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**BYPASSING PROGRESSIVE TAXATION: FRAUD AND BASE EROSION IN THE  
SPANISH INCOME TAX (1970-2001)**

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**Tax Systems Analysis**

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**BYPASSING PROGRESSIVE TAXATION:  
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**ABSTRACT:** In this paper I estimate under-assessment of incomes in the Personal Income Tax during the years following its introduction in Spain. The methodology combines an analysis of discrepancy with National Accounts and an econometric exercise, which follows and slightly modifies the Feldman and Slemrod (2007) procedure, based on the relation of reported charitable donations with the composition of income in tax micro-data.

Both calculations show that concealment of income differed substantially across sources and levels, with better compliance at the bottom of the distribution of taxpayers. Because of this, fraud made the tax less progressive than it was on paper. Compliance improved over the next decades, but the overall levels were still far from those attained in developed countries, because of lack of administrative capacity or political will to enforce the new regulation. In this way, general, comprehensive income taxation was hardly a reality 20 years after its introduction.

***MAIN RESULT: Widespread evasion and avoidance in non-wage incomes severely affected the Spanish personal income tax during its first years in force, limiting both revenue and the redistributive effects of taxation.***

JEL Codes: H23, H24, H26, N44

Keywords: Tax evasion, base erosion, under-reporting, progressivity, personal income tax

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# 1 Introduction

Personal income taxation was at the centre of developed countries' tax systems in the second half of the 20th Century. It provided a significant share of revenues and occupied a pivotal place in the tax debate. In theory, it was designed to follow the "ability to pay" principle, and for that reason rested on two pillars: generality (affecting all citizens over a given income threshold) and comprehensive income definition. These traits made it something different from *Ancien Régime* taxation, the realm of privileges, and also from 19th Century factor taxes, which targeted each revenue source independently. Generality and a comprehensive income definition, together with the consideration of personal circumstances in the tax, make it possible to introduce effective progressivity and redistribution.

However, in the presence of fraud and base erosion, practice might differ considerably from theory. That was the sense of Gunnar Myrdal's tough critique of the Swedish income tax in 1978. He argued that high marginal tax rates created incentives to avoid and evade taxes, and hence equity –specially horizontal equity– was not at place. According to Björklund et al. (1995), this opinion influenced his society's views and drove towards reform in 1991.

A corollary to Myrdal's argument was that formal progressivity did not translate itself into redistribution from rich to poor. The Spanish economist Fuentes Quintana thought likewise. He had been a strong advocate of tax reform in the preceding decades, pushing for a central place of a progressive income tax in the system. It was under his guidance that this model was introduced in Spain in 1977-78, when the country was transitioning into democracy. However, in the following years Fuentes was very critical of the result, specially in relation to persistent evasion, and became a proponent of the flat tax in the 1980s.

One may or may not share this proposal as a solution for evasion. But the concern about fraud –in a broad sense– was and is crucial, since it carries negative consequences on the tax system and society in many dimensions. On the one hand, it reduces tax revenue, imposing heavier spending constraints on the government. It also represents a cost for society because of the effort spent in otherwise unproductive concealment and punishment activities. Horizontal inequity, on the other hand, is likely to erode the perceived legitimacy of the tax system. Finally, fraud also affects vertical equity, if the ability to evade (and maybe the propensity) changes along the income scale. In this paper, I focus on the last issue.

What do we know about how tax evasion is actually distributed? Economic theory has attempted to model the individual decision on whether or not to evade as a choice of the taxpayer in face of risk. In the classical "deterrence model" of Allingham and Sandmo (1972), the individual under-reports her income to a certain extent, to minimize the tax bill, taking into account the possibility of being caught and the heaviness of the sanction. Related literature has abounded on the relation between marginal tax rates, the income level and evasion. Conclusions are dependent on the specific assumptions about the nature of risk aversion, but tend to point towards higher incentives to evade at higher levels of income and maybe also in front of higher tax rates; since

these tend to grow with income, which of the two forces prevails is an empirical question.<sup>1</sup>

However, these models were shown to predict much higher levels of non-compliance than found in reality. In response to that, further work paid attention to other possible determinants of the reporting behaviour, such as tax morale (Andreoni et al., 1998; Luttmer and Singhal, 2014); the importance of withholding at source and third-party information reporting has been recently underlined as a key factor by Kleven et al. (2011). What about the relation of those with income levels? We do not know much about how tax morale can differ across the income schedule, but, by contrast, it is well known that some kinds of revenue are subject to much stricter control than others, and having distinct distributions: income from labour versus income from capital.

The empirical literature has provided us with several analyses pointing towards a possible positive impact of income on under-reporting, but with considerable uncertainty because of econometric issues. The seminal work of Clotfelter (1983) for the US and those of Valdés (1982) and Raymond-Barà (1987) for Spain found high-income taxpayers to under-report more, but the effect of income was difficult to disentangle from the effect of marginal tax rates because of the intense correlation between both.<sup>2</sup> Indeed, Feinstein (1991) contradicted Clotfelter in not finding a significant effect of income on the reporting behaviour.<sup>3</sup>

Work addressed to study the distribution of fraud has also suggested a rate of under-reporting increasing with income. For the US, the data have been available thanks to the Tax Compliance Measurement Program (later on, the National Research Program), providing samples of randomly audited tax returns. Using them, Johns and Slemrod (2010) found evasion to reach maximums in the top percentiles. This was partially a result of the composition of incomes, but not exclusively.<sup>4</sup> Similar conclusions were obtained by Feldman and Slemrod (2007), who estimated under-reporting with un-audited data:<sup>5</sup> it was increasing with income levels for self-employment non-farm income and for capital income. The analyses closest to mine are Alm et al. (1991); Matsaganis and Flevotomou (2010) and Benedek and Lelkes (2011); specially the first one, which estimates total tax base erosion for the case of Jamaica in 1983. To my knowledge, an analysis of the distribution of evasion across the income scale has not yet been undertaken in Spain, although we have some intuitions from studies that will be reviewed in the following section.

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<sup>1</sup>In Allingham and Sandmo (1972)'s paper, the income level would increase evasion (i.e., the percentage of income non-reported) if relative risk aversion is decreasing with income. The impact of the tax rate was found to be ambiguous in the case of decreasing absolute risk aversion (DARA, the most accepted possibility). Yitzhaki (1974) contemplated the common case where the sanction depends of the evaded tax – as opposed to the under-reported income in Allingham and Sandmo (1972)'s model. His specification does not change the expected effect of income, while it does alter the impact of the tax rate, that would now *decrease* evasion, in presence of DARA. (Allingham and Sandmo's results also stated that with DARA the absolute level of reported income will only increase when the sanction is a factor at least equal to 1).

<sup>2</sup>In spite of this, Raymond-Barà blamed the tax rates and thus made strong policy recommendations.

<sup>3</sup>This kind of empirical analyses have also analysed the effect of other factors, such as age, education level, marital status... The discussion of those is out of the scope of this paper.

<sup>4</sup>Bishop et al. (2000) used the same kind of data for the 1980s, estimating the changes in the indices of inequality caused by including evaded income. They found that vertical equity was affected, although less than horizontal equity.

<sup>5</sup>Their methodology will be reviewed and closely replicated in section 4.2 of this paper.

My preliminary hypothesis is that evasion in a broad sense (income concealment) was higher at the top of the income scale, and that, therefore, the tax was less progressive de facto than de jure. This would stem from the easier avoidance and non-reporting of capital incomes, while wages and salaries were most likely withheld at source. If the theoretical models are right, incentives to evade more at higher income levels or tax rates would push in the same direction.

The paper also proposes a methodological innovation, slightly modifying Feldman and Slemrod (2007)'s model to estimate evasion across filers by income source. Because the estimation is based on the relationship between reported incomes and deducted donations, the regression is performed using a restricted sample (those who itemized donations in a given year). The reason to do this is that the results of a baseline estimation may be biased in a context where donation behaviour is not as widespread as in the United States: in this case, a two-step procedure à la Heckman (1979) might provide better results. This is the first time that such an approach is taken in the tax evasion literature.

The rest of the paper is organized as follows. In section 2 I review previous work about tax evasion in Spain, while some aggregate data about compliance and inspection is presented in section 3. I next explain the methodology applied to estimate tax evasion in the personal income tax between 1971 and 2001 (section 4) and show the results obtained and the impact of evasion on progressivity (section 5). Finally, a general summary and some conclusions are presented in section 6.

## 2 Previous estimates of income tax evasion

Spain usually scores high among European countries in studies about the underground economy: Schneider (2009)'s estimates of 16%-23% of GDP make the country rank third in his sample in 2009, only after Greece and Italy. National studies generally agree about an increasing shadow economy during the eighties, with a peak around 1993-95, and its inability to fall below 15% of GDP thereafter (Pickhardt and Sardà, 2015).

Tax fraud is directly related to this phenomenon, though not equivalent. Some attempts have been made to estimate evasion in several taxes in the country, such as the Corporation tax (Truyols, 1994; Almunia and Lopez-Rodriguez, 2012) or the Value added tax (Díaz and Romero, 1994; Gómez de Enterría et al., 1998). In this paper, however, the focus is on personal income taxation, where evasion has been known to be widespread. Gota Losada (1970) underlined this issue in a classic study about the first such tax (the *Contribución General sobre la Renta* introduced in 1932), with data on the fraud discovered by the tax inspection between the forties and the sixties. The problem was addressed in further reports by the Spanish Institute for Fiscal Studies (Instituto de Estudios Fiscales, 1973), but has remained one of the main unresolved issues in the system after the 1978 reform, which introduced the modern Personal Income Tax (Fuentes Quintana, 1990; Comín, Francisco, 1994).

There are some estimations available. Albi (1975) studied the year 1971 (which corresponds to the *Impuesto General sobre la Renta de las Personas Físicas*, introduced in 1964). He calculated that total under-reporting of income tax bases amounted to 78% of the aggregate tax base declared

that year (which meant 33% of Spain's GDP).<sup>6</sup> The so-called personal income tax in Spain was, until 1978, a super-tax: it only affected those whose income exceeded a high threshold (under which incomes were taxed by factor taxes –“*impuestos de producto*”–, targeted at different kinds of revenue separately). Albi's calculation uses the whole group of factor taxes as a reference, adding up their respective tax bases, so his result is not comparable to the specific collection of the income tax per se: this was a negligible part of the total, as we shall see. The most important of those factor taxes during the seventies was the Labour tax (*Impuesto sobre los rendimientos del trabajo personal*), which can be fairly considered the main real precedent to the current PIT. Fraud in this labour tax was estimated by Santos Peñas (1975) to be around 56% for the years 1964-72 (also in terms of base under-reporting).<sup>7</sup>

In the process of introduction of the modern personal income tax, Alcaide (1980; 1981) performed some analyses on compliance. He shows that around 20% of the obliged households filed a return in 1977, going up to around 59% two years later. In both cases, however, ratios were decreasing with income, which points towards significant under-reporting: reported incomes were around 21% of real estimated household revenues in 1977, and 61% in 1979.<sup>8</sup>

Under the modern *Impuesto sobre la Renta de las Personas Físicas*, concern for this issue has not diminished. Fuentes Quintana (1990) shows how 27.5% of a random sample of returns from 1979 were found fraudulent by inspectors, with the percentage of tax evaders increasing with income, which supports the initial hypothesis in this paper. During the 1980s, a Commission was appointed by the government to estimate evasion in several taxes. The PIT study group yielded results for the years 1979-86, after which its existence was put to an end.<sup>9</sup> Their estimations are shown in table 1: levels of compliance generally beneath 70% in all concepts, but increasing over the period. The filing obligation was fulfilled by 52 to 64% of those legally obliged, and 43 to 55% of the total taxable income in the country was reported.<sup>10</sup>

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<sup>6</sup>All calculations involving GDP levels are made with data from Prados de la Escosura (2003).

<sup>7</sup>This general estimate conceals acute differences among categories of workers: evasion from civil servants was calculated as 5.6%, in industry workers 28.5%, in service workers 43.1% and finally professionals were found to evade the most, at a rate of 71.0%.

<sup>8</sup>For the income category of more than 6 million ptas, the ratio returns/households was under 8% and 19% in 1977 and 1979 respectively. It is important to explain that this does not necessarily mean that the wealthiest families did not file a return, but that they probably did not report a significant share of their true income. It should also be noted that such a big improvement in compliance in just two years seems unlikely: the estimations are surely not very precise, since they rely on faulty data on household incomes and their distribution. Many low-income households may have paid their share in the factor taxes and simply not filed a return for PIT, which would maybe not have increased their tax due anyway. The fundamental changes in the system of personal taxation make comparison difficult across regimes.

<sup>9</sup>Lagares (1999), the head of this Commission, recalled that “*It was not easy [...] to present the results obtained, because these showed a reality far from what the Tax Administration had expected, still divorced from the actual magnitudes of our national incomes, and from what could have pleased the politicians*”.

<sup>10</sup>Because of their distinct systems of tax administration, the Commission could not include Navarra and the Basque country in their study. Unfortunately, this data problem is quite common in the area. We do however have an estimation for the Basque provinces in 1983-89 using the same methodology: Sasigain (1993) found a slightly higher level of compliance (60 to 64% in the period) and the same strong contrast between wage incomes (70 to 84%) and that of revenues from capital or self-employment (31-33% with no clear trend).

Table 1: Compliance in the Spanish income tax according to the  
*Comisión para el Estudio del Fraude en el IRPF*

	Filing	Tax base reporting		
		Total	Labour	Other yields
1979	52%	43%	54%	22%
1980	57%	48%	62%	24%
1981	56%	49%	63%	25%
1982	56%	50%	65%	25%
1983	59%	51%	67%	23%
1984	59%	51%	67%	25%
1985	61%	52%	69%	26%
1986	64%	55%	71%	30%

Source: Comisión para el Estudio del Fraude en el IRPF (1988).

Note: only regions under the common fiscal rule (i.e., excluding the Basque Country – only Álava in 1979-80 – and Navarra).

Unsurprisingly, concealment of revenue was significantly more intense in non-labour yields. In a similar way, Díaz and Melis (1993) found that evasion could be very roughly estimated to be around half the real tax base for entrepreneurial incomes in 1989.<sup>11</sup>

Has this situation improved in more recent years? Díaz and Fernández (1993) estimated 6.2% of under-reporting in wages in 1990, down from 11.6% in 1987. Their figures are shockingly different from those obtained by the Commission, because they are based on a different source and method: these authors use withholding data from firms (*Estadística Anual de Retenedores*), which allows disentangling salaries from pensions, and limiting the scope to wages of those actually obligated to file a return. Díaz and Fernández attribute the difference in the results precisely to the incidence of the income threshold, which they seem to think that the Commission did not correctly estimate. Other possible sources of discrepancy are the 85% coverage in their source, or the fact that this estimation isolates the under-reporting of the filers, while the Commission data subsumes the effect of non-filing.

In terms of total tax base, Esteller (2011) also obtained a more positive result for the period 1993-2000, with average compliance estimated at 80%. Using micro-data of the year 2008, Domínguez et al. (nd) have recently calculated under-reporting of non-wage incomes as 40-55%, which is also a favourable evolution from 70% in 1986 (their method is largely replicated in section 4.2 of this paper): to sum up, studies point to a decrease in tax evasion, but at the same time to persistent differences in the subjection of incomes to tax depending on their source. The is-

<sup>11</sup>If the taxpayers with this kind of revenue were imputed the average wage reported in tax, and their relatives working with them were imputed the minimum wage, business incomes would be estimated at more than double than the reported magnitudes. The authors state: “This approximation to personal businesses’ under-reporting in PIT, whatever crude, yields an index of concealment equal to the average index of concealment obtained by the Tax Inspection in the sample investigation that served as a base for the establishment of assessments for the reform of presumptive taxation” (p. 189).



sue deserves further attention, since it violates basic principles of fiscal equity while affecting tax revenue.

### 3 The struggle for compliance in Spain

The path towards general income taxation in Spain was slow and painful. Initially, the threshold was very high,<sup>12</sup> and there was also persistent lack of compliance. Table 2 represents this evolution by showing the number of returns, and of those returns with positive tax due, and puts them in relation to the number of inhabitants and households in the country.<sup>13</sup> Columns (8) and (9) are more illustrative of generality than (5) and (6), because these taxes were during almost the whole period conceived as family taxation, and implied until 1989 joint compulsory filing for married couples.

Table 2: Generality of personal income taxation in Spain

Period	Returns (1)	Positive tax due (2)	Pos/ returns (3=1/2)	Adults (4)	Ret/ adults (5=1/4)	Pos/ adults (6=2/4)	House- holds (7)	Ret/ (Hh.) (8=1/7)	Pos/ (Hh.) (9=2/7)
1933-54	19	6.7	54.6%	16,794	0.1%	0.0%	6,124	0.3%	0.1%
1955-67	211	64.5	31.4%	19,383	0.7%	0.2%	7,779	2.7%	0.8%
1968-79	956	76.6	6.9%	22,129	1.4%	0.1%	9,508	9.6%	0.8%
1980-90	7,641	6,019.7	75.3%	24,530	31.9%	17.7%	11,140	68.2%	53.2%
1991-00	13,776	11,285.8	81.4%	27,981	49.2%	40.2%	12,310	111.8%	91.4%

All data are expressed in thousands and averaged over the periods given by the first column. 'Hh' = Households.

Note: since 1983, the number of returns corresponds only to the regions under the common fiscal rule (i.e., excluding the Basque Country and Navarra).

Source: author's calculations with data about number of returns from Gota Losada (1970); Valdés (1982); Ministerio de Hacienda (1980, 1981), IEF-BADESPE and PIT microdata. For households, INE (*series históricas*) and Household Budget Surveys, interpolated. For adults, Alvaredo and Saez (2009), tables in Appendix (population over 20, excluding regions with special regimes).

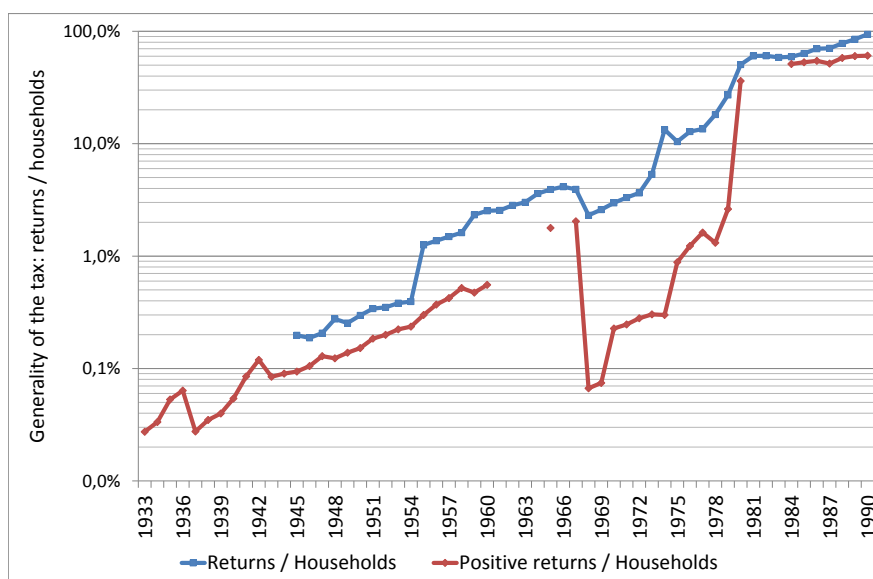
In figure 1 I plot the series of tax filers and taxpayers over the total number of households, for the period 1933-1990 (again, the number of tax filers is that of tax returns, while 'taxpayers' refers only to those who had positive tax due as a result of filing). Filing gradually became more and more widespread until the late 1980s, when the process was quite complete. Several turning points correspond to major reforms in the tax in 1954, 1967 and 1978. The line of effective tax-

<sup>12</sup>Under this threshold, individuals were subjected to factor taxation, which was in general not progressive, as was consistent with the conservatism of the political regime.

<sup>13</sup>Under the old tax regime, returns with no positive tax due correspond to individuals who did not pay any personal income tax in addition to factor taxation (although they were required to file); column (2) therefore represents more closely the concept of 'taxpayer' than column (1). For the modern tax (after 1979), it is important not to mistake "positive tax due" with "positive differential tax due" ("*cuota diferencial a pagar*"): column (2) still represents the number of effective taxpayers, not only those who had to pay an additional quantity during the filing season as a result of insufficient withholding.

payers (in red) runs parallel to that of filers in the first decades, but then drops very significantly in 1967. During the period of the IGRPF, indeed (that is, until 1978), this tax was filed by an increasing number of taxpayers, but only under 10% of those who filed actually paid some tax: all others had already fulfilled their obligations with the factor taxes. This meant, among other things, that revenue collection through the *IGRPF* was insignificant, and its progressive rates did not generally apply. The reform in personal taxation during the sixties therefore did not really have a redistributive impact, as it was presented at the time – it might actually have had just the opposite effect.

Figure 1: Generality in Spanish personal income taxation



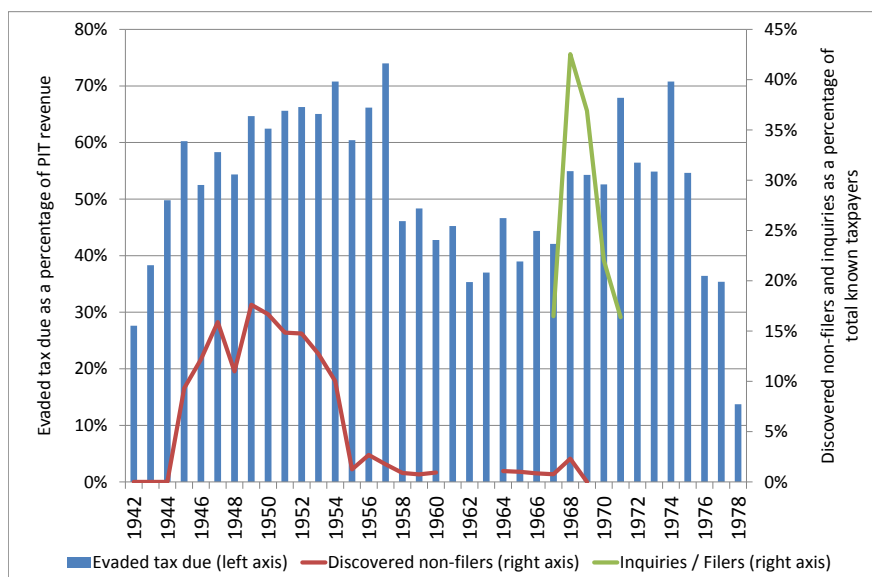
Sources: same as table 2. The blue line (Returns/Households) represents the extension of filing, while the red one (Positive returns/Household), that of effective payment of the personal income tax.

Under the modern PIT, on the other hand, 80-90% of tax filers had positive tax due, which was translated to 50-60% of households (since 55-85% filed a tax return). During the nineties, the tax attained generality, with returns outnumbering households (separate taxation of married couples was introduced as an option in 1989-91). In the first decade of its existence, nonetheless, there was still considerable distance to 100%. As we shall see, this does not only reflect the legal threshold, but also to failure to comply with the system.

The results of the tax inspection activity can shed further light on evasion. It should be kept in mind, however, that these data show in all cases a lower bound, and their trends do not necessarily coincide with those of actual fraud (since resources and efficiency in tax inspection also play a role in the outcome). In figure 2 I depict the relative importance of uncovered tax fraud in the precedents of PIT. Evaded tax due is shown as a percentage of total tax liquidated in the corresponding year (this does not mean that all uncovered tax was eventually paid): it stands near 50% of revenue, showing that it should have been indeed a big concern. The relative decrease in the sixties is associated, according to Gota Losada (1970), with the use of presumptive assess-

ment in several of the components of income, which therefore were no longer subject to this tax inspection. It is thus not a clear indicator of improvement.

Figure 2: Results of inspection in the personal income tax



Sources: Gota Losada (1970); Hacienda Pública Española (1974); ?, Castillo (1994) and Torregrosa (2015a). 'Evaded tax due' is that discovered by auditors, and shown as percentage of each years' liquidated collection. 'Discovered non-filers' are individuals not presenting a tax return and being caught by inspection; they are displayed as a percentage of the number of filers after including them. 'Inquiries' represents more widely investigation processes ("actas").

The same evolution is mirrored in the series of discovered non-filers (as a percentage of filers plus discovered non-filers): in the forties, near 15% of the total number of filers eventually known by the tax administration had failed to make their tax return. The norm was widely overlooked. After 1955, however, this number dropped down to under 3%.<sup>14</sup> Was tax fraud overcome?

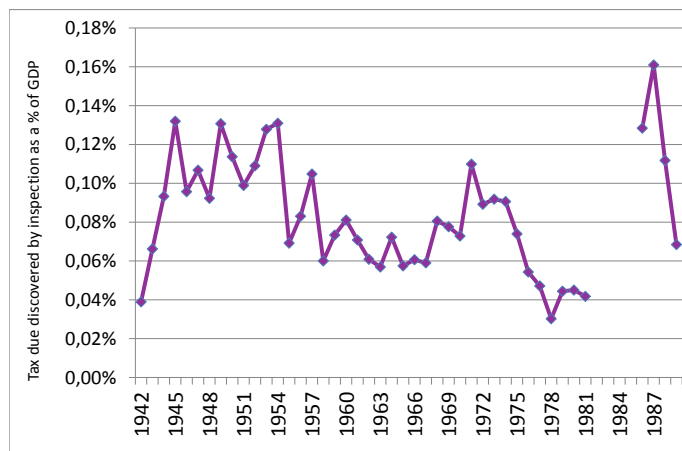
Both data series are unfortunately not complete, but the ratios significantly decrease after 1978 (not shown in the graph), when the denominators experienced very significant growth due to the introduction of the modern tax (both in revenue and number of filers). It should not be concluded, however, that the problem disappeared. If we look at the importance of the discovered evaded tax in terms of GDP, a different picture emerges (figure 3): the relative magnitude is around 0.10% of GDP, with no clear difference between the period of the old income taxes (pre-1978) and that of modern PIT, where the tax base was now much wider because of the inclusion of new taxpayers.<sup>15</sup> The fact that the discovered tax bill did not significantly increase after the 1978 reform calls into question the ability of the inspection body to adapt to the new tax, which undoubtedly required

<sup>14</sup>This could be related to the re-introduction of the use of "signos externos", objective criteria for subjection to the tax, like dwellings or vehicles owned, or number of servants. This instrument had been relegated following the Civil War.

<sup>15</sup>The revenue of the old taxes in the period 1958-78 was around 0.2% of GDP, while in 1979-90 it attained 5.7%: i.e., it multiplied by a factor of 28 in relative terms.

higher control resources if it were to be effective.

Figure 3: Tax due discovered by inspection, as percentage of GDP



Sources: Same as in fig. 2, with GDP from Prados de la Escosura (2003).

The lack of capacity in the tax administration is one of the explanatory factors for the historically high levels of fraud in Spanish personal income taxation, together with tax morale or economic structure considerations. Indeed, evasion was for a long time a profitable strategy for taxpayers, given the probability of being investigated and the sanction structure. Lagares (1974) made some calculations on expected income and fines, and obtained that the rational choice for a risk-neutral individual would be not to declare her income. This was the combined effect of low and un-progressive sanctions, and meagre probabilities of detection, in combination with quite high interest rates in the economy.<sup>16</sup> Still in 1986, according to Castillo (1994), this was the optimal strategy for a “rational” citizen.

These observations are of course at odds with the reality, where some tax was paid. In fact, many taxpayers were constrained to comply due to withholding at source of their (labour) income, while others had the option not to do it (notably in the case of self-employment and capital incomes). The lack of knowledge of the tax administration about the real incomes of citizens and firms was so notorious that collective presumptive assessment was established as an alternative to the direct estimation of tax bases (i.e. derived from individual accountancy) as late as 1957-64 in several taxes. This model still partially survives in the form of presumptive taxation schemes for self-employment activities (*Estimación Objetiva*).

Already in 1940, a Registry of Income and Wealth of individuals was created by the dictatorial government (*Registro de Rentas y Patrimonios*), to which banks, stock exchange agents and other establishments were supposed to inform about their clients’ assets. But this does not mean that third-party information reporting was a reality. In fact, it took several decades to painfully introduce it as an automatic part of economic life. Banking secrecy was abolished by law in 1977, at the same time as tax crime was introduced; however, the first was appealed to the supreme Con-

<sup>16</sup>The use of a model of risk neutrality (that is, direct maximization of expected income) leads to corner solutions. If we considered a more complex model with risk aversion, the optimal strategy would be less extreme.

stitutional Court, paralysing its application for years, while the second had very limited practical results up to at least 1990 (Castillo, 1994).

Some improvements came about during the eighties. The introduction of VAT in 1986 was expected to foster compliance, given the incentives of the different parties involved to report economic activity in order to request refunds (according to the results in table 1, this was at least partly effective). At the same time, in 1985 a new law introduced the withholding and reporting of financial revenues by the financial institutions. The legislators acknowledged the disproportionate weight of labour income in the aggregate tax base, which was a result of unequal compliance. The immediate effects of this reform, however, were not outstanding. The banking sector found ways to avoid fiscal transparency, with the creation of several opaque instruments that had considerable success during the second half of the decade (notably, the “*primas únicas*” and “*cesiones de crédito*”).<sup>17</sup> It is remarkable that the State issued one also opaque public debt asset, the *Pagarés del Tesoro*, which it swapped in 1991 for another kind of anonymous debt (*Deuda Pública Especial*) granting complete impunity.<sup>18</sup> In this way, the government conceded amnesty to black money, in exchange of finance under market price.

At the same time, reinforcement of the tax administration was taking place, with the proliferation of new offices around the territory, a reform of the structure of tax inspection in 1986 (Pan-Montojo, 2007; Castillo, 1994), and a general process of computerization. Finally, the body was given higher autonomy in 1991 with the creation of the AEAT (*Agencia Estatal de la Administración Tributaria*), which was expected to bring higher efficiency with a more flexible operation than that of the public sector in general.<sup>19</sup> In spite of that, Onrubia (2007; 2012) shows how insufficiencies in terms of personnel and organisation prevailed during the last decades of the 20th Century and are significant even today, compared with other Western European countries.

There was no withholding at all in rental incomes until very recently. A law in 1998 established the obligation of tenants to withhold part of their payments, as a response to widespread non-reporting of these incomes. But the mechanism is not general, since the obligation only concerns legal entities and not individuals or households (due to the associated compliance costs to the withholder). Rents of housing between individuals are therefore still lacking automatic control. Indeed, shifting of income from financial to fixed assets in the aftermath of the reforms of the middle 1980s was suggested by Castillo (1994) as one of the elements contributing to the first housing bubble of 1986-89.

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<sup>17</sup>Descriptions and some data on these assets can be found in Esteve (1990) and Castillo (1994).

<sup>18</sup>The identity of the holders would only be known to the government at the time of expiration, in 1997, when the tax crime could no longer be prosecuted. On these events, see López-Laborda and Saucó (2003).

<sup>19</sup>Notably, the ability of granting higher salaries to inspectors, to fight the draining of qualified personnel towards the private sector which was an acute phenomenon in the 1980s.

## 4 An estimation of the incidence of tax evasion

In the empirical part of this paper, I estimate under-reporting of income tax bases in the country for selected years between 1971 and 2001, following two different methodologies. While both of them have their shortcomings, a joint examination of the results might reinforce their plausibility. The following section compares my estimates with those of previous works and international cases. I also attempt to go one step further and approximate the impact of fraud on the progressivity of the tax.

Under-assessment of incomes for tax purposes arises in at least three distinct ways, and all three will be considered in this paper (and, from now on, generally referred to jointly as "income under-assessment" or "income concealment"; also as tax evasion in a broad sense). The first one is the existence of non-filers: individuals who were legally obliged to pay taxes and file the corresponding tax return, but failed to do so. As we have seen in section 3, this was a problem of considerable magnitude in Spain during most of the 20th Century. Unfortunately, there is hardly any available information on them (for the US case, see Erard and Ho, 2001).

The other ways for income to escape taxation are legal under-valuation and (illegal) under-reporting by taxpayers. Both are jointly studied here, since they are difficult to disentangle from the available data. Of course, only under-reporting is fraud from a legal point of view, while the first entails no punishable behaviour. It does, however, limit the capacity of the income tax to be precisely a general contribution falling on all kinds of income equally. I consider this issue to be an expression of a base-voidening strategy by taxpayers, where the state implicitly recognises its incapacity to tax certain revenues.<sup>20</sup>

In the Spanish case, legal under-valuation arises notably in self-employment activities under certain threshold, which can make use of presumptive standard estimation, and in imputed incomes of owner-occupied housing (included in the tax base as a percentage of the cadastral value of the dwellings). Both procedures are known to have greatly under-assessed market values.<sup>21</sup> Under-valuation of certain revenues, of course, affects equity among taxpayers because they all have different weights in each citizen's total income.

The privileged treatment of capital incomes is a related phenomenon, which grew propelled by international and specially European integration, as e.g. Pérez Royo (1990) explains.<sup>22</sup> Gradually, capital incomes have been offered tax advantages, culminating in the dualization of PIT,

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<sup>20</sup>This definition includes tax allowances, exemptions and reductions, but not tax credits, which are deducted from the tax bill instead of the base. These instruments can be thought of as similar, but have normally clearly different distributive effects, with tax credits being potentially more progressive.

<sup>21</sup>Regarding housing, the percentage was first set at 3% and downgraded to 2% in 1988; currently 1.1% is applied if the cadastral value was assessed after 1994. Naredo (1993) found that undervaluation with respect to market values increased during the eighties (in a context of growing housing prices), and applied correction factors ranging in 1982 from 2.48 to 3.42 for urban properties and 6.7-8.4 for rural ones. Durán-Cabré and Esteller-Moré (2010) calculated that cadastral values were 20-30% of market values in the period 1987-2001.

<sup>22</sup>"A minimally realistic position [...] will have to acknowledge that the trend of our legislation, mainly since the Law 14/85 and RD 2027/85, towards an increasingly effective control and taxation of capital incomes, whose last steps have been taken with R. Decree-Laws 1/89 and 5/89, will to some extent have to be retraced".

which exceeds our time range. Procedures for the total or partial exemption of these incomes impact on our estimates, while they may be covered only indirectly and unprecisely. Also, because of the special treatment given to collective investment institutions, mobile capital incomes could be shifted to a considerable extent into these arrangements, thereby lowering the burden on the “personal income” of their recipients (Carbajo Vasco, 1991 reviews these special regimes, which were deepened in 1985 and 1992). Income shifting might be detected by the econometric equations in subsection 4.2, though they are much less likely to be captured by the discrepancy exercise of subsection 4.1.

#### 4.1 The discrepancy approach

The international literature has attempted to measure under-reporting with the comparison between tax returns and household surveys or national accounting. This approach has been widely applied in Italy, where tax evasion issues are also acute (Bernardi and Bernasconi, 1997; Fiorio and D’Amuri, 2005; Marino and Zizza, 2012); and also in some tax gap estimations performed by states in the US (as cited by Alm and Borders, 2014). The intuition behind it is that the incentive to conceal income in a tax return is not present at an anonymous interview, so the answers to the latter would be more honest (which does not preclude possible errors). In this sense, the difference between both sources would indicate lack of generality in the taxation of income. It is important to keep in mind, as has been said, that this difference is not only illegal fraud, but also avoidance and other escapes from taxation in a broad sense – including incomprehensive legal definitions of the tax base, which can be difficult or impossible to discern. Offshore unreported revenues will not show up in this calculation, to the extent that they are not present either in National Accounts (on this source of evasion, see e.g. Zucman, 2013; Johannesen, 2014).

The data used here comes from two sources. One is the PIT returns micro-data provided by the Spanish Institute for Fiscal Studies (IEF), which offers a 2% randomised sample of all taxpayers in each year since 1982.<sup>23</sup> The other arises from the Household Budget Surveys (from now on, HBSs) undertaken by the Spanish Statistical Institute (INE). The comparison of both databases poses several challenges. Firstly, income data in HBSs are known to be also widely under-assessed; therefore, a previous adjustment to the magnitudes in the National Accounts is required (see Torregrosa, 2015b).<sup>24</sup> On the other hand, incomes in the HBSs are always given in net terms, so gross revenues can only be obtained after imputation of the tax paid; something which was also

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<sup>23</sup>The design has changed in the later years, being more complex since 1999.

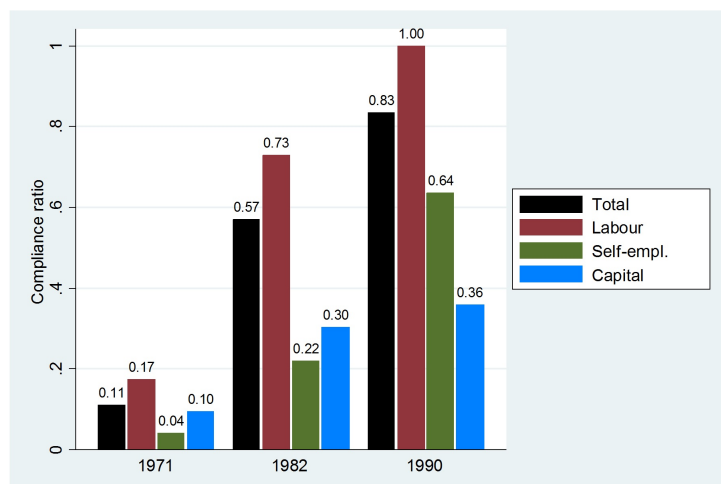
<sup>24</sup>A scaling-up procedure was implemented, using different factors by income source. This prior adjustment will directly affect the levels of the ratios obtained (which would be higher relative to the raw HBS data), but only indirectly their variation across income levels, by affecting the relative ranking of households. Because the same factor was used to all income of a certain kind irrespective of the income level of the recipient, incomes might be under-estimated in high ranks and therefore the ratios would suffer from upward biases (because of known non-response among affluent households). It should also be taken into account, however, that were item non-reporting is an issue in the HBS, factorization is not a completely correct adjustment methodology (imputation should go along). This additional problem entails a downward bias on the compliance ratios for incomes where item non-reporting in the HBSs is significant. This could be the case for capital incomes.

tackled in previous work (Torregrosa, 2015a). Other adjustments in the homogenization of the data are explained in the methodological Appendix A.

The categories of income to be analysed need to be identifiable in both databases. This restricts the analysis to four components: labour income, capital income, self-employment income and the total sum of household revenues.<sup>25</sup> Several non-monetary items are included in the taxable base: imputed income from owner-occupied housing (in capital income), in-kind compensation (labour income) and self-supply (self-employment income).

The aggregate composition of incomes of taxpayers in both sources serves as an indication of total evasion in a very broad sense. Figure 4 reflects the compliance ratio obtained by dividing the reported magnitudes by the real estimated flows of household incomes of each kind. In 1990, over-reporting of Labour incomes has been obtained, which likely arises because of the total being underestimated in the HBS data; this figure has thus been adapted to 100% and the other ratios have been adjusted accordingly.<sup>26</sup>

Figure 4: Compliance ratios by income source (obliged taxpayers)



Sources: author's calculations with aggregated tax data of 1971 from Dirección General de Tributos (1980), p. 34; tax return micro-data 1982 and 1990 from IEF; household budget surveys from INE, adjusted in Torregrosa (2015b; 2015a) using aggregate magnitudes from INE (1979; 1993).

Calculations for 1971 are undertaken under the assumption that the share of income of each kind accruing to the households over the threshold is the same as in the HBS of 1973-74.

Labour and total ratios for 1982 are approximated by adding subjected pensions to the denominator (data from Ministerio de Trabajo, 1991) and using their distribution by deciles given in Bandrés (1993).

<sup>25</sup>Labour income includes pensions in 1990, but they are not available in the HBSs in previous years. Pensions are thus added from other sources for the aggregate discrepancy in 1982, while pensioners are dropped for the calculations of under-reporting by levels. See the methodological appendix for details.

<sup>26</sup>Recall note 24 on the adjustment procedure applied in Torregrosa (2015b): how high incomes might have been under-adjusted, and low incomes over-adjusted (this entails that the income share of non-taxpayers appears bigger in our corrected-HBS data than it actually was, thus pushing the compliance ratios up). It is also possible that the problem arises because of imperfect matching between the survey and the tax database.

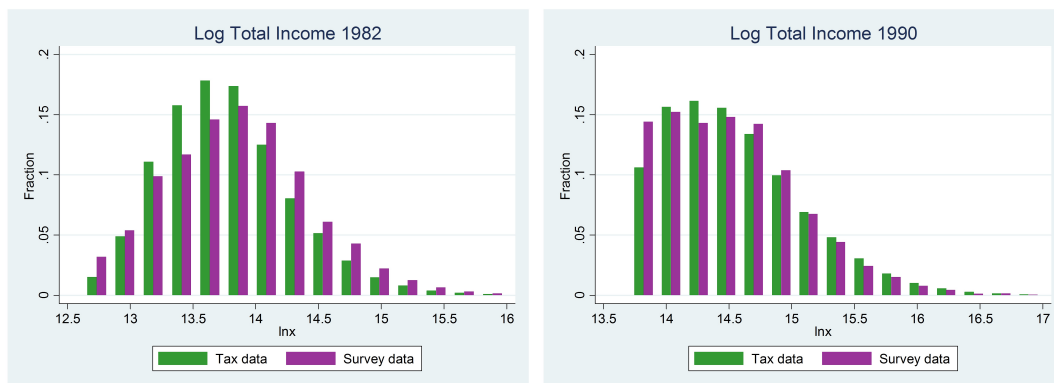


It can be seen that labour incomes were the most correctly reported, already in 1971, but specially since the eighties.<sup>27</sup> On the other hand, capital incomes show the most deceiving behaviour, while self-employment starts as the kind evading the most but experiences a very significant improvement. The total tax base shows a significant increase, but lack of compliance was still calling for concern in the last decade of the 20th Century.

These ratios subsume the impact of non-filing (which was specially acute in 1971), under-valuation and under-reporting. In the rest of the paper, I attempt to concentrate only on the last two aspects. However, non-filers cannot be directly excluded from the HBS sample, because we do not know who they were exactly. Therefore, my procedure relies on re-weighting this survey sample to match the population of effective tax filers (i.e., that of the tax database), by region, marital status, and labour market status (active versus pensioner). In this way, the weighted averages of the survey data will reflect the values of those who did file their returns. This procedure, of course, is only an approximation, which may be biased if inside each category the differences in income between filers and non-filers are significant.<sup>28</sup>

A comparison of the distribution of the tax bases, shown in figure 5, indicates that the incomes reported to the tax authorities were more concentrated than incomes in the survey. In the lower-middle range there is an ‘excess mass’ of tax data observations, which would correspond to higher income taxpayers under-reporting their incomes (and as a consequence, implying an ‘excess’ of survey observations at the top). At the bottom of the distribution, there are also more observations from the survey, which would signal to the impact of non-filers not completely adjusted by the re-weighting procedure.

Figure 5: Comparing the distributions in the tax and survey data



Source: author’s calculations with IEF panel data and HBSs.

The survey data have been re-weighted to match the population of effective filers.

To calculate the compliance ratios by income levels, I follow Matsaganis et al. (2010). Under-

<sup>27</sup>The 17% compliance estimated in 1971 might indicate that most wages accrued to taxpayers who failed to make a return, but this does not imply that they weren’t paying the corresponding labour tax, which was supposed to be withheld at source. Recall that the declared tax base data here is only for the “general” tax, not a comprehensive one for all the range of factor taxes.

<sup>28</sup>If non-filers have lower incomes than filers *inside a given combined category*, the estimated compliance will be upward biased (because mean incomes in the re-weighted survey will be underestimated), and the other way around.

reporting is calculated for each income source separately, as a ratio of the means in each database for each region. The underlying hypothesis here is thus that any difference between taxpayers at different income levels arises because of their location and the composition of their income:

$$C_{sk} = \frac{Y_{Rsk}}{Y_{Ssk}} \quad (1)$$

where  $C_{sk}$  stands for compliance ratio of income source  $s$  at region  $k$ ,  $Y_R$  represents average income reported in the tax returns and  $Y_S$  average income reported in the HBSs.<sup>29</sup>

Once these compliance ratios are obtained, they are used to make an estimation of the real incomes of taxpayers in the tax-return database, at the individual level (applying the average compliance behaviour):

$$Y_{Eisk} = \frac{Y_{Rsk}}{C_{sk}} \quad (2)$$

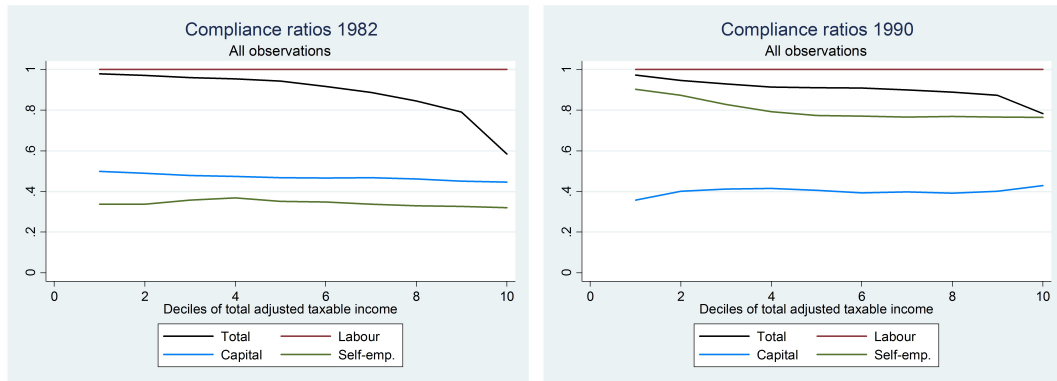
where  $Y_{Eisk}$  represents the real estimated income from source  $s$  of individual  $i$ , living in region  $k$ .<sup>30</sup>

Compliance behaviour by income level can then be calculated as:

$$C_{sj} = \frac{Y_{Rsj}}{Y_{Esj}} \quad (3)$$

$C_{sj}$  will differ from that in equation (1) in that the first assumed equal behaviour by source and income level, with no re-ranking, while this alternative calculation assumes equal behaviour by source and region, with the possibility of considerable re-ranking caused by the reporting decision. Figure 6 shows the results of these calculations.

Figure 6: Estimated compliance ratios by income deciles



Source: author's calculations with IEF panel data and HBSs (re-weighted). Following Matsaganis et al. (2010).

Again, in the case of income from labour we do not find any detectable under-reporting (as would be expected from their higher control). In both years we can see as well a decrease in

<sup>29</sup>Of course, it may be argued that different income levels behave differently even inside a given income source. Therefore, in Appendix B I show an alternative calculation following the earlier work of Fiorio and D'Amuri (2005), who directly estimate these ratios by income levels. This procedure, however, will be biased if the reporting decision causes significant re-ranking between the observations, to the extent that they changed their quantile.

<sup>30</sup>When the income of a given category is negative, it is multiplied by the compliance ratio instead of divided, thus assuming symmetric behaviour.

total compliance with income, with behaviour worsening significantly in the top decile, where it is estimated at 60-80%. Self-employment and specially capital incomes had worse compliance levels, which are driving the total because of the changing composition of tax bases across income levels.<sup>31</sup>

There is an improvement between both years in the total and self-employment compliance rates. The exception is the persistent sheltering of capital incomes (a part of which is channelled as *legal* under-valuation procedures). When interpreting the results, it should also be kept in mind that high incomes are possibly under-adjusted in the survey data, because of the use of a single factor for each kind of income (these factors should probably increasing with income to confront the higher reluctance to participate or give accurate answers of higher-income households). This means that compliance ratios are likely over-estimated in the upper part of the distribution, while the opposite effect would be found at the base.

The different rates obtained for the income deciles are likely to have had a very relevant impact on the progressivity of the tax, as we will see in section 5 (horizontal equity would of course also be affected). Even though equity would also be deteriorated if the lowest deciles under-reported the most, the fact that it is the top that specially escaped taxation would make fraud more worrisome, since the 10% of wealthiest taxpayers concentrated (as well as today) a much higher percentage of the total taxable base than their share in population. The leaking of a third of their incomes was therefore a vast obstacle for the revenue capacity of the tax – and the fiscal system in general, of which it was an important pillar.

## 4.2 Econometrics: too generous to be true?

The second estimation follows Feldman and Slemrod (2007) and Domínguez et al. (nd), who applied the formers' framework to the Spanish PIT in 2008. The method is based on Pissarides and Weber (1989)'s insight about relative under-reporting in household surveys: the self-employed were shown to be untruthful reporters of their income, because of their seemingly higher expenditure in food relative to the (reliable) wage-earners. The truthful category in Feldman and Slemrod's elaboration is no longer a type of individual (like the self-employed versus the wage earners in Pissarides and Weber, 1989), but an income source: labour; and the "consumption" item, that might be related to the level of income but in principle not to its composition, is here charitable donations. We may think of many characteristics which determine the income share that an individual wishes to give to others, but it is plausible that this decision is not influenced by whether the income was obtained as wages, self-employment revenues, or interests.

If we accept these assumptions, we can estimate an equation of the following form:

$$\ln DONATIONS_i = \alpha + \beta \ln(L_i + k_2 MC_i + k_3 FC_i + k_4 SE_i + k_7 N_i + k_8 O_i) + \gamma X_i + u_i, \quad (4)$$

where  $X_i$  is a vector of taxpayer characteristics including her age, marital status, number of

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<sup>31</sup>Some compliance ratios over 1 were obtained for labour incomes (and have been adjusted to 1). These indicate that the re-weighting applied does not fully account for the impact of non-filers, which would have lower incomes than filers in the given categories.

dependants, region of residence, city size, type of tax return, wealth dummy, differential tax due before the deduction for donations, and investment in housing.<sup>32</sup>  $L$  stands for labour income,  $MC$  for income from movable capital,  $FC$  income from fixed capital,  $SE$  from self-employment,  $N$  represents negative incomes of all kinds and  $O$  other incomes (mostly irregular ones). Revenues from different sources are always defined as broadly as possible from the data (i.e., they are meant to represent the total yield, net of costs of obtainment but not of other tax allowances). The coefficients of interest are the  $k$ :  $1/k$  indicates the compliance ratio of each component of income (labour income is taken to be fully reported, and therefore has no corresponding  $k$ ).<sup>33</sup>

Again, it should be noted that the coefficients  $k$  subsume two different kinds of under-assessment of incomes: actual evasion and legal understatement, arising from tax code's rules. This can be potentially important, as we have previously mentioned, in fixed capital and economic activities under presumptive assessment.<sup>34</sup>

Notice that, in contrast to Feldman and Slemrod (2007)'s estimation and other similar works, there is no variable representing the 'price' of the donation. This is because in Spain charitable contributions are treated as a tax credit (a given percentage of the donation is deducted from the tax bill), and not as a deduction from the taxable base, which implies that they are not affected by different marginal tax rates.

Another potential issue is the possibility that the taxpayers over-report their donations so as to obtain an excessive tax credit. Indeed, Slemrod (1989) found an average overestimation of 7.2% in audited tax returns in the US. It would be a problem for our estimation if propensity to this behaviour were related to the composition of an individual's income. But this is not clear; in fact, Feldman and Slemrod argue that it would not be rational in combination with an under-reporting of income, because it could trigger the attention of the tax administration. It is as well possible that the apparent higher charitable inclinations of wealthy taxpayers arise partly because they have better control on their donations and report them more accurately. If this were the case, our calculation would over-estimate fraud (given the correlation between the level of income and certain changes in its composition).<sup>35</sup>

The biggest problem, however, seems to be the possibility of sample selection bias, if we apply

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<sup>32</sup>Age is not available as such in 1982, so a dummy variable for being retired is used as an approximation. The type of tax return is included for years after 1989, when the option of separate filing for couples was introduced.

<sup>33</sup>Following Domínguez et al. (nd), an alternative estimation has been performed for 2001, where pensions are taken to be the only fully compliant income source. In our case, however, there is no significant change in the coefficients, and the behaviour of wage incomes cannot be statistically distinguished from that of pensions (this is similar to the later results in Domínguez et al., 2015 for 2005-2007). These calculations are available upon request.

<sup>34</sup>In 1982 we cannot include these incomes separately in the estimations, because all tax returns with explicit charitable donations were done in the "ordinary" model, which does not include the possibility of presumptive assessment. For 2001, on the contrary, we introduce them separately in the equation, as Domínguez et al. (nd) did.

<sup>35</sup>However, the direction of the bias is difficult to establish. Fack and Landais (2013) find that, in France, wage earners and low income taxpayers tended to over-report their donations to a greater extent (given their having less capacity to under-report incomes or abuse other deductions). If this were the case in our data too, the results would be an under-estimation. Informal conversation with a tax adviser in Barcelona suggested that these deductions are not very prone to evasion because of their low quantitative importance.

this procedure to the data using only the observations which have donations deducted in their returns. This would be specially worrisome in Spain, compared to the US, where giving-deducting behaviour has traditionally been more extended. Table 3 shows that returns with itemized donations ( $s=1$ ) were 3% of the sample in 1982 and 14% in 2001, and that their mean income was significantly higher than that of the whole universe of taxpayers. This casts reasonable doubt on the possibility of obtaining generalizable results from what is a small, particular sub-sample.

Table 3: Composition of the sample regarding itemized donations

s	1982			2001		
	Freq.	Percent	Mean income	Freq.	Percent	Mean income
0	116,308	97.4%	1,021,411	300,089	85.7%	3,501,217
1	3,082	2.6%	2,524,057	50,084	14.3%	6,093,974
Total	119,390	100.0%	1,060,201	350,173	100.0%	3,754,349

Source: author's calculations on the IEF tax return microdata.

Income is in nominal pesetas, and refers to the sum of net revenues from each source (which is higher than the taxable base given legal deductions applied). 2001: weighted means, but percent refers to the unweighted distribution.

This issue can be solved by using a two-stage estimation, following Heckman (1979), as has also been done in García and Marcuello (2001) to estimate the giving behaviour in the Spanish household budget survey data for 1990. The first equation is a Probit aimed at explaining the 'donating or not' behaviour, run over all observations:

$$Prob(s_i = 1 | \ln BI_i, Z_i) = \Phi(\alpha + \beta \ln BI_i + \gamma Z_i), \quad (5)$$

$s = 1$  meaning that the taxpayer made a deductible donation during the year.  $\Phi$  is the normal cumulative function.  $Z_i$  is a vector of taxpayer characteristics which includes all those in  $X_i$  but also some extra variables expected to affect the yes/no decision, but not the amount ('exclusion restriction'). In this case, city size and regional dummies are used. The rationale for the first one is that in bigger cities individuals are more likely to face direct appeals for making donations, which may make them more prone to do them, but not necessarily more generous once they have made the first decision (this exclusion restriction is also applied in García and Marcuello (2001), although they do not provide a theoretical justification). The regional dummies are also used following the intuition that the level of public goods, social cohesion, or other such aspects might affect the perceived need of individuals in different communities to make charitable donations (in that sense, Bradley et al. (2005) include the level of regional public expenditure). Once again, we expect the impact to be through a higher probability of donating, rather than giving more money after having decided to donate, since it is unlikely that the taxpayers in general have a very sophisticated knowledge of the level of need in different locations.

After estimating the Probit equation, we calculate the inverse Mills ratio ( $\lambda$ ), which in Heckman (1979)'s procedure accounts for the probability of selection of the observations (more specif-

ically, the ‘nonselection hazard’):

$$\lambda_i = \frac{\phi(\alpha + \hat{\beta} \ln BI_i + \hat{\gamma} Z_i)}{\Phi(\alpha + \hat{\beta} \ln BI_i + \hat{\gamma} Z_i)}, \quad (6)$$

where  $\phi$  and  $\Phi$  are the normal density function and normal cumulative function of the predicted values in the probit estimation. This new variable  $\lambda$  is included in the second equation, to correct the bias arising from the truncation of the sample (here, we only use the observations with  $s = 1$ ):<sup>36</sup>

$$\ln DONATIONS_i = \alpha + \beta \ln(L_i + k_2 MC_i + k_3 FC_i + k_4 SE_i + k_5 N_i + k_6 O_i) + \gamma X_i + \delta \lambda_i + u_i, \quad (7)$$

I apply this methodology to the analysis of the years 1982 and 2001. Other years have data problems that preclude successful estimation.<sup>37</sup> The number of variables and observations available increases between the two years, and some features of the tax had changed (namely, imputed income from owner-occupied housing is no longer included in the taxable base for the first dwelling, and a non-taxable threshold was introduced). In the year 2001 we can separately estimate compliance for different kinds of self-employment income categories, according to the assessment procedure (accountancy-based or presumptive).

Table 4 shows some indicators of the goodness-of-fit of the probit equations. The overall performance is good, even though predicting accuracy is low for observations with  $s=1$ . This is not surprising in such an unbalanced sample, according to Greene (2003). It points to the estimated probabilities being generally low. There might be a problem of omitted variable bias because of not including educational level (not available in the tax data), which has been shown to be significant in related studies, including García and Marcuello (2001) for Spain. This feature is, however, expected to be highly correlated with income and other variables in the model, which would reduce the extent of problem. In any case, the results have to be read with caution.

Table 5 presents the estimated coefficients. They are generally not at odds with other studies of charitable donations (Domínguez et al., nd; Brooks, 2003; García and Marcuello, 2001; Backus, 2010; Bradley et al., 2005). The income elasticity of donations is lower than one. Demographic variables have the expected signs: older taxpayers and women are more likely to donate, and also those with children. Investment in housing (not shown because of space considerations)

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<sup>36</sup>In principle, a Tobit estimation is another option to deal with this problem. The condition for this strategy, however, is that the two decisions (to give or not to give, and what amount to donate in the first case) are essentially affected in the same direction by the same factors. This is not necessarily true, and in fact different signs are obtained for some variables in the two stages of the estimation, suggesting that there are two qualitatively different decisions involved for the taxpayer. This was found also by García and Marcuello (2001).

<sup>37</sup>Namely, very low number of observations from 1985 to 1991 because deductible donations were restricted, and from 1992 to 1998 the inability to correctly calculate the quantities donated because of the existence of different percentages of deduction (in the micro-data, only the quantity deducted is available, which represented 10-15-20-25% of the donation, depending on the year). A new panel begins in 1999, but in the first two years the variable ‘age’ is missing for many observations. I have also estimated the models for 1983: the results are similar to those in 1982 and therefore serve as a reassurance. Compliance, however, seems slightly higher, which points to the low precision of these early data estimates because of the low number of observations.

Table 4: Goodness-of-fit measures of the Probit estimation

	1982	2001
Prob>chi2	0.0000	0.0000
Pseudo R2	25.60	11.73
% correctly classified		
Total	99.83%	85.54%
s=1	2.82%	5.71%
s=0	97.33%	98.86%

Source: author's calculations.

seems to be a substitute of charitable donations (it is a very important expenditure item for some households, and also deductible). The tax due variable (also not shown) corresponds to the differential tax due resulting from the return (not the total of the tax bill, most of which has normally been deducted at source), *before* the application of the tax credit for donations. It intends to control for the incentive to make (or report) donations because of anticipating a high payment at the filing season, which could arise in relation to variability in yearly incomes. This seems to be the case in 1982, where it has a positive, significant value in both the one-step and the two-step estimations; in 2001, on the other hand, the coefficient is negative in the one-step and the probit equation.<sup>38</sup> The significance of lambda in the two-step estimation shows that there is indeed a sample selection problem, which causes the one-step estimation to be biased.

The coefficients of interest  $k$  indicate the presence of under-reporting when they are significantly bigger than one. Table 6 displays the estimated compliance ratios under both estimation strategies, although the 2-step method is considered more accurate while the first one would be biased. The estimated compliance ratios are higher in 1982 when we apply Heckman, and lower in 2001. The story thus changes considerably. With the first results, we would have concluded that under-reporting lay above 80% in the beginning of the eighties, and was strongly pulled back during the following two decades. The Heckman estimates, however, yield under-reporting levels near 60% for all non-labour incomes in 1982, with the behaviour of movable capital actually getting slightly *worse* (around 70% still escaping taxation at the end of the century). Only self-employment incomes improved very significantly, while fixed capital incomes did so more slightly.<sup>39</sup>

<sup>38</sup>I interpret this as weak evidence pointing towards over-reporting of donations in 1982.

<sup>39</sup>The behaviour of the self-employed in 2001 under presumptive taxation, also in agrarian activities, cannot be statistically distinguished from total compliance. This might be shocking for readers familiar with the Spanish context. A plausible explanation is the relatively low number of observations for these categories, which does not allow to obtain precise estimates.

Table 5: Regression results. Dependent variable: log donations (marginal effects in probit)

	1982			2001		
	One-step Censored nl	Two-step Heckman Probit	Censored nl	One-step Censored nl	Two-step Heckman Probit	Censored nl
InIncome	0.462*** (0.0739)	0.0516*** (0.001)	1.018*** (0.180)	0.534*** (0.00770)	0.0826*** (0.001)	0.305*** (0.0235)
Movable capital	5.065** (1.978)	-	2.363*** (0.521)	2.001*** (0.152)	-	3.143*** (0.466)
Fixed capital	6.142** (2.761)	-	2.705*** (0.785)	1.403*** (0.116)	-	1.932*** (0.289)
Self-empl.	5.992*** (2.074)	-	2.625*** (0.546)	-	-	-
SE Direct	-	-	-	1.228*** (0.0506)	-	1.493*** (0.122)
SE Objective	-	-	-	1.110*** (0.131)	-	1.325*** (0.288)
SE Agrarian	-	-	-	1.326*** (0.160)	-	1.491*** (0.330)
Married	-0.566*** (0.0883)	-0.0052*** (0.001)	-0.579*** (0.0899)	-0.204*** (0.0255)	0.0425*** (0.002)	-0.353*** (0.0272)
Female	-	-	-	0.197*** (0.0267)	0.0862*** (0.0023)	-0.0837** (0.0339)
Pensioner/age	0.627** (0.257)	0.0024 (0.003)	0.618** (0.251)	-0.0365*** (0.00333)	0.0041*** (0.0003)	-0.0542*** (0.00345)
Dependants	0.0660*** (0.0181)	0.0012*** (0.0003)	0.102*** (0.0185)	0.00399*** (0.00138)	0.0025*** (0.0001)	-0.00450*** (0.00149)
Citysize1	0.0589 (0.150)	0.0029 (0.002)	-	0.158*** (0.0357)	0.0503*** (0.004)	-
Citysize2	-0.110 (0.161)	-8.85e-06 (0.003)	-	0.154*** (0.0342)	0.0361*** (0.003)	-
Citysize3	-0.0763 (0.113)	0.0058*** (0.002)	-	0.228*** (0.0263)	0.0453*** (0.002)	-
Citysize4	-0.0441 (0.0830)	0.0108*** (0.001)	-	0.162*** (0.0173)	0.0343*** (0.002)	-
lambda	-	-	0.665*** (0.161)	-	-	-0.842*** (0.0594)
Regions	yes	yes	no	yes	yes	no
Observations	3,082	119,387	3,082	50,084	350,173	50,084
R-squared	0.161	0.256	0.131	0.165	0.117	0.159

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The one-step procedure corresponds to equation (5), while the two-step calculations follow equations (6) to (8).

'Dependants' captures the needs of the household, which are subsumed in 'lnminpf' in 2001 (exempted income according to family situation). 'lambda' is the inverse Mills ratio. Other controls include a dummy for joint filing of marriages (compulsory in 1982), the differential tax due prior to the deduction for donations, the investment in acquiring a house, a dummy for disability (1982), age squared (only in 2001), the interaction of 'married' with 'female' (only in 2001), a 'wealth' dummy, and a constant.



Table 6: Compliance ratios à la Feldman-Slemrod

	1982		2001	
	1-step	2-step	1-step	2-step
Movable capital	20%**	42%***	50%***	32%***
Fixed capital	16%*	37%**	71%***	52%***
Self-employment	17%**	38%***	-	-
SE Direct	-	-	81%***	67%***
SE Objective	-	-	90%	75%
SE Agrarian	-	-	75%**	67%

Source: author's calculations with the coefficients from table 5.

The compliance ratio is  $1/k_i$  for each income source. Self-employment activities are separated in 2001 according to the valuation procedure: direct assessment (accountancy-based) or objective, where we further distinguish agrarian activities. \*\*\* Different from 1 at  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## 5 Discussion

Table 7 shows an overview of the results in terms of estimated compliance for different income sources by all the methods applied. An improvement can be seen across the years, but also a persistence in the differences in compliance degrees depending on the source, with the increase concentrated on self-employment incomes.<sup>40</sup>

The table allows to make a decomposition of total evasion, where the estimations for filers are only a part of the aggregate discrepancy (which includes the effect of non-filing). Both estimations are consistent with each other: in 1982, aggregate non-labour incomes were hidden by over 70% – but more than half of that fraud was due to non-filers.<sup>41</sup> Those who did file declared non-labour revenues around a half or a third of what they actually earned, in average (similar appreciations can be made for the following years).

The favourable evolution in the case of business incomes can be related to the aforementioned introduction of the Value Added Tax in 1986 (which incentivized the report of activity in order to claim back taxes paid on purchases), and secondly, to a reform in the system of presumptive taxation in 1991: given that in the eighties the low incomes reported by this group were worrisome for tax authorities, a new model was introduced for the standard assessment of these revenues,

<sup>40</sup>My results in terms of under-reporting by filers can be compared with those of Domínguez et al. (nd), whose work is closely replicated in the 1-step procedure. They calculated for the year 2008 a rate of compliance of 60% for movable capital, 70% for fixed capital, and 65% for self-employment activities under direct estimation (78% in the case of presumptive assessment). These levels are near the ones I get using the same method for 2001, so improvement in compliance seems to have been concentrated to a large extent in the last decades of the 20th Century.

<sup>41</sup>Indeed, if we estimate aggregate incomes of filers using the  $k$  as up-scaling factors, we find them to be around 60% of the aggregate incomes of those obliged to pay the tax (obtained from the HBS in section 4.1). The rest of the discrepancy is due to non-filers. If we up-scale incomes by the factors obtained in the 1-step estimation, the aggregate is significantly higher than the macro framework.

Table 7: Estimated compliance ratios by sources of income

	1982			1990		2001
	Total	Filers		Total	Filers	Filers
	Discr.	Discr.	2-step	Discr.	Discr.	2-step
Labour	73%	100%	ass. 100%	100%	100%	ass. 100%
Movable capital			42%			32%
Fixed capital	30%	45%	37%	36%	37%	52%
Self-employment	22%	32%	38%	64%	62%	-
SE Direct	-	-	-	-	-	67%
SE Objective	-	-	-	-	-	75%
SE Agrarian	-	-	-	-	-	67%
Total	57%	89%	-	83%	84%	-

Source: author's calculations.

Total discrepancy results are those in figure 4, thus subsuming the effect of non-filing. Filers' discrepancy estimates correspond to the ratios of the re-weighted values, referring only to active population in 1982 (and adjusting to Labour = 100% in 1990). The econometric estimations for filers are obtained from the coefficients in table 5, the compliance ratio being  $1/k$  for each income source (only the two-step results are shown). Self-employment activities are separated in 2001 according to the valuation procedure: direct assessment (accountancy-based) or presumptive, where we further distinguish agrarian activities. The results shown in italics are not statistically significant at the 10% level.

which seems to have brought up the reported yields.<sup>42</sup> It might also be suggested that a "learning" process took place after the introduction of the modern tax, in the context of higher legitimacy of the system under democracy.

Regarding fixed capital incomes, there were two potentially opposing changes. On the one hand, imputed rents from the main home were no longer subject to tax after a reform in 1998 (this would push down estimated compliance, given that all "loopholes" in the definition of the tax base are included as such). On the other, a withholding mechanism was introduced for rental incomes in the same year, supposedly enhancing compliance. The evolution of cadastral values, which were updated during the 1990s, surely also played a role.

The persistently low values obtained for movable capital, on the other hand, could seem harder to explain, considering the improvements in withholding and information reporting by the financial sector. Nevertheless, they could be pointing to the role of financial sophistication and avoidance, including international mobility and use of tax havens. Piketty (2003) provides some similar insights for the case of France.<sup>43</sup> Another possible cause for the downward path is the changing composition of filers, with the "new ones" under-reporting more. The answer is to

<sup>42</sup>In the 1978 law, the method for presumptive taxation was the *Estimación Objetiva Singular*, based on turnover. The 1991 reform introduced a new method, *Estimación por signos, índices y módulos*, which uses parameters such as the number of employees or the situation or size of the business premises. This system seems to have improved the reporting of entrepreneurial incomes, but is still fiercely criticized because of non-neutrality and not following the principle of economic capacity (Navarro, 1993).

<sup>43</sup>He reports a falling ratio of dividends in tax returns to those in National Accounts in the period 1927-95, and relates it to the development of funded pension plans and retirement saving accounts.

be given by further research.

## 5.1 The equity concern: impact on progressivity

A second consistency check is whether our discrepancy and econometric results yield similar profiles of compliance by income levels. I have therefore estimated what would be the total compliance for different income levels using the coefficients from the donations equation: I assign the obtained  $k$ s to each individual in the sample, thus imputing them the average behaviour in each income source. This allows to calculate “real” incomes, and contrast them with reported ones, in a similar manner as with Matsaganis et al. (2010)’s calculations. These ratios are shown in figure 7, and, for 1982, they can be compared with the compliance profile in figures 8 and 6. As can be seen, they are very similar and the general results hold: concealment was concentrated at the top.

Figure 7: Estimated compliance ratios by income deciles à la Feldman & Slemrod



Source: author’s calculations with IEF panel data.

The lines for different sources of income represent the compliance ratios from table 6, which are used to estimate total incomes.

Intuitively, it is easy to imagine that this distributional pattern of under-reporting necessarily has an impact on progressivity estimations. Three different scenarios are shown in table 8. Scenario 1, ‘Original’ is calculated as the combination of reported incomes and actual tax payments. In the presence of fraud, these indicators are a miscalculation of real progressivity (see e.g. Torregrosa, 2015a). In scenarios 2 and 3, I use “real” incomes, obtained factoring up the reported revenues with the  $k$ s (i.e., necessarily assuming that under-statement of incomes is uniformly distributed for each income source).<sup>44</sup> The ‘corrected’ column in table 8 represents the effective behaviour of the tax, with real incomes and actual tax payments. Furthermore, in a ‘no under-reporting’ scenario, the distribution of the tax burden and thus the reduction in inequality would have been very different. These calculations (real incomes, alternative simulated tax payments) are shown in the fifth column of table 8.

Real inequality would be around 7-24% higher than it looks in the reported data, and the average tax rate around 13-20% lower (difference between the columns ‘original’ and ‘corrected’). The redistribution estimates are the most affected: the index would be 64% lower than apparent

<sup>44</sup>I use the results of the donations equations for 1982 and 2001, while the coefficients obtained from the discrepancy analysis are applied for 1990 – in 1982, using these alternative coefficients does not change the results.

Table 8: Impact of under-reporting on progressivity estimations

1982					
	Original (1)	Corrected (2)	Difference (2-1)/(1)	No under-reporting (3)	Difference (3-2)/(2)
Pre-tax Gini	0.3166	0.3713	17%	0.3713	0%
Post-tax Gini	0.2919	0.3625	24%	0.3252	-10%
Average tax rate	0.1205	0.0963	-20%	0.1650	71%
Redistribution	0.0246	0.0088	-64%	0.0461	424%
Progressivity	0.1840	0.0899	-51%	0.2356	162%
Tax rate top 10%	15.64	10.82	-31%	21.58	99%
Tax rate 1%	22.69	11.53	-49%	38.67	235%
1990					
	Original (1)	Corrected (2)	Difference (2-1)/(1)	No under-reporting (3)	Difference (3-2)/(2)
Pre-tax Gini	0.3447	0.3676	7%	0.3676	0%
Post-tax Gini	0.3097	0.3431	11%	0.3017	-12%
Average tax rate	0.1536	0.1341	-13%	0.2095	56%
Redistribution	0.0350	0.0245	-30%	0.0659	169%
Progressivity	0.1987	0.1654	-17%	0.2513	52%
Tax rate 10%	19.86	16.46	-17%	30.68	86%
Tax rate 1%	27.81	20.19	-27%	45.11	123%
2001					
	Original (1)	Corrected (2)	Difference (2-1)/(1)	No under-reporting (3)	Difference (3-2)/(2)
Pre-tax Gini	0.3699	0.3955	7%	0.3955	0%
Post-tax Gini	0.3225	0.3622	12%	0.3291	-9%
Average tax rate	0.1597	0.1381	-14%	0.2011	46%
Redistribution	0.0473	0.0333	-30%	0.0664	99%
Progressivity	0.2539	0.2147	-15%	0.2673	24%
Tax rate 10%	23.04	19.22	-17%	28.84	50%
Tax rate 1%	30.07	22.14	-26%	41.17	86%

Source: author's calculations.

In all cases, instead of the legal tax base, the sum of net revenues from all sources has been used (which is closer to the concept of "total pre-tax income"). The 'original' scenario is the estimate readily obtained from the data, affected by under-reporting. 'Corrected' shows the real behaviour of the tax, if evasion was distributed as obtained, while the 'No under-reporting' scenario shows how the tax would be distributed under full compliance.

The redistribution indicator is the Reynolds-Smolensky index, corresponding to the difference between the Gini of pre-tax and post-tax incomes. The progressivity indicator is the Kakwani index, calculated as the difference between pre-tax Gini and concentration of tax payments. The tax rates for the top 10 and 1% refer to the distribution of corrected incomes.

in 1982, and 30% in 1990/2001; while progressivity was 51-15% overestimated respectively. This is a very significant impact, which would be a lower bound if under-reporting were increasing *within* income source. On the other hand, the negative impact has also clearly decreased between both estimations, following the changes in the distributional patterns of fraud.

Without evasion, the personal income tax would behave in a notably different way. The 'no under-reporting' column shows that, as expected from the progressive rate schedule, the taxation of high incomes would have been much more intense if the spirit of the law had been followed.<sup>45</sup> The Spanish tax system has been historically criticized for applying high legal rates on narrow tax bases; to a certain extent the appreciation seems to hold as late as the end of the 20th Century. Differences are very intense, again specially in the first year shown, but still in 2001 redistribution would have been *doubled* if income sheltering were eradicated.<sup>46</sup>

## 5.2 An international comparison

Placing the Spanish experience in international perspective might shed some further light. Table 9 presents rates of evasion (1 - compliance) taken from many different studies. The estimates of total tax base concealment in Spain during our time period are higher than many other available in the literature, which correspond to more developed countries or later periods. Our case appears close, however, to the results for Italy in 1991-94 and Chile in 1996, and also to the US estimates for the 1980s, obtained through the discrepancy method (i.e., subsuming the effect of non-filing and exemptions).

Evasion rates for self-employment incomes are always higher than those of dependent labour incomes or the general tax base. The behaviour in Spain does not stand out a lot in this respect. Rates of 70-80% are also found among small informal business suppliers in the US, suggesting that a significant part of the difference between countries could be due to the business structure. Small enterprises are more frequently informal, and also often taxed following presumptive methods: this regime, as has been said, historically under-estimated these revenues in the Spanish PIT. Similar systems exist in developing countries and also in places like France or Belgium, although they tend to loose importance. Presumptive methods are not applied, or very marginally, in developed economies where businesses are deemed capable of managing a basic accountancy. This element, therefore, clearly affects the comparison of Spain with countries such as Sweden or the US.

The process of salarization and the growing size of enterprises therefore seem important determinants of the increased compliance in developed countries. And indeed, both these indicators

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<sup>45</sup>In 2001, the existence of a special treatment for long-term capital gains has been considered a tax privilege, and thus the 'no fraud' scenario locates these revenues together with all the rest (i.e., I do not distinguish between the '*Base General*' and the '*Base Especial*', and apply the general, progressive tax schedule to the total – the '*Base Especial*' had a 18% uniform tax rate). The quantitative incidence of this choice, however, is very limited.

<sup>46</sup>Of course, such a result is highly implausible. The exercise serves as an indication of the intensity of the distortion, and not as a credible policy objective. The estimated tax gap in terms of tax liability lies between 2.4 and 3.3% of GDP – a lower-bound, since it does not include the Basque Country nor Navarra.

Table 9: A comparison of Personal Income Tax evasion estimates across countries

Study	Country	Year	Evasion as % of...		
			Tax liability	Total	Self-empl.
This study	Spain	1982*	42%	38%	78-62%
		1990	36%	17%	36-...%
		2001	29-17%**		...-33%
Esteller (2011)	Spain	1993-2000		20%	
Domínguez et al. (2015)	Spain	2005			24%
Domínguez et al. (nd)	Spain	2008			35-22%
Klepper and Nagin (1989)	US	1982			32-74-48%**
Internal Revenue Service (1996)	US	1985	14%	31%	35-73-31%**
		1988	13%	26%	32-81-32%***
		1992	13%		32-81-32%***
Feldman and Slemrod (2007)	US	1999			35-74-78%***
Johns and Slemrod (2010)	US	2001	18%	11%	43%
Black et al. (2012)	US	2006	23%		56%
Kleven et al. (2011)	Denmark	2007	2%	2%	37%****
Galbiati and Zanella (2012)	Italy	1987			46%
Bernardi and Bernasconi (1997)	Italy	1991		26%	63%
Bernardi (1996)	Italy	1994		23%	60%
Fiorio and D'Amuri (2005)	Italy	2000			78-8%
Marino and Zizza (2012)	Italy	2004		14%	56%
Albarea et al. (2015)	Italy	2010		7%	24%
Matsaganis et al. (2010)	Italy	2002	21%	11%	
Matsaganis and Flevotomou (2010)	Greece	2004	26%	10%	24%
Artavanis et al. (2015)	Greece	2003-09			43%
Leventi et al. (2013)	Greece	2005-09	30%	12%	43%
Benedek and Lelkes (2011)	Hungary	2005	16-20%	9-13%	67%
Engel et al. (1999)	Chile	1996	54%	23%	
	Chile	2003	46%		
	Ecuador	2005	58%		
	El Salvador	2005	36%		
	Guatemala	2006	70%		
Jiménez et al. (2010)	Mexico	2004	38%		
	Peru	2006	33%		
	Argentina	2005	50%		

Income tax evasion is presented as % of the estimated total in each case. Most of these studies apply different variants of the discrepancy method. The estimates for the US and Denmark, on the other hand, are based on audit data (except for Feldman & Slemrod, 2007), as well as those from Galbiati and Zanella, 2012. Numbers in italics refer to total evasion (including non-filing and underpayment). The tax liability calculations of this study refer exclusively to filers.

\* 1982 refers only to the active population.

\*\* The first figure includes the effect of the reduced tax rate on long-term capital gains.

\*\*\* Refers respectively to Non-farm proprietor income, Informal supplier income and Farm income.

\*\*\*\* Refers to all self-reported income, as opposed to that subject to third-party information.

were comparatively low in Spain at the start of the period, but tended to increase over time. The share of employed workers over the workforce, according to the OECD database, was around 75% in Spain in the middle of the 1970s and grew up to near 85% thirty years later, converging significantly with its level in richer economies (at around 90%). This evolution entails that the share of incomes that lacks accurate third-party control is decreasing. In the framework of Kleven et al. (2015), the size of businesses is also important, because it makes collusion difficult and generates more accurate accountancy. Firm size was indeed growing in Spain during this period, with small and medium enterprises decreasing considerably as a share of total employment (from 92% in 1986 to 79% in 1998).<sup>47</sup>

The previous appreciation with respect to labour and self-employment incomes cannot be easily extended to capital yields. It is difficult to find examples to make a comparison, since not many works provide with estimates for capital incomes escaping taxation. In the case of discrepancy work, it is normally difficult to obtain an adequate comparable magnitude. The extent to which the above-mentioned processes also affected capital incomes in different countries is unknown, and in any case they have been potentially counteracted by increasing capital mobility, avoidance schemes and development of tax privileges, which can be seen as a “white-collar” substitute for outright evasion.

## 6 Final comments

Tax evasion is a very popular topic in the Spanish public debate today. Folk wisdom has it that it is still very pervasive, and unequally distributed – concentrating among the rich and the self-employed. Its existence would render the tax system unfair, and there is much claim for fighting against it, specially under the *zeitgeist* brought about by the economic crisis. What is the origin of these impressions?

This paper has reviewed the slow and twisted path toward generality in income taxation in the country. The principle that all citizens should contribute according to their economic capacities was not followed for a long time. During most of the 20th Century, personal taxation was only directed at the very rich households, so for most of the income scale there was no progressivity (and hardly at the top, given acute non-filing). With the reforms in the seventies and the introduction of the modern tax in 1978, the nature of the problem changed: the tax was now supposed to capture all incomes and treat them equally; but resistances were hard. A high percentage of individuals did not even file a tax return, and those who did reported incomes well below their real value on average. The new tax was severely affected by lack of compliance and low legal valuations, in spite of several administrative and legislative developments during the next decades.

I have estimated under-assessment of incomes in tax returns, including non-filing, legal under-valuation and under-reporting by filers. Discrepancy between macro aggregates gives us an ap-

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<sup>47</sup>Which is nevertheless still a high value compared to developed countries; see Tafunell, 2005, p. 721, where the figure for Germany is 65% in 1986, similar to other central-northern European countries. The contrast is specially acute when we focus on the share of microenterprises, with less than 10 employees (over 40% of total employment in Spain versus 18% in Germany in 1986).

proximation to the total impact of these elements, which lies around 42% evasion in 1982 for the total tax base, and ranging from 27% in wages to around 70-80% in other yields – with a decrease in self-employment incomes to around 36% in 1990. As a second step, restricting the attention to the behaviour of filers, I try to assess how reporting compliance changed across income sources and the income scale. To do that, I have followed two proposals in the literature. The first is a discrepancy analysis between tax return microdata and survey data (after adjusting these to National Accounts for each income source), following Matsaganis et al. (2010)'s approach.

The second method is an econometric estimation with tax return micro-data, exploiting the relation between reported charitable donations and the composition of income (under the assumption that donations should not be affected by the latter, only by its level). This idea was developed by Feldman and Slemrod (2007) and applied to Spain for 2008 by Domínguez et al. (nd). Nevertheless, here I have slightly modified the procedure to correct for a plausible sample selection problem using Heckman's estimation method, because returns with charitable donations are a small –and distinct – part of the total.

The discrepancy analysis shows very high levels of compliance in labour incomes, while they were much lower for self-employment and, specially, capital yields. As a result both of composition and of differing rates of compliance across deciles within income source, evasion in the total tax base is found to be increasing as we move towards the top of the income distribution. The donation equations confirm the different behaviours of incomes from disparate sources. Taking labour as fully compliant, all other yields would only be reported at near 40% of their real value in 1982. Nineteen years later, at our second estimation, compliance had gone up slightly in fixed capital incomes (lying now at 52%), and specially for self-employment activities (67%), but down in the case of movable capital (32%).

Because of the varying composition of incomes across the society's income distribution, we expected a negative impact of these results on progressivity. Thus, the estimations we get from the reported data concerning redistribution and progressivity would be upwards biased. This is confirmed by a back-of-the-envelope calculation that gives an estimate of that bias as around 60-30% for the redistribution index and between 15 and 50% for the progressivity indicator, depending on the year. The results seem to confirm Comín's insight that, at least for some time, *“the regressivity of the tax system, however, has not been banished in practice, because fraud is still very flagrant in incomes with no withholding at source. Widespread evasion in high-income taxpayers and non-labour revenues has made PIT a tax on labour incomes”* (Comín et al., 1995).

The bad news is that undermined progressivity of PIT, which was – and is – the only real progressive tax with some weight in the system, calls into question the image of the ensemble of taxation and the joint tax-and-transfer scheme. Escaping from contributions has proven pervasive in the country. The good news, however, is that efforts to reduce it, despite being slow, have reaped some rewards, specially with regards to self-employment incomes. A lot is left to be done, judging by the results in this paper and the ones from Domínguez et al. (nd), but at least we know where the big tax gaps are.

Further work would benefit from access to audit data, as has been possible in the US, allowing the development of rich research in the area (Bishop et al., 2000; Feldman and Slemrod, 2007; Johns and Slemrod, 2010), and also in Denmark (Kleven et al., 2011). This would provide much more



precise estimations. They are without a doubt interesting not only for economic history, but also for societal awareness and policy design.

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# Appendices

## A Homogenization of databases before discrepancy analysis

In this methodological appendix I explain the adjustments undertaken to make the survey and the tax data comparable.

1. The population in both databases is not completely coincident. My unit of analysis is the taxpayer (individual or couple), obligated both to pay tax and to file a return. I have thus modified in this sense the structure of the data in the HBSs, where the focus is on the household, and excluded both individuals who filed only to obtain refunds of excessive withholding (and paid no net tax) and those with incomes under the threshold that legally required filing (who had very small participation in total tax paid).<sup>48</sup>
2. Type of return: when the tax was created, the taxpayer unit was the family, and thus all members receiving incomes should make a joint tax return. This feature was modified after heavy mobilization by high-income families with two income-earners, who would pay significantly lower tax if allowed to file separately. They won this case in 1988, and thus starting in that fiscal year couples have the option to file independently or jointly. The first choice is rational for those over a certain threshold of income, and where the share of the second earner is significant. This has been simulated in the HBS for 1990, replicating the information in the tax data.
3. Types of incomes: the fiscal database would allow us to further distinguish among self-employment regarding the type of tax base estimation procedure (namely accountancy-based or presumptive), but this is not possible in the HBSs; as well as the separation of movable and fixed capital incomes.<sup>49</sup>
4. We do not have information on pensions received in 1982 in the survey data. Therefore...
  - (a) For the aggregate discrepancy, I add pensions to the denominator, with information from Ministerio de Trabajo (1991) (first, I have subtracted 22% as an approximation of the part corresponding to households under the income threshold, from Bandrés, 1993). Without doing this, the labour and total ratios would be over-estimated (at 86% and 63% respectively).
  - (b) For the discrepancy by levels, pensioners have been dropped from the tax data, so the comparison refers exclusively to active population. In any case, during the first years

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<sup>48</sup>The limit of this obligation was 300,000 pesetas in 1982 and 900,000 pesetas in 1990. It is noteworthy that these thresholds did not coincide with the non-taxable minimum, which did not exist as such until 1988, and was 648,000 pesetas in 1990. An additional problem arises in 1990, when imputed incomes from the owner's house were not to be considered for this limit, but cannot be distinguished in the IEF data.

<sup>49</sup>In 1990 capital incomes have some disaggregation in the HBS. It is, however, not fully coincident with the fiscal definition, because mortgages paid cannot be distinguished and deducted from imputed rents from owner-occupied housing. Therefore, compliance in movable capital would be over-estimated and the opposite effect would be true for fixed capital.

after the introduction of the tax there was certain discussion as to whether public benefits should be included in the base, which was finally set at the supreme national court: unemployment and disability pensions were excluded in 1983 and 1986 respectively, while regular old age pensions were subject to tax. Recall, however, that these revenues were paid by the state and withheld at source, so fraud in them is not expected.

5. Negative values in self-employment and capital incomes in the 1982 tax data have been changed to 0 before the comparison, to avoid potential bias given that there are no negative values in the HBS observations.
6. In order to obtain averages for the filing population, the HBS sample has been re-weighted to match the characteristics of the tax data sample, with respect to region, marital status and labour market status.
7. The averages are then calculated over all observations in each income-region category. This means that partial non-reporting of certain incomes is subsumed with their under-reporting. The alternative procedure, using only the observations with each kind of income, would entail assuming that partial non-reporting is non-existent.

## B Alternative discrepancy: by income levels

In the text, discrepancy by income levels has been obtained as a result of a composition effect, after comparing the means for type-region combinations. Earlier works on the sort, however, calculated the compliance ratios directly comparing the means of type-level combinations, thus assuming that there is no re-ranking as a result of income under-reporting. This is the case of Fiorio and D'Amuri (2005), whose calculation corresponds to:

$$C_{sj} = \frac{Y_{Rsj}}{Y_{Ssj}} \quad (8)$$

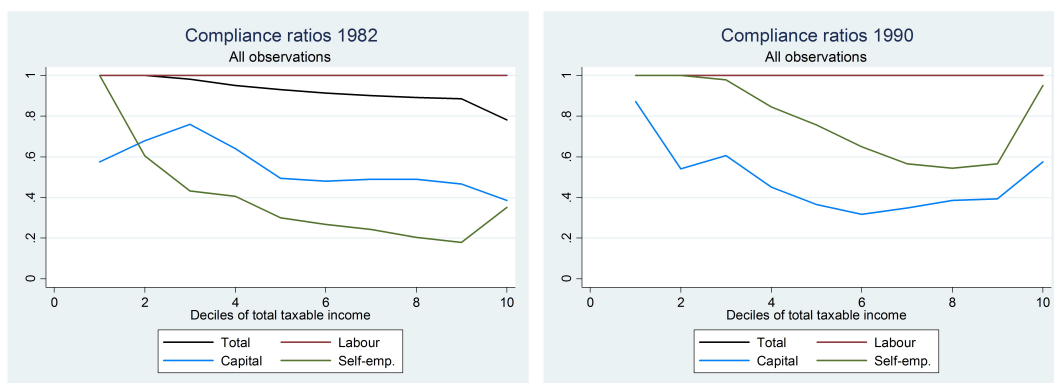
where  $C_{sj}$  stands for compliance ratio of income source  $s$  at income level  $j$ ,  $Y_R$  represents average income reported in the tax returns and  $Y_S$  average income reported in the HBSs.  $C_{sj}$  is expected to be lower than one, indicating the existence of evasion.

The results of these calculations, by deciles, are shown in figure 8. They display something like a U shape for self-employment, and also for capital incomes in 1990. The total tax base is not shown to be significantly under-reported for any income level in 1990 (presumably a result of the previously mentioned under-adjustment in the HBS).

This procedure would be unreliable in the presence of significant re-ranking: if taxpayers get ordered differently because of their reporting behaviour, to the extent that they changed their quantile, it is not consistent to compare the two distributions directly. Such was the motivation of the Matsaganis et al. (2010) approach. The extent of re-ranking and the validity of the assumptions underlying both procedures rests, however, unknown. Reality probably lies somewhere in between.



Figure 8: Estimated compliance ratios by income deciles à la Fiorio & d'Amuri



Source: author's calculations with IEF panel data and HBSs (re-weighted). Following Fiorio & d'Amuri (2005).

## 2011

- 2011/1, **Oppedisano, V; Turati, G.:** "What are the causes of educational inequalities and of their evolution over time in Europe? Evidence from PISA"
- 2011/2, **Dahlberg, M; Edmark, K; Lundqvist, H.:** "Ethnic diversity and preferences for redistribution"
- 2011/3, **Canova, L.; Vaglio, A.:** "Why do educated mothers matter? A model of parental help"
- 2011/4, **Delgado, F.J.; Lago-Peñas, S.; Mayor, M.:** "On the determinants of local tax rates: new evidence from Spain"
- 2011/5, **Piolatto, A.; Schuett, F.:** "A model of music piracy with popularity-dependent copying costs"
- 2011/6, **Duch, N.; García-Estévez, J.; Parellada, M.:** "Universities and regional economic growth in Spanish regions"
- 2011/7, **Duch, N.; García-Estévez, J.:** "Do universities affect firms' location decisions? Evidence from Spain"
- 2011/8, **Dahlberg, M.; Mörk, E.:** "Is there an election cycle in public employment? Separating time effects from election year effects"
- 2011/9, **Costas-Pérez, E.; Solé-Ollé, A.; Sorribas-Navarro, P.:** "Corruption scandals, press reporting, and accountability. Evidence from Spanish mayors"
- 2011/10, **Choi, A.; Calero, J.; Escardíbul, J.O.:** "Hell to touch the sky? Private tutoring and academic achievement in Korea"
- 2011/11, **Mira Godinho, M.; Cartaxo, R.:** "University patenting, licensing and technology transfer: how organizational context and available resources determine performance"
- 2011/12, **Duch-Brown, N.; García-Quevedo, J.; Montolio, D.:** "The link between public support and private R&D effort: What is the optimal subsidy?"
- 2011/13, **Breuilé, M.L.; Duran-Vigeneron, P.; Samson, A.L.:** "To assemble to resemble? A study of tax disparities among French municipalities"
- 2011/14, **McCann, P.; Ortega-Argilés, R.:** "Smart specialisation, regional growth and applications to EU cohesion policy"
- 2011/15, **Montolio, D.; Trillas, F.:** "Regulatory federalism and industrial policy in broadband telecommunications"
- 2011/16, **Pelegrín, A.; Bolancé, C.:** "Offshoring and company characteristics: some evidence from the analysis of Spanish firm data"
- 2011/17, **Lin, C.:** "Give me your wired and your highly skilled: measuring the impact of immigration policy on employers and shareholders"
- 2011/18, **Bianchini, L.; Revelli, F.:** "Green politics: urban environmental performance and government popularity"
- 2011/19, **López Real, J.:** "Family reunification or point-based immigration system? The case of the U.S. and Mexico"
- 2011/20, **Bogliacino, F.; Piva, M.; Vivarelli, M.:** "The impact of R&D on employment in Europe: a firm-level analysis"
- 2011/21, **Tonello, M.:** "Mechanisms of peer interactions between native and non-native students: rejection or integration?"
- 2011/22, **García-Quevedo, J.; Mas-Verdú, F.; Montolio, D.:** "What type of innovative firms acquire knowledge intensive services and from which suppliers?"
- 2011/23, **Banal-Estañol, A.; Macho-Stadler, I.; Pérez-Castrillo, D.:** "Research output from university-industry collaborative projects"
- 2011/24, **Lighthart, J.E.; Van Oudheusden, P.:** "In government we trust: the role of fiscal decentralization"
- 2011/25, **Mongrain, S.; Wilson, J.D.:** "Tax competition with heterogeneous capital mobility"
- 2011/26, **Caruso, R.; Costa, J.; Ricciuti, R.:** "The probability of military rule in Africa, 1970-2007"
- 2011/27, **Solé-Ollé, A.; Viladecans-Marsal, E.:** "Local spending and the housing boom"
- 2011/28, **Simón, H.; Ramos, R.; Sanromá, E.:** "Occupational mobility of immigrants in a low skilled economy. The Spanish case"
- 2011/29, **Piolatto, A.; Trotin, G.:** "Optimal tax enforcement under prospect theory"
- 2011/30, **Montolio, D.; Piolatto, A.:** "Financing public education when altruistic agents have retirement concerns"
- 2011/31, **García-Quevedo, J.; Pellegrino, G.; Vivarelli, M.:** "The determinants of YICs' R&D activity"
- 2011/32, **Goodspeed, T.J.:** "Corruption, accountability, and decentralization: theory and evidence from Mexico"
- 2011/33, **Pedraja, F.; Cordero, J.M.:** "Analysis of alternative proposals to reform the Spanish intergovernmental transfer system for municipalities"
- 2011/34, **Jofre-Monseny, J.; Sorribas-Navarro, P.; Vázquez-Grenno, J.:** "Welfare spending and ethnic heterogeneity: evidence from a massive immigration wave"
- 2011/35, **Lyytikäinen, T.:** "Tax competition among local governments: evidence from a property tax reform in Finland"
- 2011/36, **Brühlhart, M.; Schmidheiny, K.:** "Estimating the Rivalness of State-Level Inward FDI"
- 2011/37, **García-Pérez, J.I.; Hidalgo-Hidalgo, M.; Robles-Zurita, J.A.:** "Does grade retention affect achievement? Some evidence from Pisa"
- 2011/38, **Boffa, f.; Panzar, J.:** "Bottleneck co-ownership as a regulatory alternative"

- 2011/39, **González-Val, R.; Olmo, J.:** "Growth in a cross-section of cities: location, increasing returns or random growth?"
- 2011/40, **Anesi, V.; De Donder, P.:** "Voting under the threat of secession: accommodation vs. repression"
- 2011/41, **Di Pietro, G.; Mora, T.:** "The effect of the l'Aquila earthquake on labour market outcomes"
- 2011/42, **Brueckner, J.K.; Neumark, D.:** "Beaches, sunshine, and public-sector pay: theory and evidence on amenities and rent extraction by government workers"
- 2011/43, **Cortés, D.:** "Decentralization of government and contracting with the private sector"
- 2011/44, **Turati, G.; Montolio, D.; Piacenza, M.:** "Fiscal decentralisation, private school funding, and students' achievements. A tale from two Roman catholic countries"

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2012

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- 2012/1, **Montolio, D.; Trujillo, E.:** "What drives investment in telecommunications? The role of regulation, firms' internationalization and market knowledge"
- 2012/2, **Giesen, K.; Suedekum, J.:** "The size distribution across all "cities": a unifying approach"
- 2012/3, **Foremny, D.; Riedel, N.:** "Business taxes and the electoral cycle"
- 2012/4, **García-Estévez, J.; Duch-Brown, N.:** "Student graduation: to what extent does university expenditure matter?"
- 2012/5, **Durán-Cabré, J.M.; Esteller-Moré, A.; Salvadori, L.:** "Empirical evidence on horizontal competition in tax enforcement"
- 2012/6, **Pickering, A.C.; Rockey, J.:** "Ideology and the growth of US state government"
- 2012/7, **Vergolini, L.; Zanini, N.:** "How does aid matter? The effect of financial aid on university enrolment decisions"
- 2012/8, **Backus, P.:** "Gibrat's law and legacy for non-profit organisations: a non-parametric analysis"
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