the Spanish PIT Microdata (*Muestra de IRPF*) as a repeated cross section for the years 2009, 2010, 2011, and 2012. The data has been designed as a stratified sample and applying the respective weights allows us to construct the complete distribution of income tax declarations in Spain with an approximate number of 19 million annual observations.

Table 1 presents the summary statistics for the four variables we will analyze in this paper, separately for the four years within our period. As a general trend, we observe a decreasing means throughout these years that can be explained by the deterioration of income subject to the personal income tax during the crisis. The taxable income (*Base Liquidable*) shrunk by 5% between 2009 and 2012. Interestingly, the decline in income from economic activities (-13%) contributed to this by a larger amount than the decline in labor income, which, over the four years, accumulated to 4.3%.[11]

To proceed with our analysis, we construct income groups of 1,000€, for which we compute the fraction of tax declarations as a share of the total number of observations for the entire distribution. In this way, we obtain bins of 1,000€, each of which represents a certain fraction of the distribution.

Table 1
Summary statistics

Year	Variable	Obs	Mean	Std. Dev.	Min	Max
2009	labor income	19315324	20434.45	31763.07	0	23400000
	income from economic		848.6858	11717.42	-7878355	12000000
	tax base (base imponible)		18915.08	34542.38	-6211877	54900000
	tax base (base liquidable)		17883.28	34134.46	-6211877	54900000
2010	labor income	19257143	20362.81	28620.41	0	17500000
	income from economic		809.5308	11298.91	-8239530	11300000
	tax base (base imponible)		18821	31005.44	-8234024	39900000
	tax base (base liquidable)		17820.86	30571.17	-8234024	39900000
2011	labor income	19467579	20230.58	27246.43	0	27700000
	income from economic		750.5376	10568.34	-8213113	9323439
	tax base (base imponible)		18611.04	30642.83	-11000000	27700000
	tax base (base liquidable)		17648.61	30211.23	-11000000	27700000
2012	labor income	19379350	19547.07	26319.38	0	16200000
	income from economic		734.9893	11632.62	-5684947	13700000
	tax base (base imponible)		17915.83	30455.52	-17200000	29900000
	tax base (base liquidable)		16989.03	30044.73	-17200000	29900000

4. EMPIRICAL RESULTS

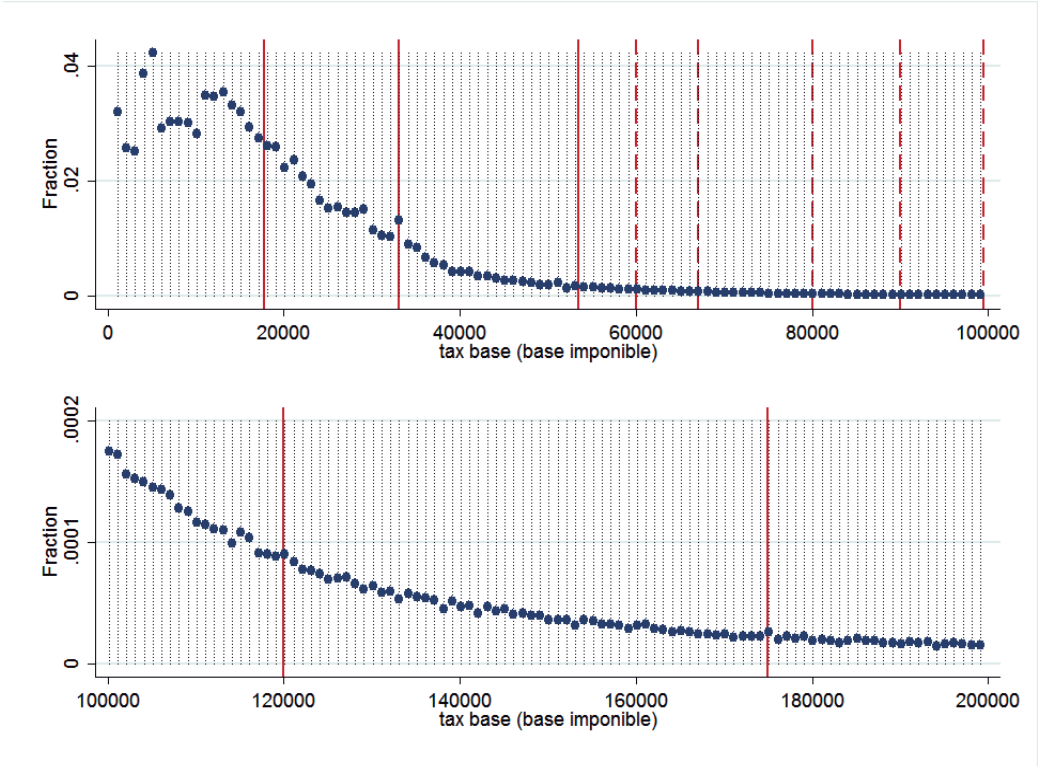
In the figures below, we show the distribution of taxpayers (histogram) along several definitions of income (from particular sources of income to taxable income, that is, the aggregate of all sources income minus itemized deductions). Here, we just show the results for 2012, as it is probably the most interesting fiscal year because of the surcharge enacted by the central government, which was as high as +7% for those with taxable income above 300,000€. For each one of the rest of years analyzed (2009-2011), the corresponding histograms – with the same structure as for 2012 – are included as an Annex.

[11] We will return to this later when we discuss the dynamic effects of changes in the distribution.

In Figure 12, we can see the distribution of Broad Income. The vertical red solid lines identify the jumps in the marginal tax rates, while the dashed ones account for jumps in particular ACs (see Section 3.2.1). The first panel of Figure 12 (13) shows the distribution of Broad Income (Taxable Income) up to 100,000€, while the second panel shows it for taxpayers with an income from 100,000 to 200,000€. The distribution of very high-income taxpayers is shown by means of Figure 13 and Figure 15 for Broad Income and Taxable Income, respectively. In Figure 16, we show the histogram for those taxpayers whose main source of income is self-employed income, while in Figure 17 we show the histogram for those who do not have self-employed income, and so their main source of income is labor.

From visual inspection of the figures, there is no (clear) evidence of bunching despite the big jumps in the marginal tax rates as described and shown in Section 3.2.1. On average, the jumps are 6%, 10%, 7%, 3%, 3% and, for those with income above 300,000€, 1%. If we focus on the results of Taxable Income (Figure 14 and 15), at the third threshold – which applies from 33,007€, and where there is the greatest jump in the marginal tax rate, 10% – there might be some bunching, although – if any – this is really small. Around 120,000€, there seems to be some bunching also, but in any case this would not be due to the 2012 jump in the marginal tax rates, as it can also be seen for other years when there was not a jump in the tax rate[12]. Hence, this bunching is probably due to

Figure 12
Distribution of Broad Income (*Base Imponible*) for income levels up to 200,000€ (2012)



[12] By means of informal conversations with tax inspectors and tax advisors, we have not been able to infer any salient tax parameter that could explain this bunching at 120,000€.

Figure 13
Distribution of Broad Income (*Base Imponible*) for top taxpayers (2012)

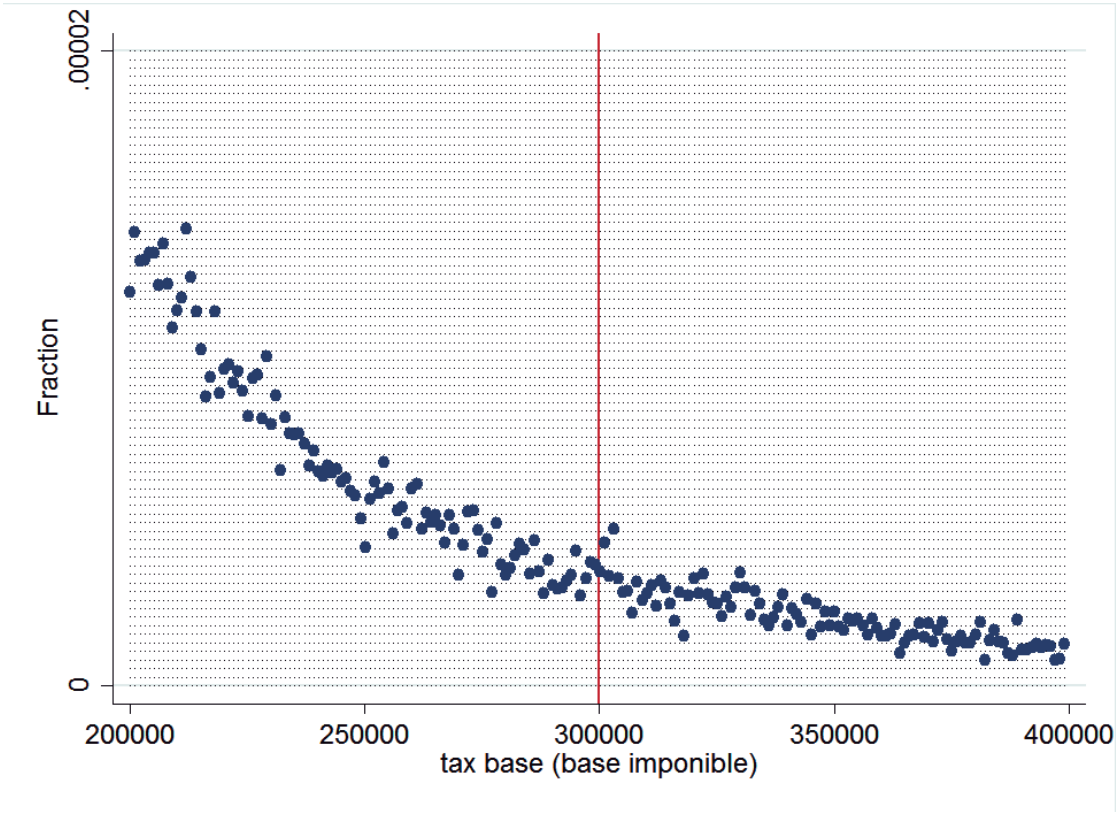


Figure 14
Distribution of Taxable Income (*Base Liquidable*) for income levels up up to 200,000€ (2012)

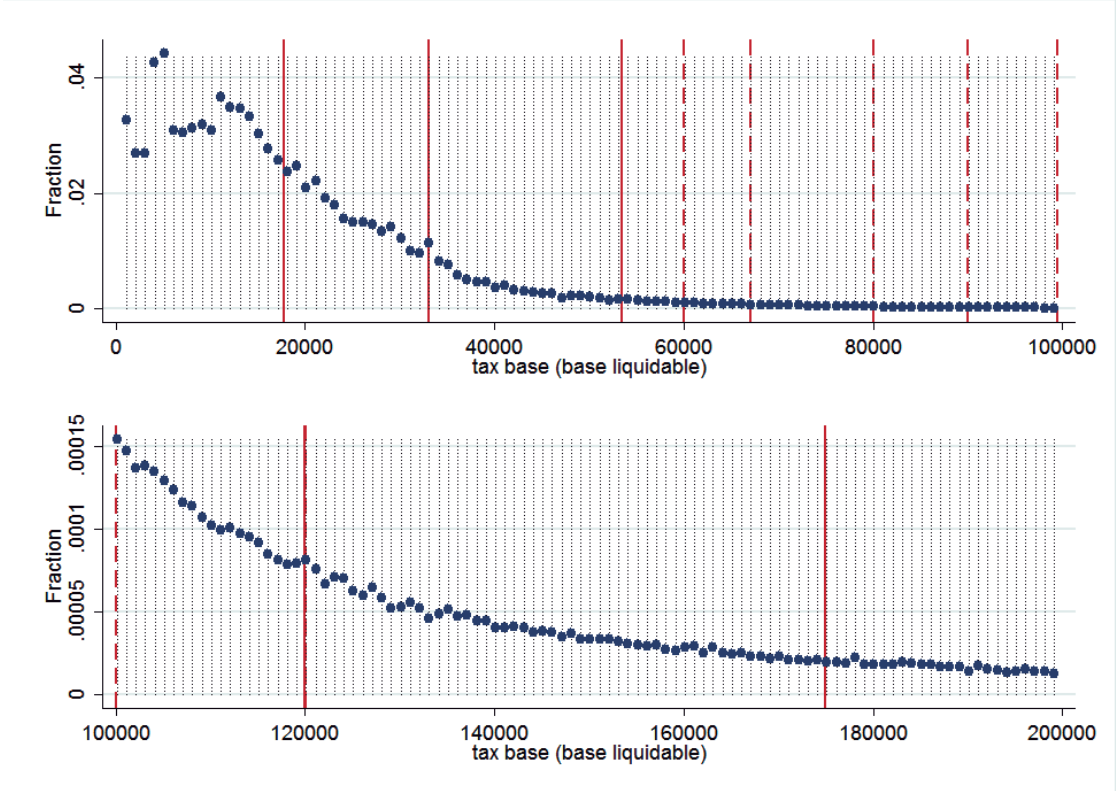


Figure 15
Distribution of Taxable Income (*Base Liquidable*) for top taxpayers (2012)

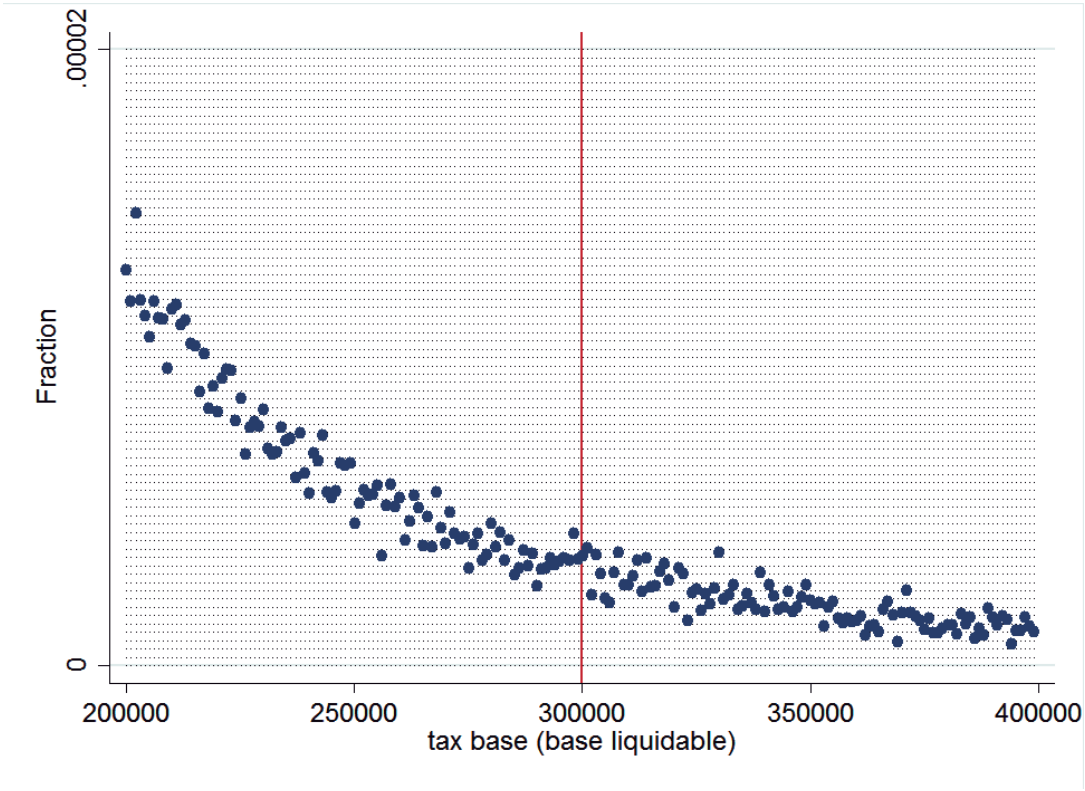
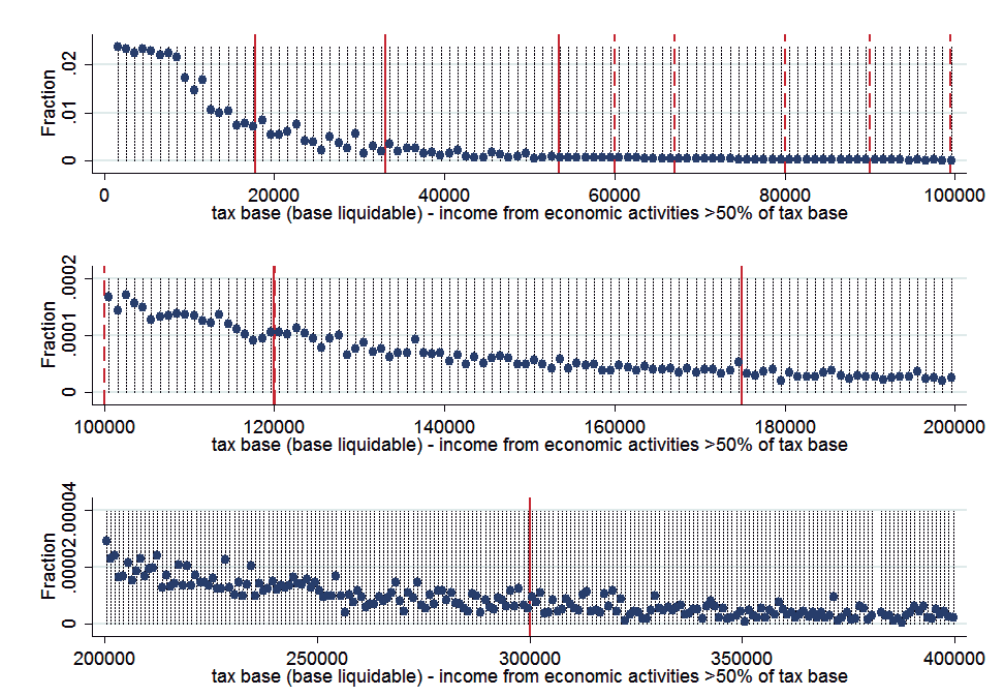


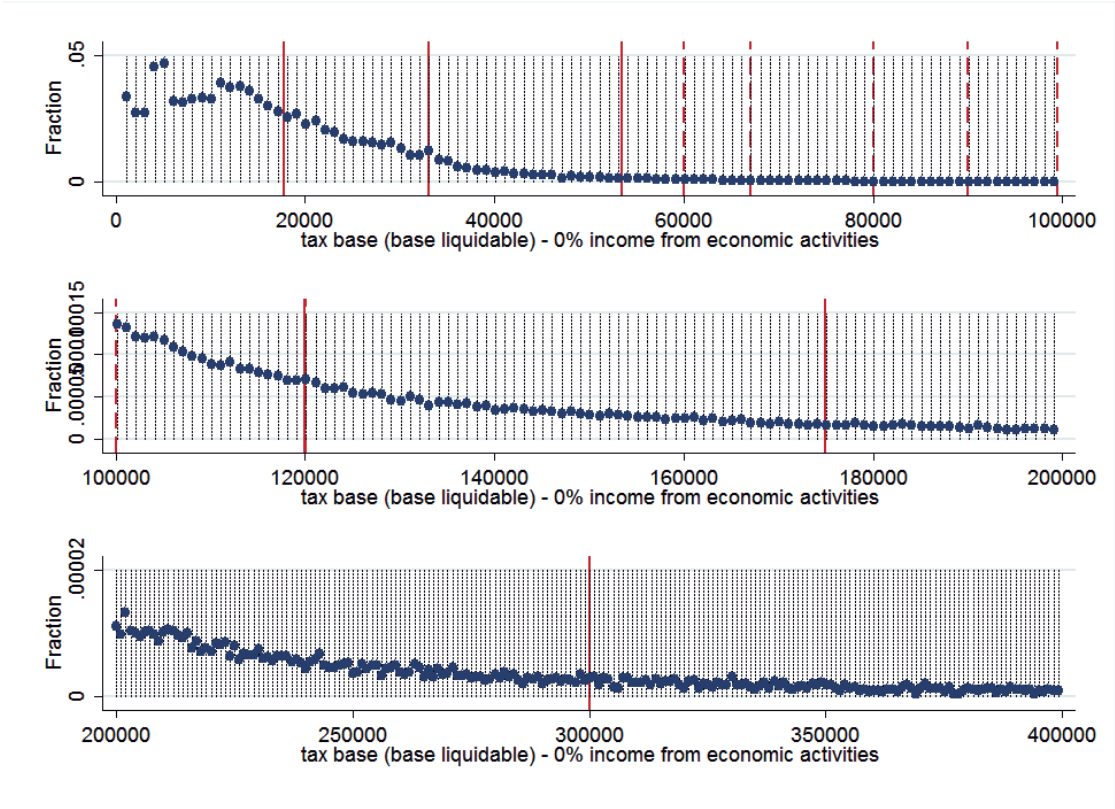
Figure 16
Distribution of Taxable Income for those taxpayers whose self-employed income (*Rendimiento de actividades económicas y profesionales*) is above 50% of Taxable Income (2012)



some rounding effect with respect to the annual salary (see Figure 18). At 300,000€, it is very difficult to observe any bunching either.

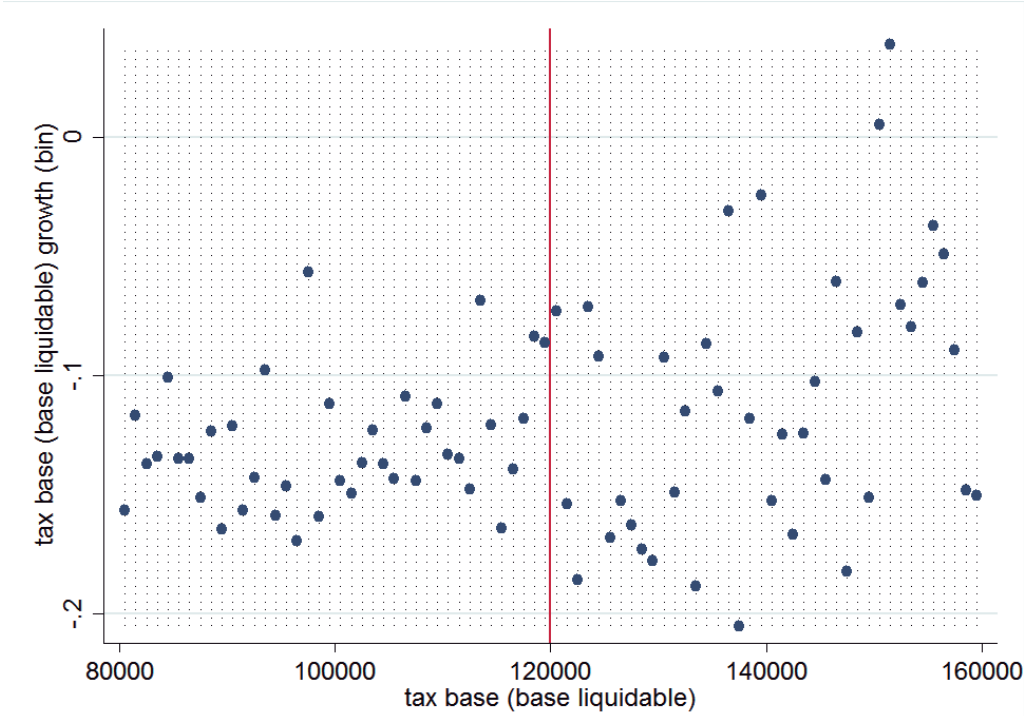
From these results, which remain for the previous years as can be checked in the Annex, one would be tempted to conclude responses – if any – to taxes are very small, and so would tend to implicitly corroborate Sanmartín's (2007) results. However, these histograms do not exploit the dynamics of the tax changes occurred in Spain during the last years, in particular, in the 2011-12 period. That is, perhaps responses are due to tax changes along time rather than to jumps in the marginal tax rate for a given year (or to a combination of both sources of variation). For instance, for 2012, the jump in the marginal tax rate in Catalonia for individuals with income above 300,000€ was 1%, while it was +5% when comparing the tax schedule between 2011 and 2012. In order to check whether we can infer some bunching - and so, some response – from the dynamics of tax changes, we again employ the graphical analysis.

Figure 17
Distribution of Taxable Income for those taxpayers whose self-employed income (Rendimiento de actividades económicas y profesionales) is null (2012)



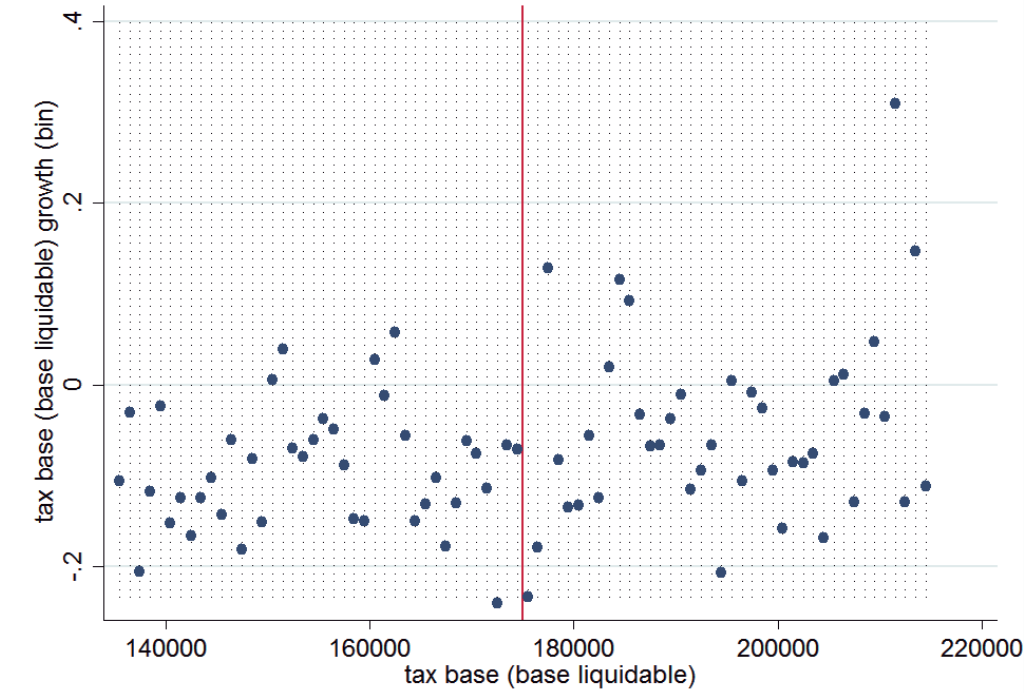
In this exercise we compute the growth rate of each income and tax base bin between 2010 and 2012. As explained in Section 3.2.1, in 2011 two new thresholds at 120,000€ and 175,000€ were implemented. This analysis allows us to observe any potential distortion in the distribution as it compares the dynamic evaluation with respect to the pre-reform period. Hence, we can identify any movement within the distribution across income (tax base) categories. Any distortion of the distribution across the thresholds of 120,000, 175,000, and 300,000€, where new tax brackets have been created (the latter only in 2012), should indicate responses to those new marginal tax rates. If tax payers react, we would expect to have – on average – higher growth rates around the thresholds since tax payers would concentrate here as a behavioral response to the change in tax rates. Those higher growth rates would then, eventually, create observable distortions in future cross-sectional analysis.

Figure 20
Tax Base (*Base Liquidable*) Growth between 2012 and 2010 around 120,000 Euros.



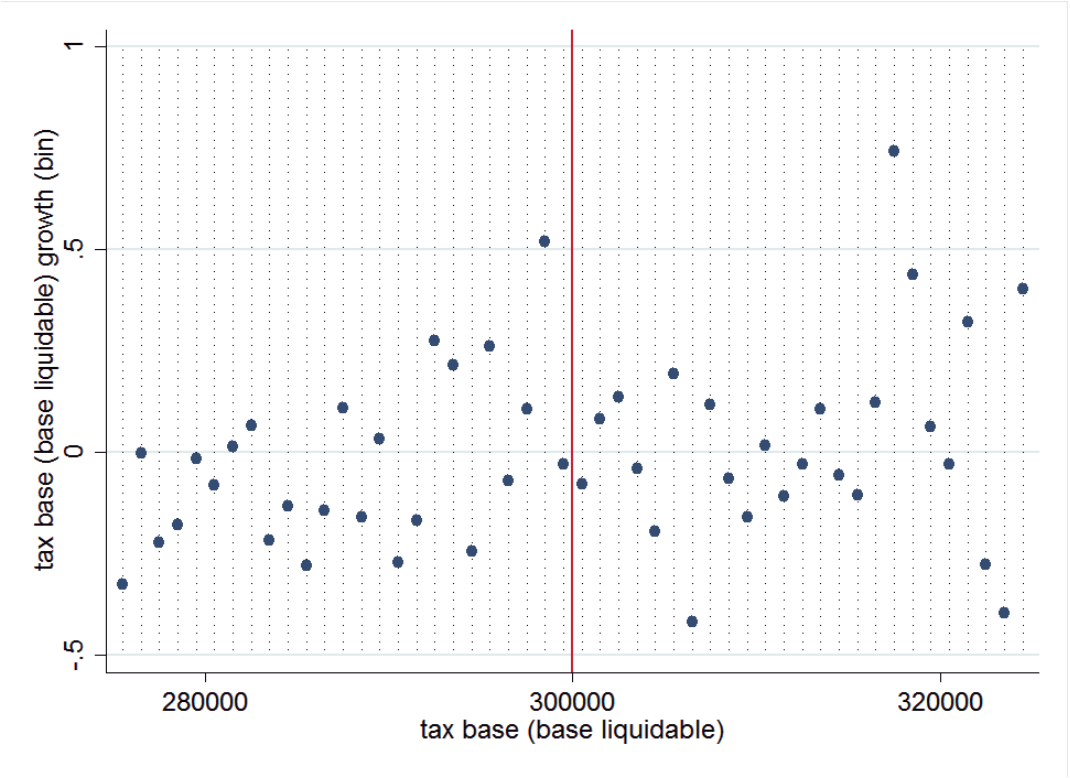
Notes: Each dot represents the two-year growth rate in the respective income group. Bin size of 1000 Euros. The red line corresponds to the MTR introduced in 2011.

Figure 21
Tax Base (*Base Liquidable*) Growth between 2012 and 2010 around 175,000 Euros.



Notes: Each dot represents the two-year growth rate in the respective income group. Bin size of 1000 Euros. The red line corresponds to the MTR introduced in 2011.

Figure 22
Tax Base (*Base Liquidable*) Growth between 2012 and 2010 around 300,000 Euros.



Notes: Each dot represents the two-year growth rate in the respective income group. Bin size of 1000 Euros. The red line corresponds to the MTR introduced in 2011.

Figures 20 to 22 plot the results for the taxable income. If taxpayers had reacted to the change in marginal tax rates, we would expect to find higher growth rates around the new thresholds compared to the rest of the distribution. Again, we do not observe any effects at none of the thresholds, which might indicate a distortion in the tax base that would call for a deeper and more detailed investigation. In the Appendix we provide the same evidence for labor income in Figures A22 to A24. Both variables analyzed here have evolved similarly across the distribution. Interestingly, the on average negative values represent the drop in income explained in the descriptive statistics before. This effect, however, is more prevalent for the lower incomes around 120,000 and 175,000€, while growth rates around the 300,000 mark of the tax base are concentrated around 0, which indicates that higher incomes have been less affected by the crisis.

In Figure 23 and Figure 24, we show particular results for the AC of Madrid and Catalonia, which have adopted different tax policies of top taxpayers, and are similar in terms of economic fundamentals. We do not provide the graphs for the whole period or for particular prototype of taxpayers, although they are available upon request. In any case, from both figures, we can see that nothing different from the average behavior already described emerges.

All in all, the bunching approach has not become a useful approach to estimate the structural parameter (ETI) needed for optimal tax design. This could be due to the fact that this administrative data is not rich enough, or alternatively, the elasticities are too small to be inferred from visual inspection at the jumps, or would need some more sophisticated graphical analysis accounting for more sources of variation (along fiscal years and within fiscal years). In order to shed light on this issue, which up to now remains inconclusive, in Section 5 we will use another empirical approach to estimate the ETI based on difference-in-difference estimations.

Figure 23
Distribution of Taxable Income (*Base Liquidable*) for the AC of Madrid (2012)

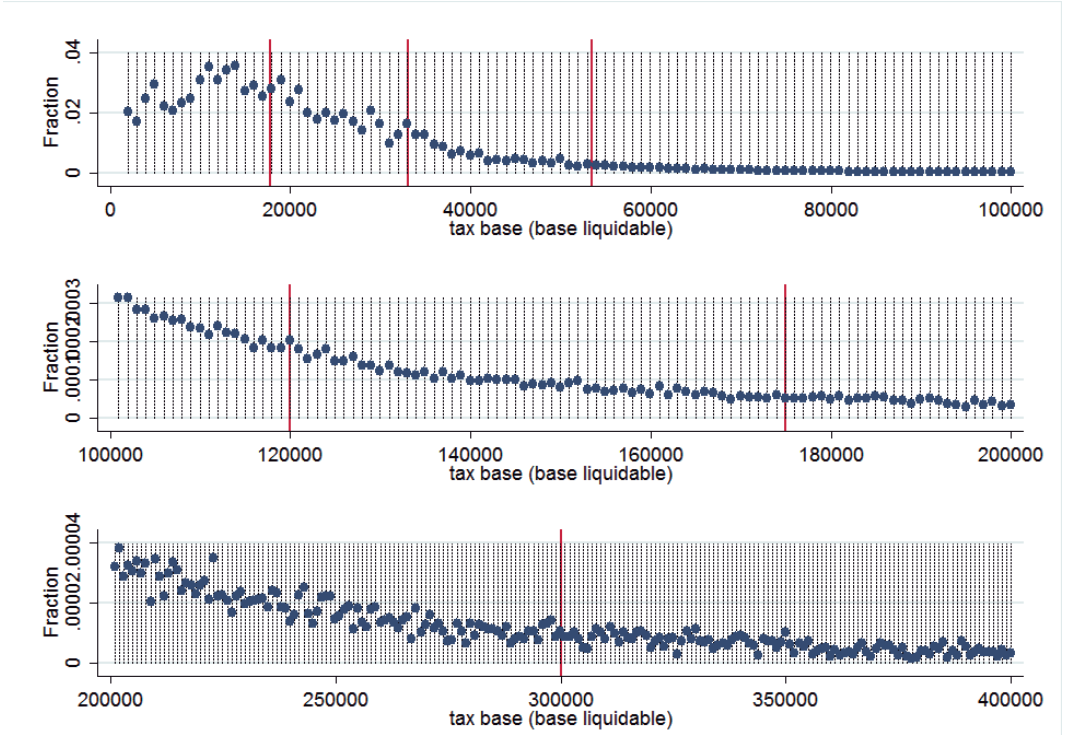
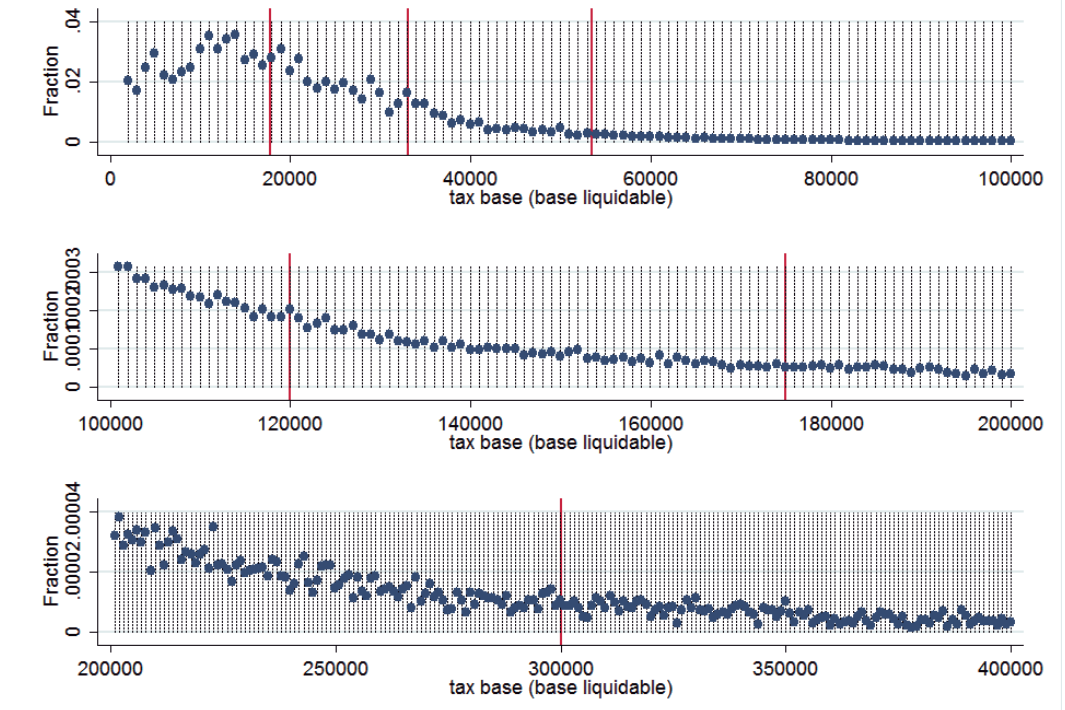


Figure 24
Distribution of Taxable Income (*Base Liquidable*) for the Cataluña (2012)



5. One Step Further: Estimation of Elasticity of Taxable Income

5.1 Identification

In this section we will estimate the Elasticity of Taxable Income with an alternative identification procedure, to prove the robustness of the absence of an effect as obtained under as the bunching approach. In any case, the absence of any bunching already suggests that, if at all, we should observe low responses of taxable income with respect to marginal tax rates. To nevertheless assess this empirically, we will estimate a difference-in-difference model based on repeated cross-section data for the years 2009 to 2012.

To perform this approach, we follow Saez *et al.* (2012). It consists of estimating the following equation:

$$\log z_{it} \quad e \bullet \log(1-\tau_{it}) + \alpha \bullet 1(t \quad t_1) + \beta \bullet 1(i \in T) + t + \varepsilon_{it} \qquad [1]$$

where z_{it} is taxable income of individual *i* in year *t*, and τ_{it} is the marginal tax rate faced by this individual (as usual in this literature expressed as the net marginal tax rate), such that *e* is the individual estimated response (expressed as an elasticity) to a change in the net marginal tax rate. In the sample, we include the control group (*C*), those whose marginal tax rate has not varied, and the treatment group (*T*), those whose marginal rate has changed from the pre-reform year (t_0) to the post-reform year (t_1). The instrument for $\log(1-\tau_{it})$ is the interaction between a dummy equal to one for the treatment group and a dummy equal to one for the post-reform year. Hence, in the end, this amounts to estimate a diff-in-diff model.

In our case, we will make use of the marginal tax rate increases in 2011 for those above 120,000 and 175,000€ and in 2012 for those with taxable income (recall, *Base Liquidable*) above 300,000€. To separate income growth from the response to tax policies, we will estimate the model for relatively small bandwidths around the respective threshold. The baseline specification includes taxpayers above (treatment) or below (control) a mark of 10,000€ relative to the threshold. We also provide results for 15,000€ and 25,000€ as robustness checks. Furthermore, we include a linear trend to capture income growth (decline) and to prevent a bias from mean reversion[13].

5.2. Parallel trends before treatment

This identification strategy requires the parallel trend assumption to hold, that is, in absence of a marginal tax variation, the variation of the endogenous variable should be equal for the treatment and the control group. If instead taxable income even in the absence of tax changes would grow, the estimate could be confounded by mean reversion in taxable income. As we do not have a complete panel, testing this assumption is not trivial. First evidence can be obtained from our dynamic bunching analysis, which suggests that tax base growth does not change around the cut-offs of tax brackets.

[13] Results are qualitatively the same if we include a non-linear time trend.

Table 2
Regression Discontinuity Design (RDD) to test for parallel trends

Threshold	Bandwidth	Method	Coeffi-cient	Std. Error	z	p-value	95%	CI Interval
120,000	25,000	Conventional	0.0344	0.02475	1.3899	0.165	-0.01411	0.08291
		Robust			1.7854	0.074	-0.00644	0.138101
	15,000	Conventional	0.05094	0.03237	1.5736	0.116	-0.01251	0.114381
		Robust			1.3885	0.165	-0.02735	0.160226
	10,000	Conventional	0.05793	0.03963	1.462	0.144	-0.01973	0.135602
		Robust			1.5575	0.119	-0.02426	0.212007
175,000	25,000	Conventional	0.06422	0.05772	1.1126	0.266	-0.04891	0.177338
		Robust			1.9063	0.057	-0.00445	0.320314
	15,000	Conventional	0.12921	0.07368	1.7538	0.079	-0.01519	0.273612
		Robust			1.6253	0.104	-0.03509	0.375899
	10,000	Conventional	0.14537	0.08859	1.641	0.101	-0.02826	0.318995
		Robust			1.2506	0.211	-0.09112	0.412397
300,000	25,000	Conventional	-0.14564	0.21434	-0.6795	0.497	-0.56574	0.274467
		Robust			-1.2737	0.203	-1.02239	0.216991
	15,000	Conventional	-0.31032	0.28243	-1.0987	0.272	-0.86388	0.243246
		Robust			-1.0398	0.298	-1.07291	0.329116
	10,000	Conventional	-0.32148	0.32767	-0.9811	0.327	-0.9637	0.320745
		Robust			-0.5921	0.554	-0.82375	0.441504

An appropriate test, however, should be based on pre-treatment data. We proceed as follows. Similar to the aforementioned analysis, we compute one-year growth rates of 100€ tax-base bins between 2010 and 2009. We use these bins to perform a regression-discontinuity design around the thresholds, using +/- 10,000, 15,000, and 25,000 as bandwidth. If the tax base prior to treatment has been growing at similar rates below and above the limits of future tax-brackets, we should not observe any significant discontinuity. Results are presented in Table 2.

We do not observe a jump around 120,000 and 300,000€. Only for the relatively large bandwidth of 25,000€ around 120,000 the discontinuity is significant at the 10% level when computing robust standard errors. All other coefficients for these two thresholds are statistically not different from zero at any conventional confidence level. For the 175,000 threshold, however, results are suggesting that the tax base was growing at larger rates above the 175,000€ mark. Furthermore, the narrow bandwidth of 10,000€, which should provide the cleanest estimate is only marginally insignificant. Therefore, we will interpret results at this threshold with caution.

5.3. Results

Table 3 shows the results of the ETI estimation of Equation 1. Overall, elasticities are rather small. This is in line with the absence of bunching as analyzed before.

Leaving aside the 175,000€ threshold due to the difficulties to ensure the parallel trend assumption, the estimated elasticity does not differ among the 120,000 or 300,000 threshold. Hence, if we focus on the latter threshold, and for the smallest bandwidth (10,000€), the estimated elasticity (0.014) – statistically significant at 95% confidence level – implies that if the marginal tax rate increases by 1%, we expect taxable income to decrease by 0.014% (recall in the regression, we work with the net marginal tax rate; so to infer the impact of the marginal tax rate we have to multiply the estimate by -1).

Table 3
ETI results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
band-width	**25,000**	**15,000**	**10,000**	**25,000**	**15,000**	**10,000**	**25,000**	**15,000**	**10,000**
threshold	**120,000 Euros**			**175,000 Euros**			**300,000 Euros**		
log(1-mtr)	0.016	0.020	0.016**	-0.032**	-0.025*	-0.010	0.006	0.010	0.014**
	(0.015)	(0.013)	(0.008)	(0.014)	(0.013)	(0.008)	(0.008)	(0.008)	(0.006)
Obs.	221,299	150,084	97,515	64,445	37,636	24,753	9,558	5,627	3,731
R-squared	0.742	0.736	0.745	0.737	0.746	0.749	0.745	0.744	0.739

Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Results of 2SLS estimations within the respective bandwidth across the indicated threshold. All models include a linear trend. The net-of-tax rate is instrumented by the interaction between the treatment-year indicator and a dummy equal to one when above the threshold.

We performed similar regressions with alternative definitions of taxpayers according to their share of different sources of income[14], but still – also according to the bunching approach – the elasticities are of the order shown in Table 3. One could argue these small responses are due to the fact that jumps in the marginal tax rate are relatively small. However, as we extensively explained in Section 3.2.1, this does not seem to be the case under the period we analyze. Moreover, these changes should be easy to interpret by these taxpayers as to potentially provoke a response. In any case, we are confident about their robustness, since they are fully coherent with the bunching approach. We are intrigued about this very low response, which undoubtedly merits further empirical research.

6. CONCLUSIONS

This paper explored the reactions of taxpayers to recently implemented changes in the Spanish personal income tax, in particular to changes in marginal tax rates for high-income earners. These changes provide interesting quasi-natural experiments to investigate behavioral responses of individuals to those policies.

Using two different empirical approaches, we do not find responses. At most, some moderate effects of small magnitude can be confirmed. The absence of the effect can be due to different reasons. First, as employees generate most of the income, it might not be feasible for those taxpayers to adjust to the new incentives generated by the system, in particular because we observe immediate short run consequences in the year following the change. Second, given that real responses might not have been possible in the short run, the absence of an effect excludes also reporting or evasion effects. This is an encouraging result as in recent years lot of effort has been undertaken to improve the fiscal system and to decrease tax evasion and avoidance. The absence of any effect is an encouraging result for the effectiveness of those reforms.

Other explanations related, for example, to some kind of patriotism ("to help the country under a very deep crisis of the public finances") (Konrad and Qari, 2012) or to altruism versus low-income people (Backus and Esteller, 2014) seem less plausible. More research, though, should be undertaken to understand responses of individual sub-groups of the population. However, the data, based on a stratified sample, does not fully allow investigating these effects. A randomized panel with a larger number of observations could help to overcome this hurdle.

[14] Results are available from the authors upon request.

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ANNEX

Figure A1
Distribution of Broad Income (*Base Imponible*) for income levels up to 200,000€ (2009)

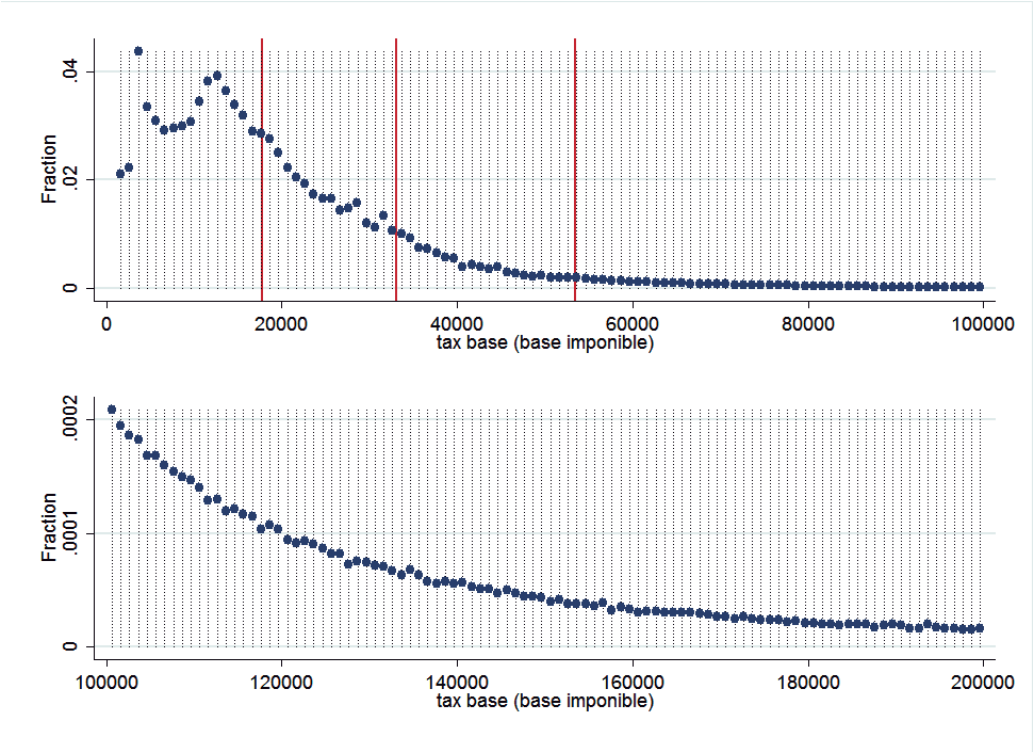

Figure A2
Distribution of Broad Income (*Base Imponible*) for top taxpayers (2009)

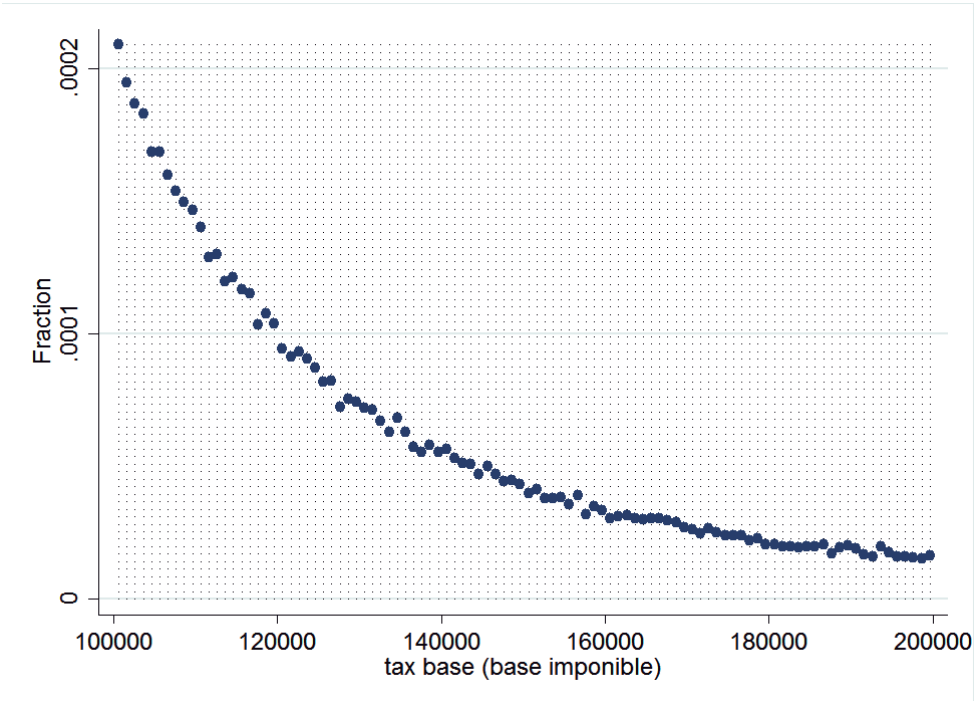

Figure A3
Distribution of Taxable Income (*Base Liquidable*) for income levels up to 200,000€ (2009)

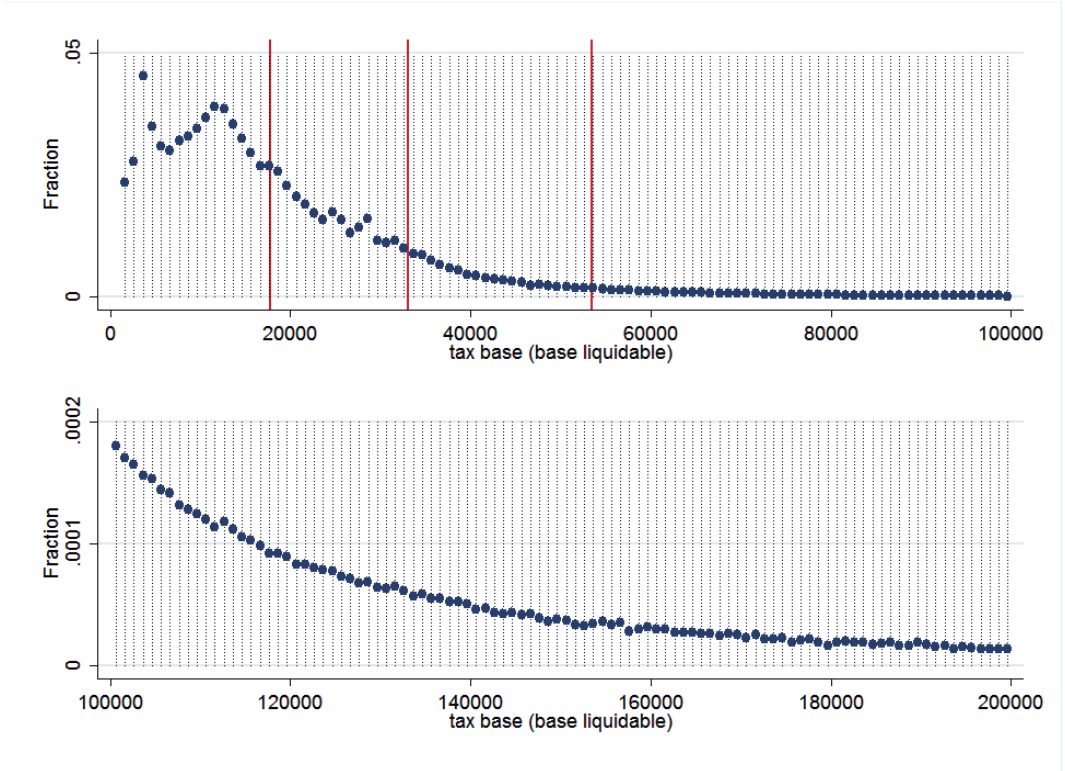

Figure A4
Distribution of Taxable Income (*Base Liquidable*) for top taxpayers (2009)

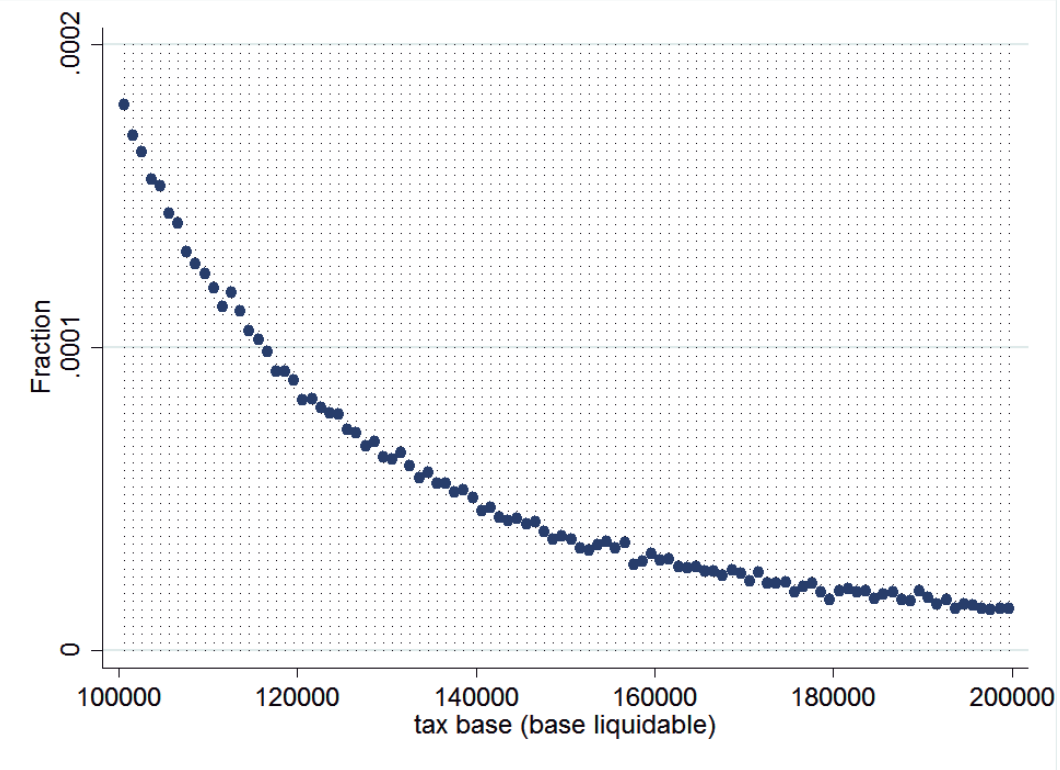

Figure A5
Distribution of Taxable Income for those taxpayers whose self-employed income (*Rendimiento de actividades económicas y profesionales*) is above 50% of Taxable Income (2009)

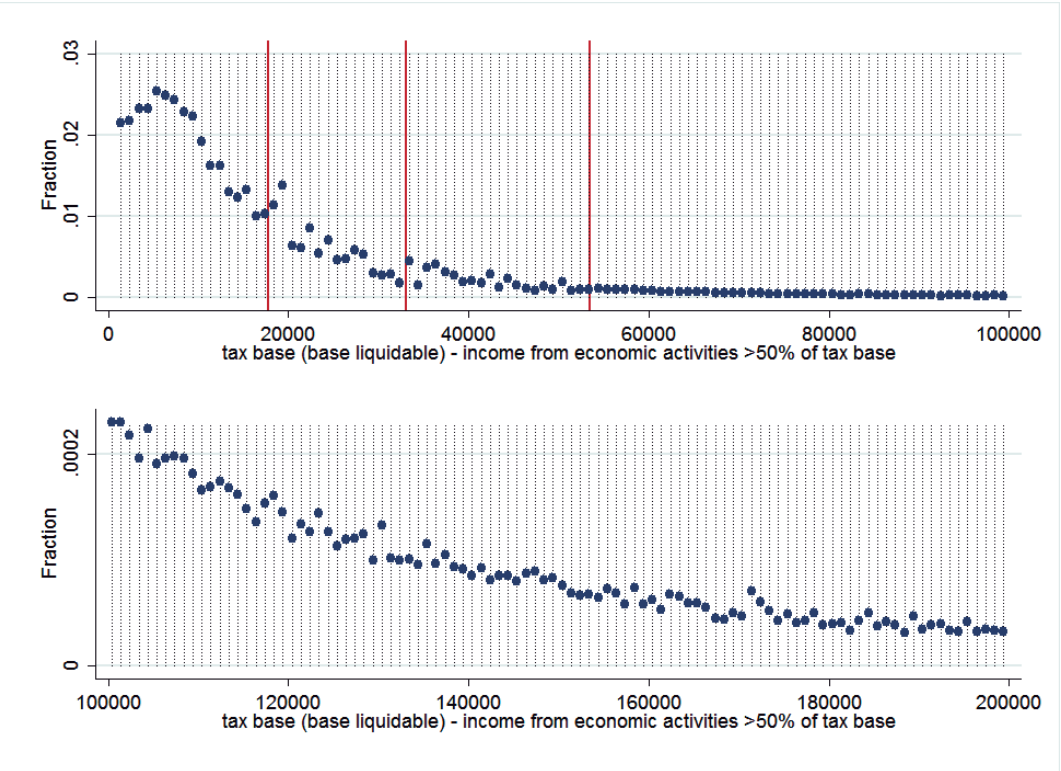

Figure A6
Distribution of Taxable Income for those taxpayers whose self-employed income (*Rendimiento de actividades económicas y profesionales*) is null (2009)

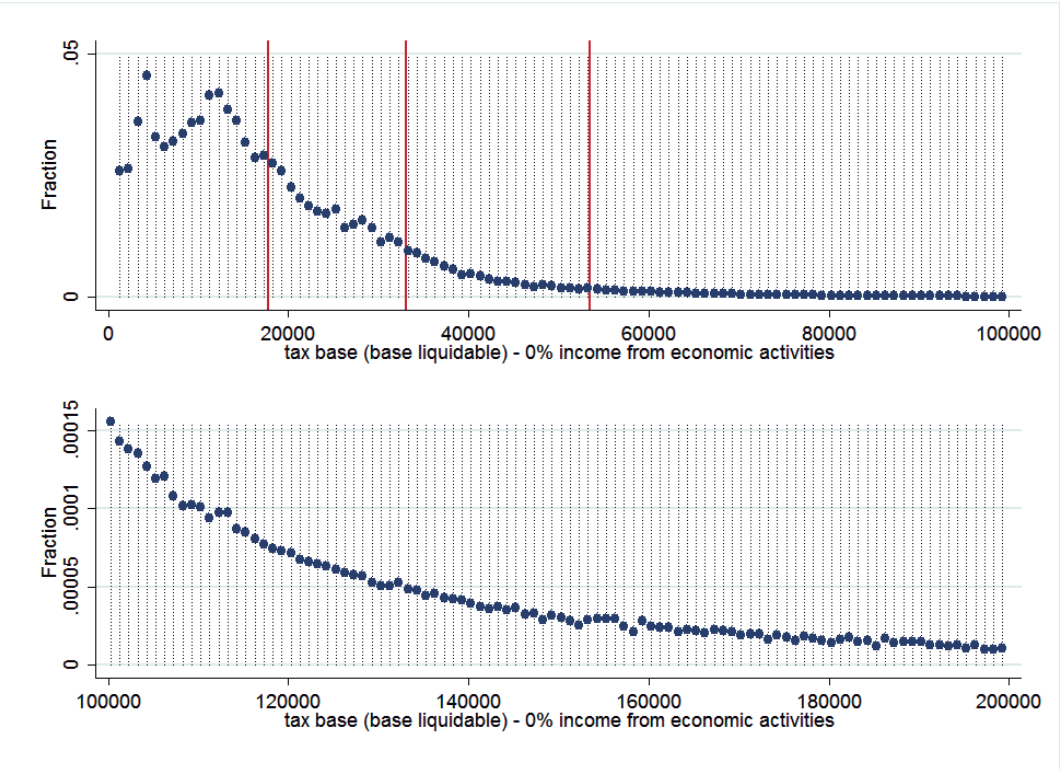

Figure A7
Distribution of Broad Income (*Base Imponible*) for income levels up to 200,000€ (2010)

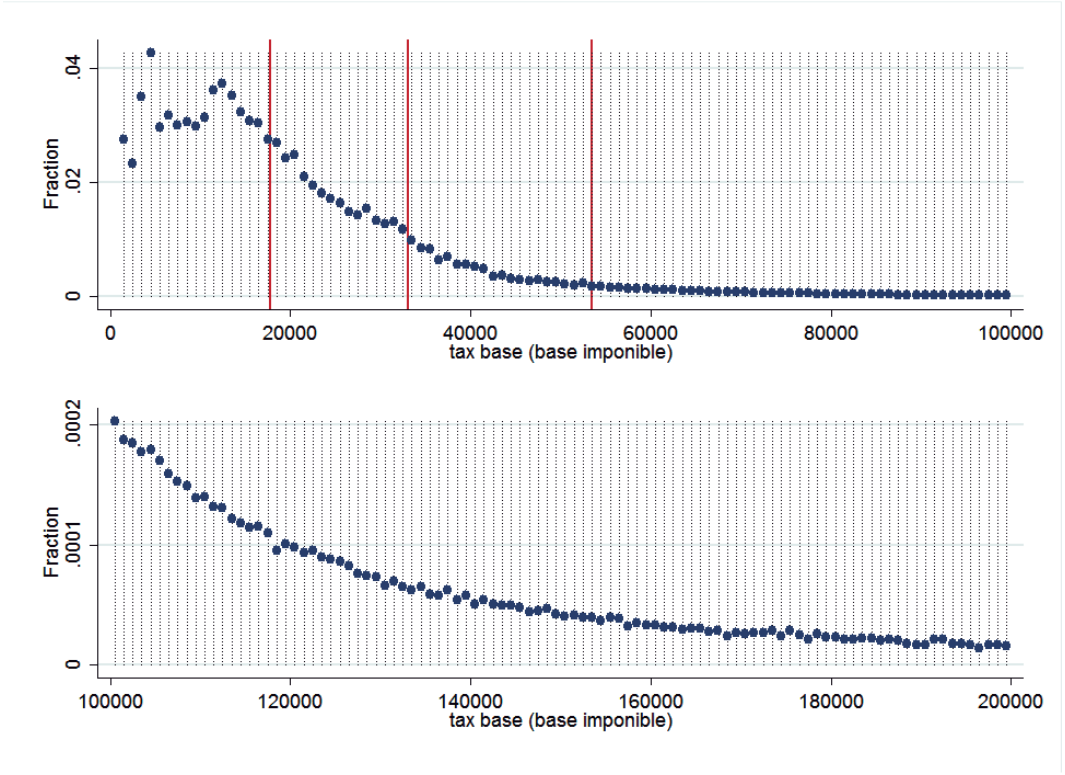

Figure A8
Distribution of Broad Income (*Base Imponible*) for top taxpayers (2010)

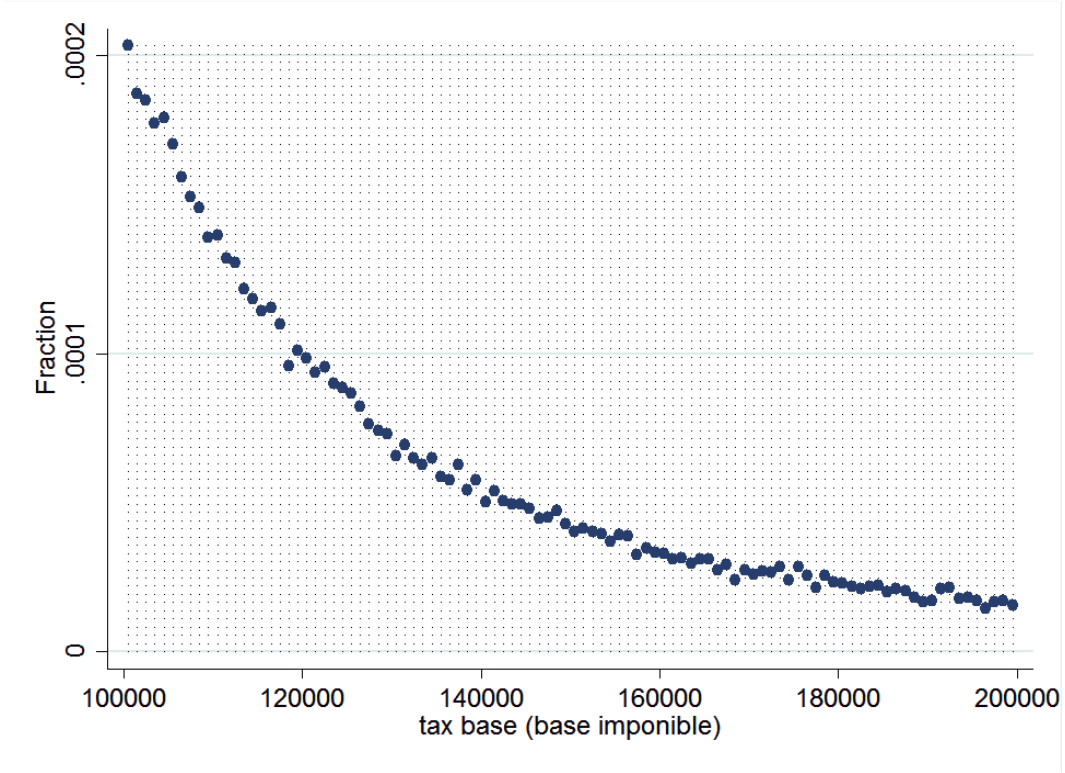

Figure A9
Distribution of Taxable Income (*Base Liquidable*) for income levels up to 200,000€ (2010)

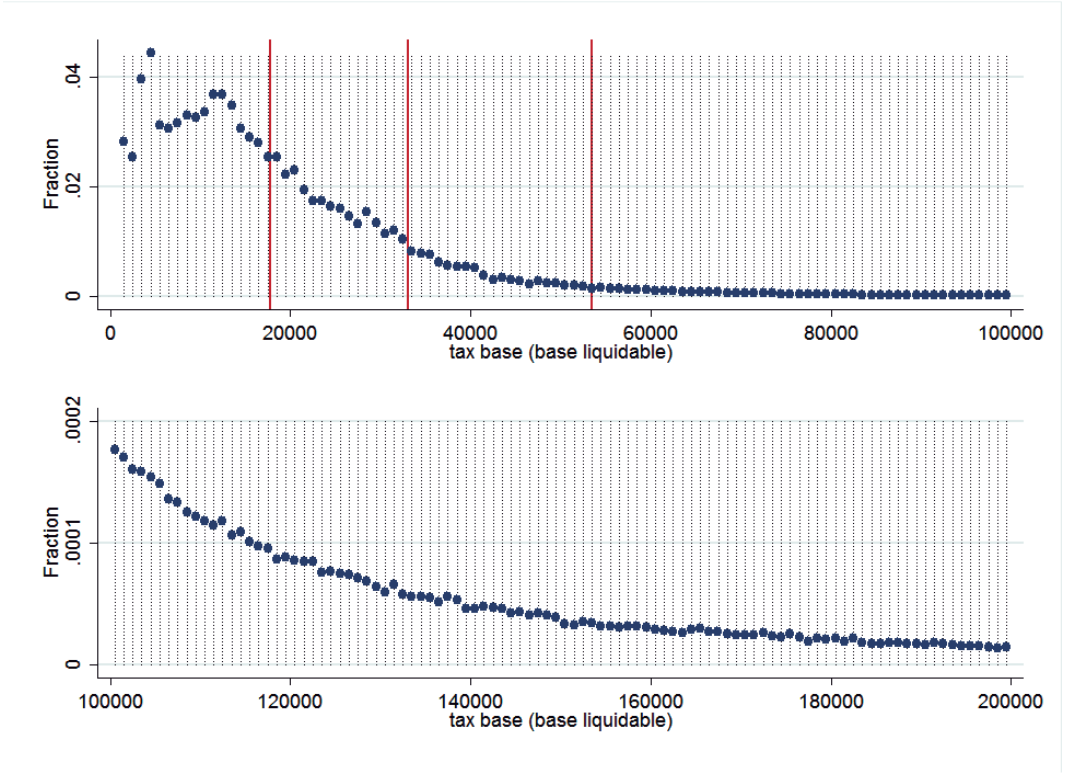

Figure A10
Distribution of Taxable Income (*Base Liquidable*) for top taxpayers (2010)

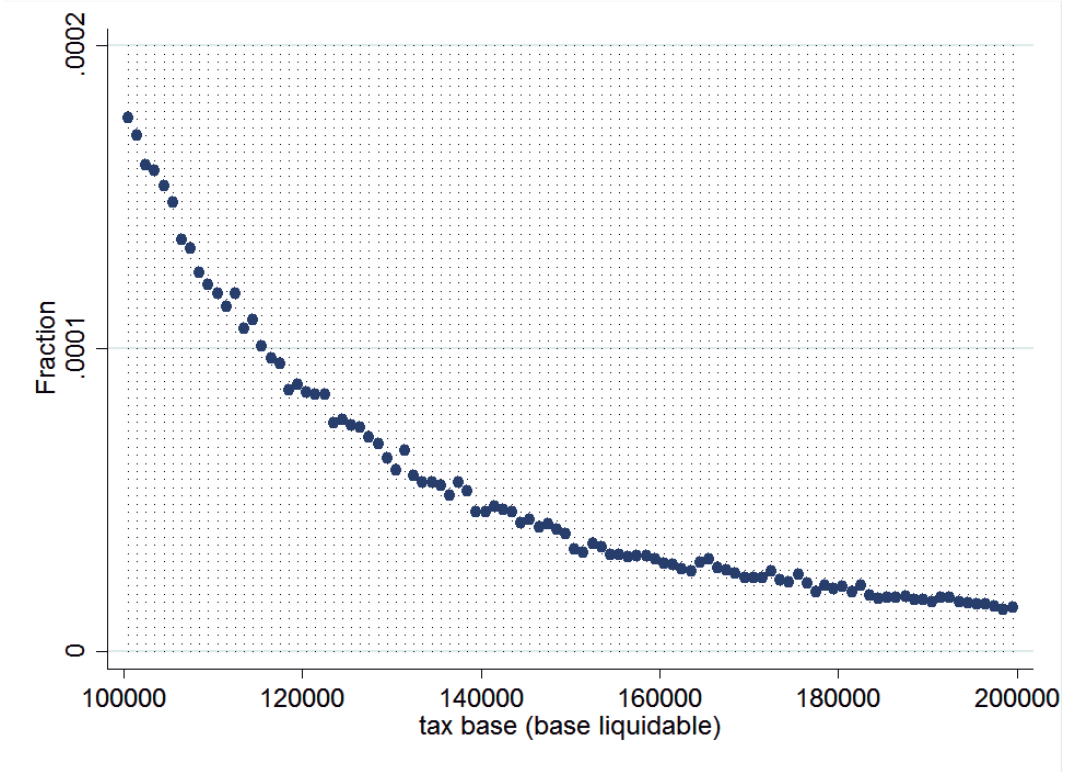

Figure A11
Distribution of Taxable Income for those taxpayers whose self-employed income (*Rendimiento de actividades económicas y profesionales*) is above 50% of Taxable Income (2010)

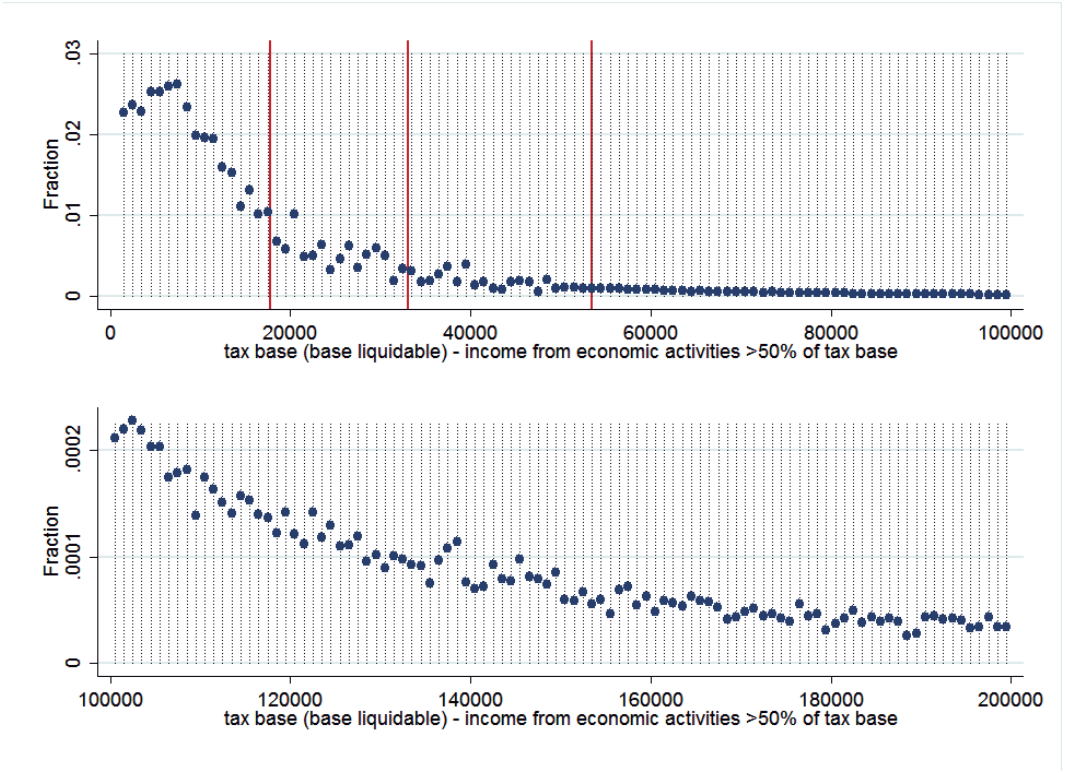

Figure A12
Distribution of Taxable Income for those taxpayers whose self-employed income (*Rendimiento de actividades económicas y profesionales*) is null (2010)

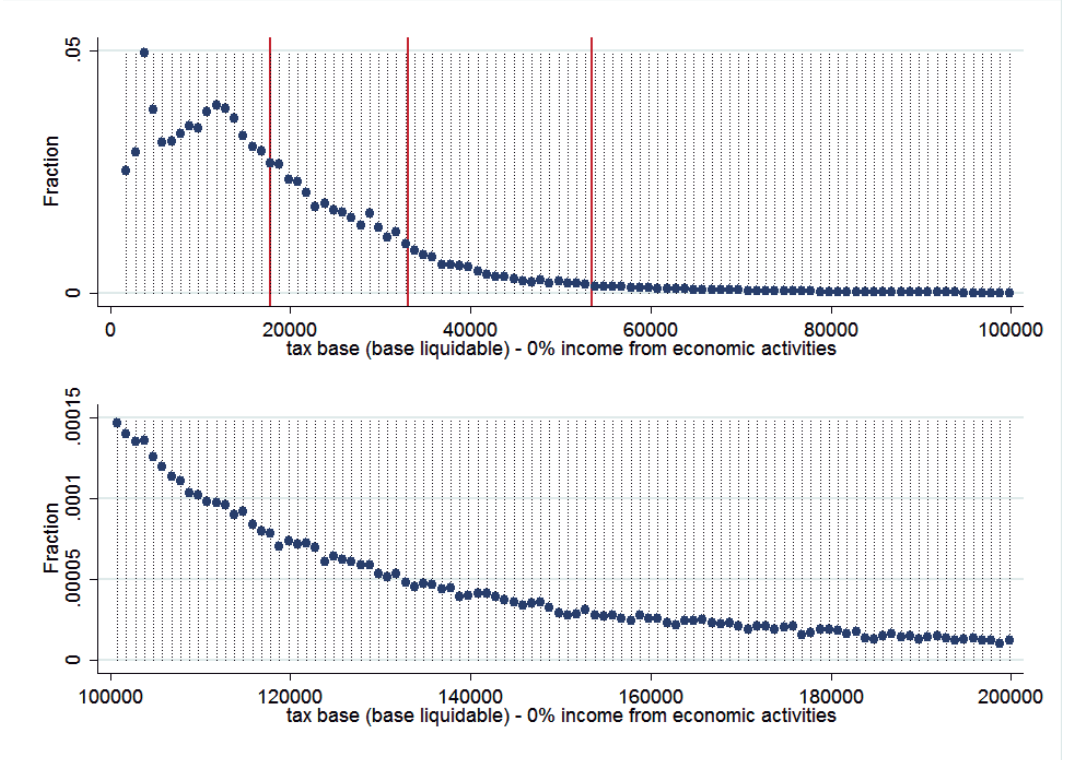

Figure A13
Distribution of Broad Income (*Base Imponible*) for income levels up to 200,000€ (2011)

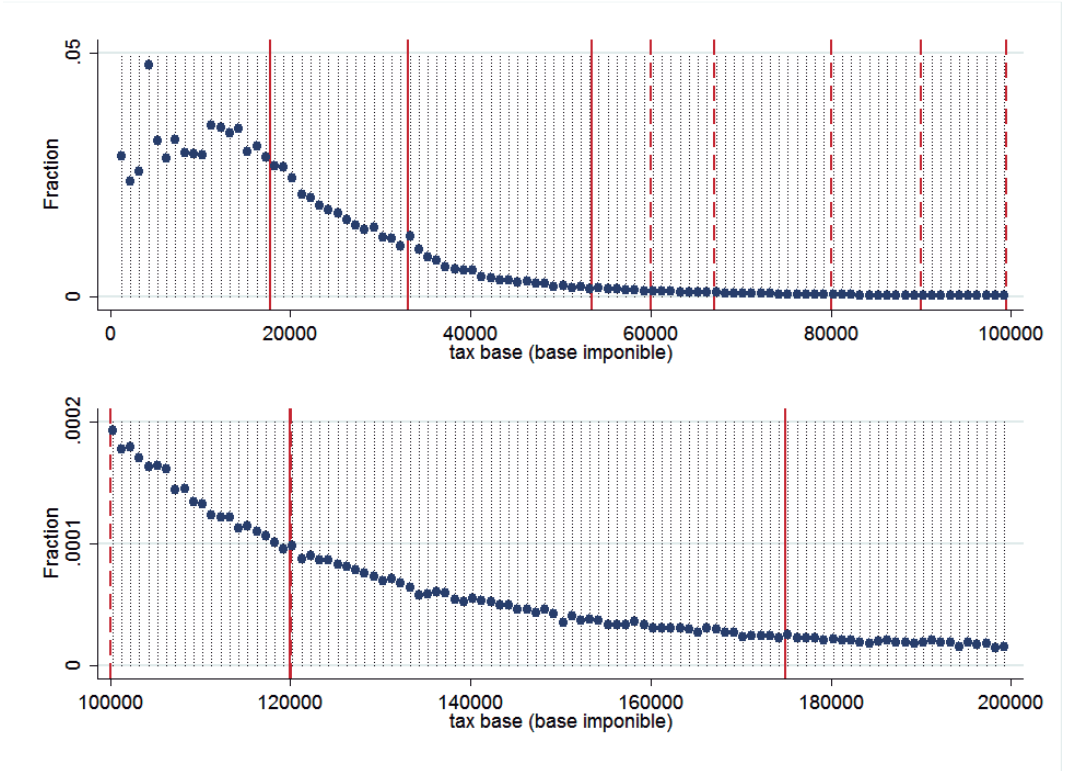

Figure A14
Distribution of Broad Income (*Base Imponible*) for top taxpayers (2011)

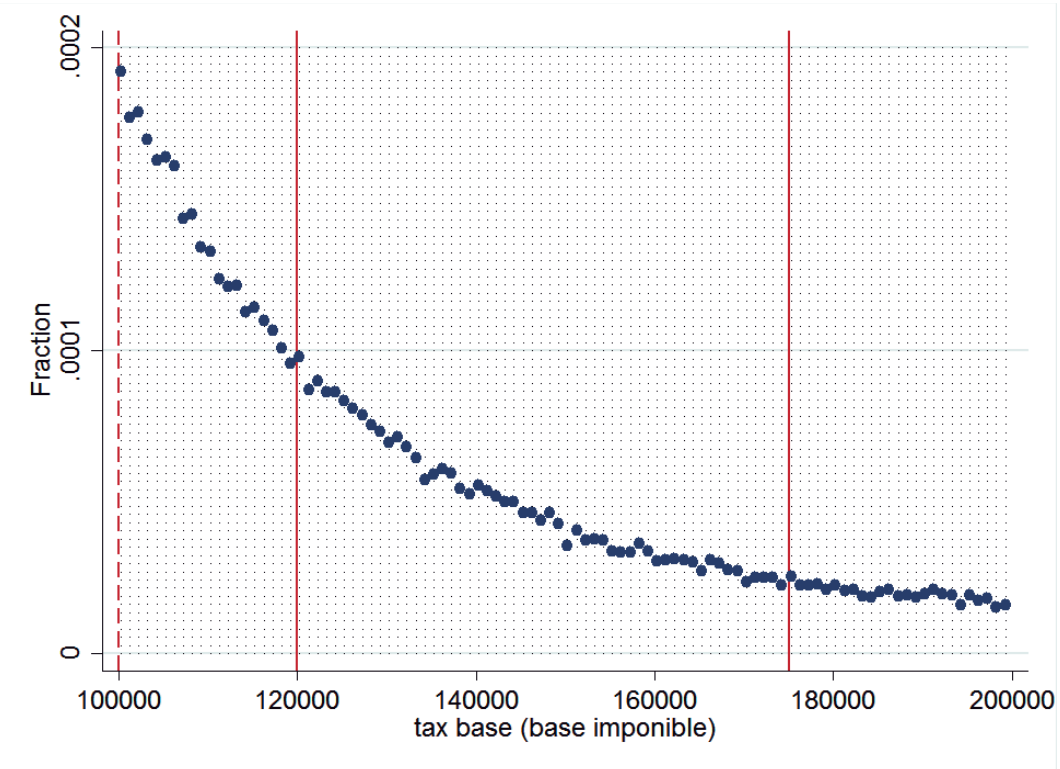

Figure A15
Distribution of Taxable Income (*Base Liquidable*) for income levels up to 200,000€ (2011)

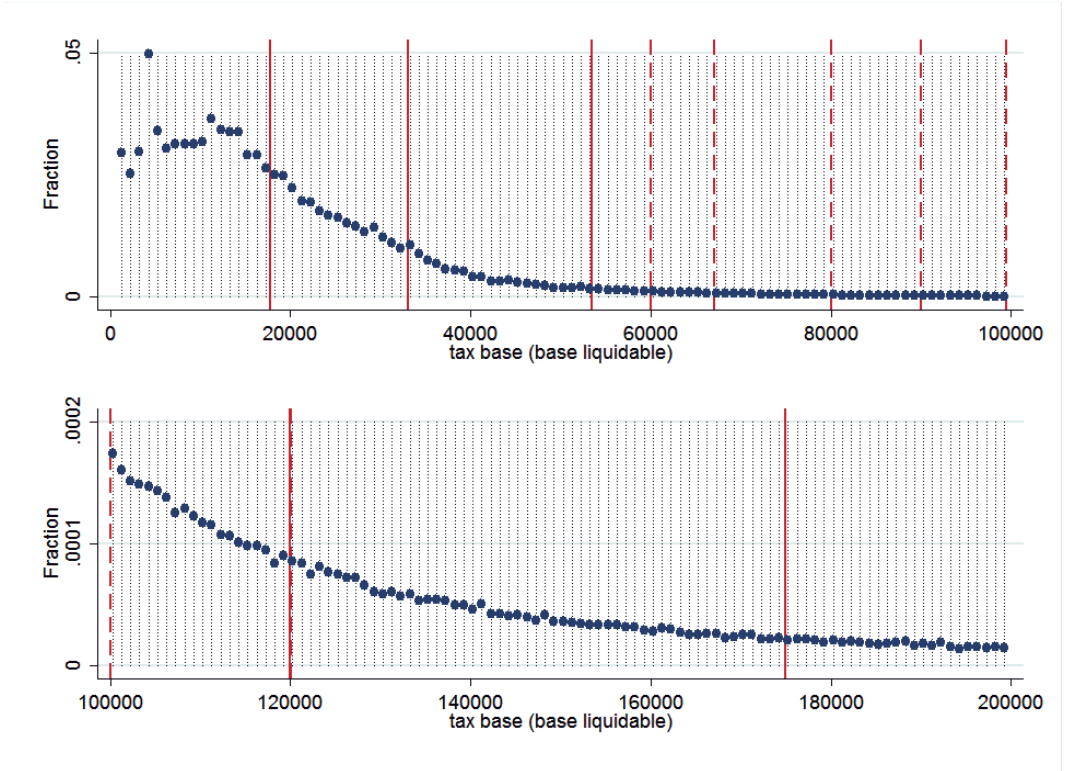

Figure A16
Distribution of Taxable Income (*Base Liquidable*) for top taxpayers (2011)

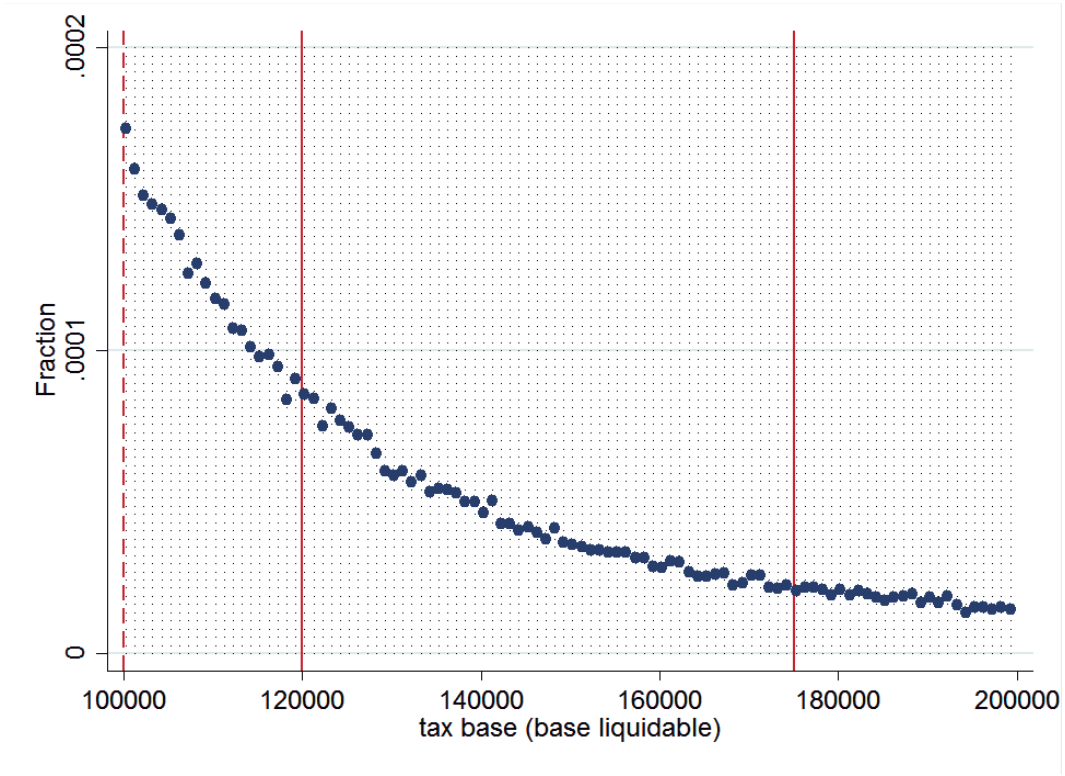

Figure A17
Distribution of Taxable Income for those taxpayers whose self-employed income (*Rendimiento de actividades económicas y profesionales*) is above 50% of Taxable Income (2011)

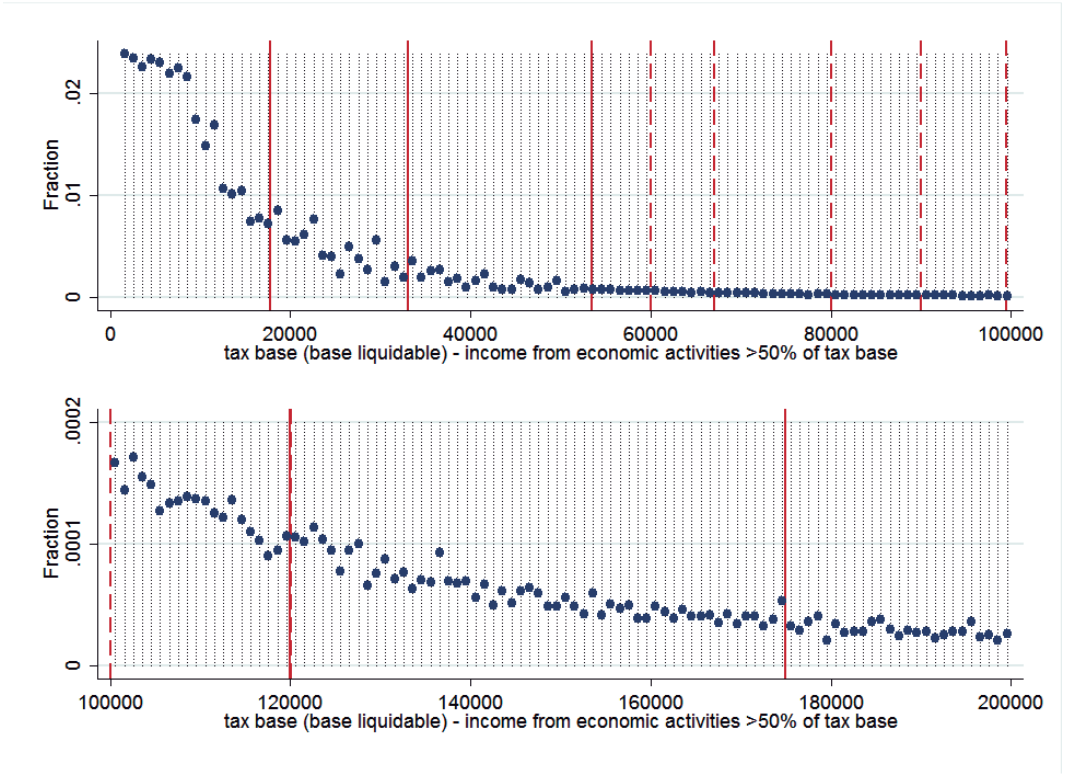

Figure A18
Distribution of Taxable Income for those taxpayers whose self-employed income (*Rendimiento de actividades económicas y profesionales*) is null (2011)

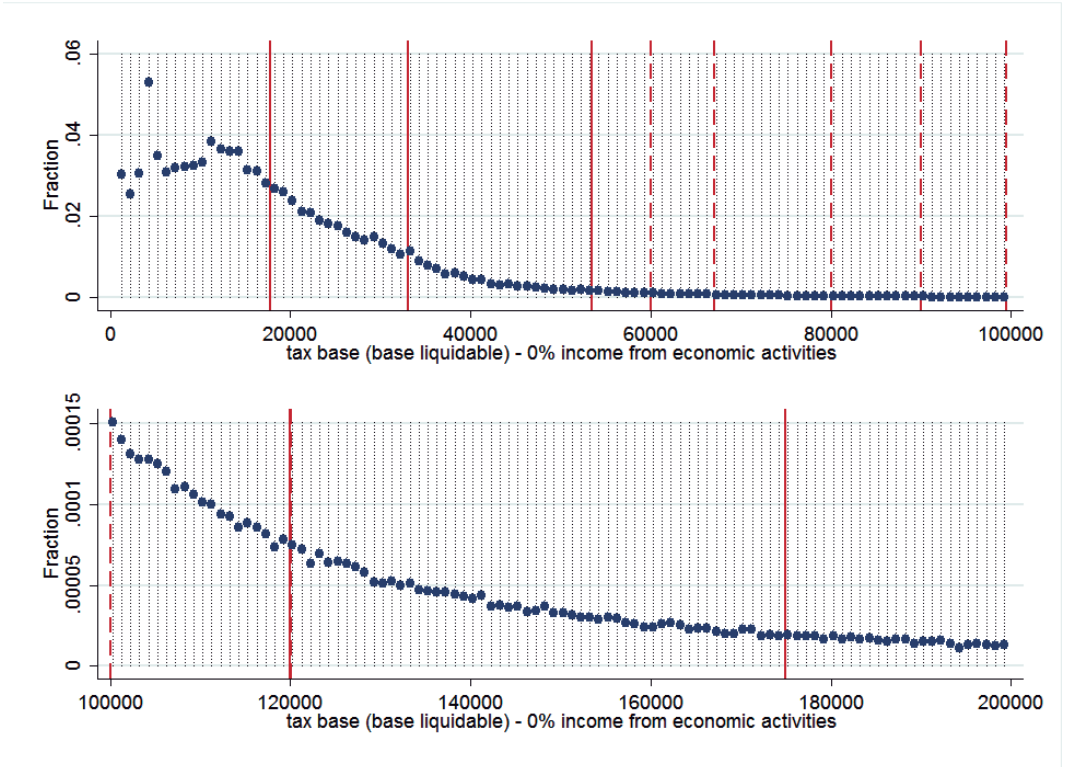

Figure A24
Labor Income Growth between 2012 and 2010 around 120,000 Euros.

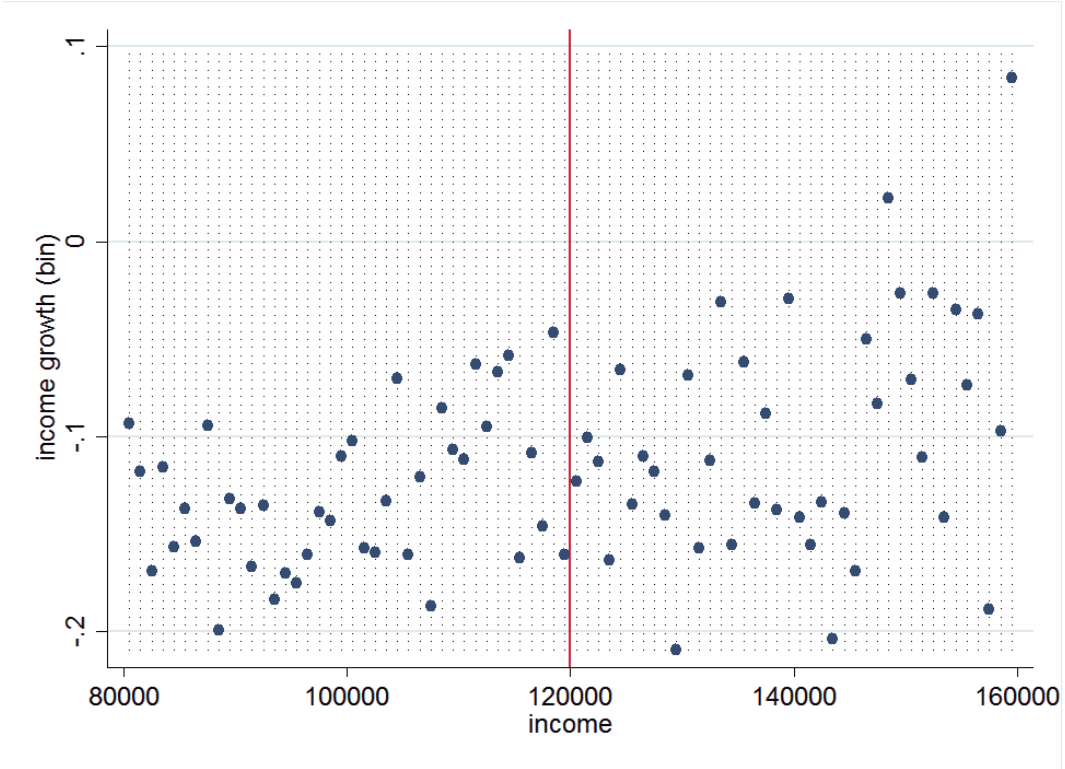

Figure A25
Labor Income Growth between 2012 and 2010 around 175,000 Euros.

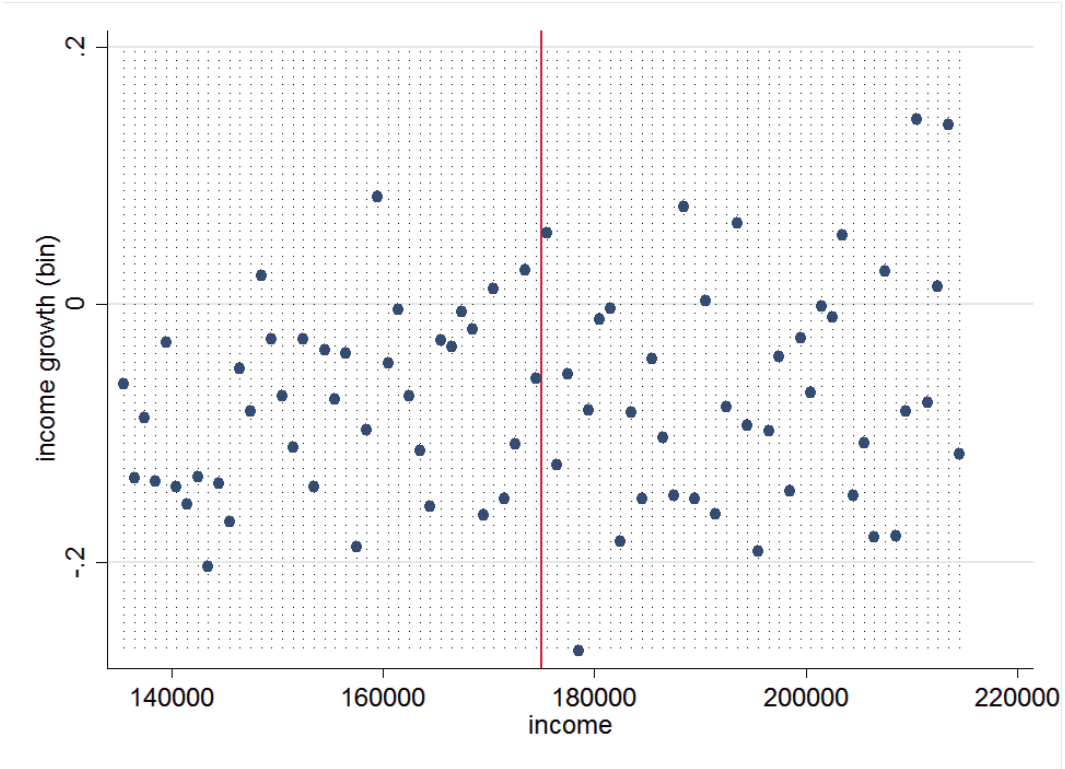

Figure A26
Labor Income Growth between 2012 and 2010 around 300,000 Euros.