Evaluating the long run effects of the last fiscal reform on tax revenues in Spain

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Abstract

The aim of this paper is to evaluate to what extent income tax revenues in Spain vary in the event of exogenous changes in income. In particular, the ongoing fiscal reform is simulated making use of EUROMOD for the year 2016 in order to obtain measures for the income tax elasticity. Considering the ordinary or general part of the tax, the elasticities are obtained within different scenarios. We have account for equiproportional and non-proportional changes in income and several levels of government. Our preliminary results indicate that the effect on tax revenues from exogenous changes in income is negligible under the new tax structure.

Keywords: income tax elasticities, taxation, fiscal reform, IRPF, microsimulation.

JEL: H21, H22, H23, H24, H71, C63.

1. Introduction

One important consequence of the Great Recession is the negative impact on tax revenues, rising concerns about the ability of the systems to keep resources in bad times.

During this process, the Spanish central government introduced a fiscal reform affecting the personal income tax, the cornerstone tax of the Spanish fiscal system.

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The consequences of such reform have been studied from the revenue´s point of view (Laborda et al. 2015) and also from the redistributive side (Adiego et al.2015). In these works, the new tax structure appears to reduce tax collection in the short term.

On the other hand, a positive business cycle is expected to improve tax collection thereby reducing fiscal deficits (Sanz et al. 2015). Such impact can be estimated by analyzing income tax elasticities. (Creedy and Gemmell, 2006).

In this paper, we estimate income tax elasticities of the most recent Spanish personal income tax based on microdata. We use the microsimulation model EUROMOD and measure to what extent, tax revenues vary in the event of exogenous changes in individuals' labor income at central and regional level.

The obtained results can be briefly anticipated. The aggregate income tax elasticity for the national government is around 1.98. At regional level, different patterns are found, although a relative negative impact drives these results.

The structure of the paper is as follows. After this introduction, we provide a theoretical framework for estimating income tax elasticities. Section 3 explains the simulation methodology, Section 4 presents the main results and, finally, Section 5 concludes the paper.

2. The income tax structure and income tax elasticities

The departure point for obtaining income tax elasticities is a definition of the concept in order to know the values required to be estimated through the simulation. Several studies have developed analytically such concepts over time (see, for instance, Fries et al. (1982), Hutton and Lambert (1980, 1982)). Here, we roughly sketched a model based on Creedy and Gemmell (2002, 2003, 2006) and the specific variation to the Spanish case (Creedy and Sanz, 2010). In both cases, income tax elasticities are obtained from a multi-step income tax function.

Traditional models begin by defining individual income y_i and final tax liability $T(y_i)$. Individual income is then treated in a multi-step income tax function such:

$$\begin{aligned} T(y_i) &= 0 && for\ a_0 \le y_i < a_1 \\ T(y_i) &= t_1(y_i - a_1) && for\ a_1 \le y_i < a_2 \\ T(y_i) &= t_2(y_i - a_2) + t_1(a_2 - a_1) && for\ a_2 \le y_i < a_3 \end{aligned} \qquad (1)$$

and so on.

After some algebra manipulation and setting $a_0=t_0=0$, $T(y_i)$ can be rewritten as:

$$T(y_i) = t_k(y_i - a'_k) \quad (2)$$

where

$$a'_k = \frac{1}{t_k}\sum_{j=1}^{k} a_j(t_j - t_{j-1}) \quad (3)$$

(2) and (3) implies that an individual *i* faces a single marginal tax rate t_k in excess of a determined threshold a'_k.

Creedy and Sanz (2010) extend the basic model for Spain, noting the special particularities of the Spanish personal income tax. Indeed, nominal income is formed from several sources $s=1,\ldots,S$; the income tax is levied on the concept of taxable income x_i instead of on nominal income, there can be individual or joint taxation and hence, it is more accurate to speak in terms of tax units (*h*) instead of individuals (*i*), and the existence of different governments involved in the design of the tax. In the present context and differentiating between central (C) and regional (R) governments, the tax unit faced two tax rates:

$$t_{ki} = t^C_{ki} + t^R_{ki} \quad (4)$$

At this point, the tax liability faced by the tax unit is defined as:

$$T^C_s \equiv T^C_s\left(y_{hs} | a_{ks} \le x_{hs} < a_{k+1,s}\right) = t^C_{ksh}(x_{hs} - a'^C_{ksh}) \quad (5)$$

$$T^R_s \equiv T^R_s\left(y_{hs} | a_{ks} \le x_{hs} < a_{k+1,s}\right) = t^R_{ksh}(x_{hs} - a'^R_{ksh}) \quad (6)$$

Moreover, there exist tax credits C_C and C_R. If $y_h = \sum_s y_{hs}$ is total gross income from all sources, the tax unit *h* final tax is

$$T_h \equiv T\left(\sum_s y_{hs}\right) = max\left\{0, \sum_{s=1}^{S} T^C_s - C_C\right\} + max\left\{0, \sum_{s=1}^{S} T^R_s - C_R\right\} \quad (7)$$

where several cases apply depending on the magnitude of C_C and C_R relative to $\sum_{s=1}^{S} T^C_s$ and $\sum_{s=1}^{S} T^R_s$, respectively. (See Creedy and Sanz (2010), p. 540 for more details). Here, we only refer to the most common situation where $\sum_{s=1}^{S} T^C_s > C_C$ and $\sum_{s=1}^{S} T^R_s > C_R$ that is finally considered in the simulations.

Under such circumstances, expression (7) can be simplify to

$$T_h = \sum_{s=1}^{S} \{T_s^C + T_s^R\} - (C_C + C_R) \quad (8)$$

And

$$T_h = \sum_{s=1}^{S} \{t_{ksh} x_{hs} - (t_{ksh}^C a_{ksh}^{\prime C} + t_{ksh}^R a_{ksh}^{\prime R})\} - (C_C + C_R) \quad (9)$$

2.1. Revenue elasticities

Consider now the effect on the tax paid by the unit when each income sources increase marginally. The change is defined as:

$$\frac{dT_h}{dy_h} = \sum_{i=1}^{I} \frac{\partial T_h}{\partial y_{hs}} \frac{\partial y_{hs}}{\partial y_h} \quad (10)$$

Hence:

$$\frac{y_h}{T_h} \frac{dT_h}{dy_h} = \sum_{i=1}^{I} \left(\frac{y_{hs}}{T_h} \frac{\partial T_h}{\partial y_{hs}}\right) \left(\frac{y_h}{y_{hs}} \frac{\partial y_{hs}}{\partial y_h}\right) \quad (11)$$

and

$$\eta_{T_h, y_h} = \sum_{i=1}^{I} \eta_{T_h, y_{hs}} \eta_{y_{hs}, y_h} \quad (12)$$

The income tax elasticity for a tax unit is the result of two components. The first is determined by the way in which total tax paid by the unit changes when income from source *s* changes. The second component is how the individual components of income change after the increase in total income *y* of the tax unit *h.*

In the case where taxable income is positive and greater than final tax credits, changes in the source *q* implies that:

$$\frac{\partial T_h}{\partial y_{hq}} = t_{kqh} \quad (13)$$

Hence, the element $\eta_{T_h, y_{hq}}$ can be rewritten as:

$$\frac{y_{hq}}{T_h} \frac{\partial T_h}{\partial y_{hq}} = \eta_{T_h, y_{hq}} = \frac{t_{kqh} y_{hq}}{T_h} \quad (14)$$

The term $\partial T_h/\partial y_{hq}$ is the effective marginal tax rate, MTR_{hq}, while T_h/y_{hq} is the total tax paid by the unit as proportion of its income from source q. Hence the tax revenue elasticity is the ratio MTR_{hq}/ATR_{hq}.

In general, defining $ATR_h=T_h/y_h$ as the overall average tax rate facing the unit, the individual income tax elasticity is defined as:

$$\eta_{T_h,y_h} = \sum_{i=1}^{I} \frac{t_{kih}}{ATR_h}\left(\frac{y_{hi}}{y_h}\right)\eta_{y_{hi},y_h} \qquad (15)$$

If there were only one income source, then $y_{hi}/y_h = \eta_{y_{hi},y_h} = 1$ and the first term in (15) would be simply the ratio of the marginal tax rate to the average tax rate facing the unit.

Let's assume now that there are H tax units with incomes $y_1, y_2, \ldots, y_H$. If total income $Y = \sum_{h=1}^{H} y_h$ and total tax revenue $T = \sum_{h=1}^{H} T_h$, the aggregate income tax elasticity is:

$$\frac{dT}{dY}\frac{Y}{T} = \sum_{h=1}^{H}\left(\frac{\partial T_h}{\partial y_h}\frac{y_h}{T_h}\right)\left(\frac{\partial y_h}{\partial Y}\frac{Y}{y_h}\right)\left(\frac{T_h}{T}\right) \qquad (16)$$

And

$$\eta_{T,Y} = \sum_{h=1}^{H} \eta_{T_h,y_h}\eta_{y_h,Y}\left(\frac{T_h}{T}\right) \qquad (17)$$

The elasticity of aggregate revenue with respect to aggregate income is thus a tax-share weighted average of the product of individual revenue elasticities and the elasticity of individual income with respect to total income. Hence it depends not only on the tax structure but on the extent to which individual incomes change when aggregate income changes defined by the term $\eta_{y_h,Y}$.

In the simulations below, we introduce two different hypothesis based on how total income is distributed across individuals. First, if $\eta_{y_h,Y}$=1, there are proportional changes in individual income. In the second case, some dynamics in the elasticity are estimated by equalizing or disequalizing the distribution of income across different tax unit.

3. Simulation

Given the previous analytical expressions, we make use of the microsimulation model EUROMOD to take into account the changes introduced in the personal income tax

through the fiscal reform and to obtain the values required for estimating new income tax elasticities.

EUROMOD is a tax-benefit simulation model for European Union countries suitable to estimate the Spanish national income tax given its ability to consider the disaggregate level of the tax system by regions and the possibility to fulfill the tax payment at individual or family level.

For the purpose of this paper, we only focus in labor income as source of nominal income. Thus, the design of the tax includes as tax base: income from employment and self-employment, property income, pensions and benefit entitlements related to unemployment, maternity or age. The tax base is then reduced by an employment related allowance to create the taxable income.

In order to get the final tax liability, the model also considers the presence of personal and family allowances and tax credits related to mortgage, main residence rent and a final deduction on the tax liability of 400 euros. Hence, with the simulation method we can obtain all the parameters in the theoretical model required to estimate income tax elasticities.

Within this framework, the fiscal reform is simulated taking as a benchmark the year 2013 (last available in the EUROMOD version G2.0+ used in this paper). In particular, the following items are able to be considered in the simulation:

- Reconsideration of tax deductions and allowances to determinate the final taxable income.

The law has restructured the way in which tax deductions and allowances respect the tax base are calculated. Indeed, tax deductions have gathered the main reductions for unemployed or disable tax payers, disappearing from the tax reductions. At this respect, the new law introduces a new universal discount of 2000 euros in concept of other expenditures. This amount is increased by 2000 euros if unemployed tax payers accept a new job in other jurisdiction (i.e. there is mobility concerns in accepting the job) the year of acceptance and the next. On the other hand, the base amount is increased by 3500 euros more if the taxpayer is disable[1].

[1] The disability amount is increased up to 7750 euros when the taxpayer has a disability condition of 65% or more or in the case when the individual receives help from third persons. This possibility cannot

Tax reductions over the former tax base do not consider now employment or disable cases. Moreover, the structure and the limits for the calculation have also changed. Now, the limit amount to be reduced affects to those taxpayers up to 14450 euros of income[2] and taxpayers with no more than 6500 euros in concept of other income. The total amount to be reduced decrease up to 3700 euros for low income tax payers as well as the final weighted tax reductions for incomes between 11250 and 14450 euros. This reduction is removed for individuals over the limits as well as the 100% increase for workers over 65 years old.

- Increase on tax credits related to families non-income conditions.

Personal and family tax credits have been increased in any of the items considered within the law. That includes a reduction for the taxpayer but also family related credits due to children, old people and disabilities currently under the supervision of the taxpayer. Such tax credits reduce the final tax liability after the tax schedule is applied.

- Tax schedule.

The tax schedule is one of the deepest reform introduced by the law. Tax brackets are reduced from seven to five, increasing tax bases and with a special impact in the treatment of higher incomes. In particular, the greater specification for these incomes has been minimized to a single tax bracket for incomes above 60000 euros.

It is also remarkable the reduction on tax rates (even higher given that increases for fiscal consolidations have been removed) and the limits of that tax brackets.

- No final tax credits.

Once the reform has been taken into account, we proceed to estimate individual income tax elasticities for a population based on "Encuesta de Condiciones de Vida" (2010) provided by the Spanish National Institute of Statistics and adapted accordingly to the model. For each tax unit, the corresponding ATR and MTR are calculated in order to obtain individual elasticities, first step to obtain the final aggregate values.

be taken into account in the simulations due to a lack of information on disability levels. Hereafter, all conditions related to disability taxpayers implies the hypothesis that everyone has a disability level of 33% or more.

[2] The limit income for the tax allowance does not include the previous 2000 euros of tax deductions.

The MTR calculation is based on Jara & Tumino (2013). In particular, the simulation increase marginally (0.03) labor income for each individual in the sample and provide the difference in tax liability before and after such increase. On the other hand, the ATR is obtained as the result of dividing the final tax liability paid by the tax unit respect to the tax base.

4. Results

For policy reasons aggregate measures of the income tax elasticity are important. Hence, the preliminary results presented in this section are in line with this aggregate perspective.

In order to consider aggregation, recall that the theoretical model relies on the need to consider some hypothesis about income distribution within the population. We begin by assuming that income is distributed equally across individuals. In this case, the income tax revenue elasticity is a weighted average of individual elasticities, where the weighs are given by individuals' final tax liability respect to total tax revenue.

At national level (Table 1), the elasticities show a downward trend over the period studied, from 2.13 in 2009 to 1.98 in the simulated year. Such decrease is deeper between 2009 and 2010 (from 2.13 to 2.02) and not due the fiscal reform. In the latter case, a slightly decrease is observed between the benchmark year 2013 and the simulated year. Hence, although the fiscal reform reduces the elasticity value, such change is almost negligible.

Table 1: Evolution of proportionate aggregate income tax elasticities. National level.

Year	***2009***	***2010***	***2011***	***2012***	***2013***	***Simulated year***
National	2.1305	2.0243	2.0202	2.0217	2.009	1.9754

A similar downward pattern is observed attending to regional elasticities (Table 2). It seems to be a structural change between 2009 and 2010 in every region. Given that this year the income tax was not subject to changes, other factors seems to drive such change.

On the other hand, the introduction of the fiscal reform affects differently the elasticity observed by regions. Table 3 illustrate these differences[3]. Following the national

[3] Some care is needed when interpreting the results obtained for Navarra, Basque Country, Ceuta and Melilla. On one hand, the regions integrated in the foral system are simulated under the hypothesis that

downward trend, regions such Balearic I., Murcia and C. Valenciana are in a worst position in terms of tax collection after the fiscal reform. Alternatively, Extremadura and Catalonia (and in a lesser extent, Canary I.) increase their elasticity value. In any case, such changes are small.

Table 2: Evolution of proportionate aggregate income tax elasticities. Regional level.

Year	***2009***	***2010***	***2011***	***2012***	***2013***	***Simulated year***
Andalusia	2.1373	2.0512	2.0315	2.0519	2.0427	2.0142
Aragon	2.2277	2.0691	2.0631	2.053	2.0491	2.0284
Asturias	2.1277	2.0192	2.036	2.0262	2.0301	1.9777
Balearic I.	2.1907	2.0816	2.0652	2.0547	2.0346	1.9727
Canary I.	2.3596	2.2435	2.2187	2.2249	2.1997	2.2028
Cantabria	2.1359	2.009	2.0034	2.0203	2.031	1.9836
C. Mancha	2.2164	2.0777	2.0663	2.0661	2.0537	2.0495
C. Leon	2.1909	2.0943	2.1184	2.0922	2.075	2.033
Catalonia	2.0531	1.9552	1.9688	1.9828	1.9669	1.989
C. Valenciana	2.1848	2.1291	2.0993	2.1045	2.0894	2.0333
Extremadura	2.2766	2.1699	2.1678	2.1958	2.1799	2.2207
Galicia	2.1553	2.0613	2.0487	2.0378	2.0152	2.0118
Madrid	2.0113	1.9169	1.9062	1.9029	1.8937	1.8426
Murcia	2.4476	2.2929	2.2727	2.2476	2.2445	2.189
Navarra	2.0725	1.9227	1.9293	1.9446	1.9348	1.8616
La Rioja	2.1732	2.0467	2.0559	2.0628	2.0422	2.0041
Basque C.	2.0239	1.8962	1.8937	1.8827	1.8695	1.7883
Ceuta	2.088	2.0352	2.018	2.0516	2.0276	1.8703
Melilla	2.1329	2.011	2.029	2.0479	2.0122	1.9495

they manage the income tax in the same manner than the rest of regions. For the case of Ceuta and Melilla, the lack of observations in the sample requires special care when interpreting the elasticity values obtained.

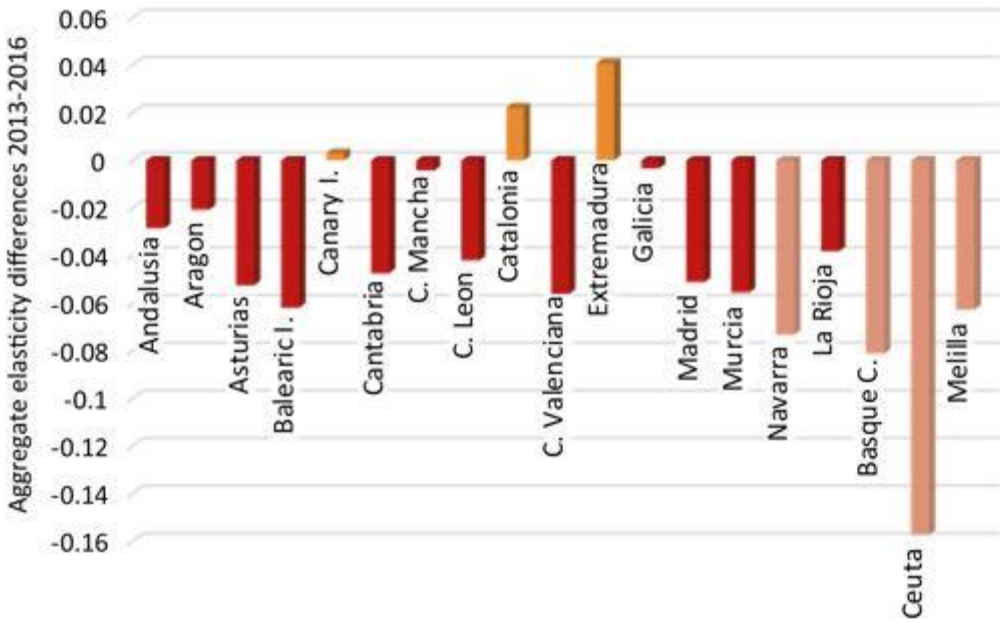

Figure 1: Variation on proportionate aggregate income tax elasticities. Regional level (2013-2016).

The second hypothesis stated in the theoretical model implies a different distribution of total income across individuals. At this point, there can be systematic equalizing and systematic disequalizing income movements.

In order to introduce some dynamics in the estimation of aggregate income tax elasticities, we have divided the sample population into two groups (low vs. high individual income) and increase (decrease) income growth for individuals in the low group depending on the equalizing (disequalizing) hypothesis. Under the first case, individual income within the "low income" group is increased 4, 5, 10, 20 or 30 per cent while reducing income in the "high income group" accordingly to keep total income increase equal to a 3 per cent. In the second case, income increase is reduce to 1 or 2 per cent.

Moreover, different income thresholds are considered. We have used the poverty line established by EUROMOD for the sample, the first and the second income tax bracket.

Table 3 presents the results for the simulated year at national level. Taking as a reference the aggregate elasticity under the proportional case (1.9754), the values obtained when introducing dynamics in income growth do not vary much. Indeed, results are similar attending to the poverty line or first income tax threshold. On the other hand, the elasticity

appears to decrease if the second tax bracket is considered as income threshold and there is an equalization of income across groups.

Table 3: Non-proportionate aggregate income tax elasticities. National level (Simulated year)

	0.01	**0.02**	**0.04**	**0.05**	**0.06**	**0.1**	**0.2**	**0.3**
Poverty line	1.9755	1.9754	1.9753	1.9753	1.9752	1.9751	1.9742	1.9732
1st tax threshold	1.9758	1.9756	1.9752	1.9747	1.9745	1.9738	1.9725	1.9692
2nd tax threshold	1.9766	1.9775	1.9732	1.9696	1.9659	1.9584	n.a	n.a.

5. Concluding remarks

In this paper, we have evaluated income tax elasticities for the Spanish national income tax at national and regional level. These values provide information for tax revenues in the event of exogenous changes in income. Hence, they can be considered as a proxy for tax collection in the long run, given a change in the economic cycle.

The fiscal reform introduced by the central government have not impact the elasticities figures for the year 2016. Under different hypothesis on the distribution of income across individuals, the values simulated do not vary significantly over time.

Under these results, the new personal income tax resulted from the las fiscal reform seems to not be able to increase tax collection in the long run. Hence, any expected change in the economic cycle will be a missing opportunity to reduce deficits over time.

6. References

Adiego, M., M. Navas, M. Paniagua and T. Pérez (2015). Los efectos redistributivos del IRPF tras la reforma fiscal. XXII Encuentro de Economía Pública, Santander.

Creedy, J. and N. Gemmell (2002). The built-in flexibility of income and consumption taxes. *Journal of Economic Surveys 16*(4), 509-532.

Creedy, J. and N. Gemmell (2003). The revenue responsiveness of income and consumption taxes in the UK. *The Manchester School* 71(6), 641-658.

Creedy, J. and N. Gemmell (2006). Modelling tax revenue growth. Cheltenham, UK – Northampton, MA, USA: Edward Elgar Publishing.

Creedy, J. and J.F. Sanz (2010). Revenue elasticities in complex income tax structures: An application to Spain. *Fiscal Studies 31*(4), 535-561.

Fries, A., J. Hutton and P. Lambert (1983). The elasticity of the U.S. individual income tax: its calculation, determinants and behavior. *The Review of Economics and Statistics 64*(1), 147-151.

Hutton, J. and P. Lambert (1980). Evaluating income tax elasticities. *The Economic Journal 90*(360), 901-906.

Hutton, J. and P. Lambert (1982). Simulating the revenue elasticity of an individual income tax. *Economic Letters 9*(2), 175-179.

Jara, H. X. and A. Tumino (2013). Tax-benefit systems, income distribution and work incentives in the European Union. *International Journal of Microsimulation 6*(1), 27-62.

López-Laborda, J., C. Marín-González and J. Onrubia-Fernández (2015). *Evaluación de la reforma del IRPF 2015-2016: Impacto recaudatorio y redistributivo.* Policy Paper 2015/05. Fedea.

Sanz, J.F., J.M. Castañer and D. Romero (2015). The impact of the economic cycle on Spanish tax revenues. *SEFO-Spanish Economic and Financial Outlook 4*(2), 89-93.