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AN EMPIRICAL ANALYSIS OF WEALTH TAXATION: EQUITY VS. TAX COMPLIANCE

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XARXA DE REFERÈNCIA EN ECONOMIA APLICADA

AN EMPIRICAL ANALYSIS OF WEALTH TAXATION: EQUITY Vs. TAX COMPLIANCE [*,†]

José Mª Durán Cabré[‡], Alejandro Esteller Moré[§]

Astract: Capital taxation is currently under debate, basically due to problems of administrative control and proper assessment of the levied assets. We analyze both problems focusing on a capital tax, the annual wealth tax (WT), which is only applied in five OECD countries, being Spain one of them. We concentrate our analysis on top 1% adult population, which permits us to describe the evolution of wealth concentration in Spain along 1983-2001. On average top 1% holds about 18% of total wealth, which rises to 19% when tax incompliance and under-assessment is corrected for housing, the main asset. The evolution suggests wealth concentration has risen. Regarding WT, we analyze whether it helps to reduce wealth inequality or, on the contrary, it reinforces vertical inequity (due to especial concessions) and horizontal inequity (due to the *de iure* and to *de facto* different treatment of assets). We analyze in detail housing and equity shares. By means of a time series analysis, we relate the reported values with reasonable price indicators and proxies of the propensity to save. We infer *net tax compliance* is extremely low, which includes both what we commonly understand by (gross) tax compliance and the degree of under-assessment due to fiscal legislation (for housing). That is especially true for housing, whose level of net tax compliance is well below 50%. Hence, we corroborate the difficulties in taxing capital, and so cast doubts on the current role of the WT in Spain in reducing wealth inequality.

Keywords: Wealth tax, wealth distribution, tax compliance.
JEL Codes: H24, H71, D31.

Resumen: La imposición sobre el capital es un tema actual de debate, básicamente debido a los problemas de control administrativo y de la correcta valoración de los activos gravados. Ambos problemas son analizados centrándonos en el impuesto sobre el patrimonio (IP), el cual solo se aplica en cinco países de la OCDE, siendo España uno de ellos. Concentramos nuestro análisis en el 1% más rico de la población adulta, lo cual nos permite describir la evolución de la concentración de la riqueza en España a lo largo del período 1983-2001. En promedio, el 1% más rico posee alrededor del 18% de la riqueza total, aumentando hasta el 19% cuando se tiene en cuenta el incumplimiento fiscal y la infravaloración del principal activo sujeto a imposición, la vivienda. La evolución sugiere que la desigualdad ha aumentado. En relación al IP, analizamos también si éste ayuda a reducir la desigualdad de la riqueza o, por el contrario, refuerza la inequidad vertical (debido a tratamientos fiscales específicos) y la inequidad horizontal (debido al *de iure* y al *de facto* tratamiento diferente de los activos). El caso de la vivienda y de las acciones se analiza en detalle. Así, mediante un análisis econométrico de series temporales, relacionamos los valores declarados con indicadores razonables de los precios de los activos, así como de la propensión a ahorrar. Inferimos que el *nivel neto de cumplimiento fiscal* es extremadamente bajo, el cual incluye tanto lo que comúnmente conocemos como cumplimiento fiscal (bruto) y el nivel de infravaloración de los activos (sólo para vivienda). Este hecho es especialmente acusado para vivienda, cuyo nivel neto de cumplimiento fiscal está muy por debajo del 50%. Por consiguiente, corroboramos las dificultades de gravar el capital, generando serias dudas sobre el papel actual del IP en España respecto de la reducción de la desigualdad de la riqueza.

Palabras clave: Impuesto sobre el patrimonio, distribución de la riqueza, cumplimiento fiscal.
Clasificación JEL: H24, H71, D31.

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1. Introduction

The future of capital taxation plays an important role in the public economic literature. Countries face increasing difficulties in taxing capital income and only a declining number of economists see a future for this source of income taxation (Auerbach, 2006; Becker and Fuest, 2005). As a result most countries give a preferential treatment to capital income in the personal income tax (IT), particularly to the highest mobile capital, through special rebates, reduced rates or even full exemption. The Schanz-Haig-Simons comprehensive income tax, in principle majority in the OECD countries, seems in fact to have been abandoned. Important efficiency issues regarding its impact on savings or economic growth are raised in the debate. Administrative difficulties in taxing capital income also appear to be an important factor to justify preferential treatments. In this sense, to tax what you can tax in practice is becoming a more important principle than what in theory ought to be taxed (Lodin, 2000). Nonetheless, those more worried about equity concerns point out the possible negative impact on income distribution (vertical equity) and the discrimination it represents against other sources of income, especially wage income (horizontal equity). But the fact is capital income receives a preferential treatment compared to other sources of income[1].

The debate on capital taxation becomes even tougher when inheritance and gift tax (IGT) is considered probably because important value judgments are taken into account. Progressivity has long been a principal justification for that old capital tax (Gale and Slemrod, 2000)[2]. Inheritance and gift tax has been seen by some as a key mean of reducing inequalities and, therefore, of guarantying equality of opportunities. This justification appears more compelling because income concentration has been growing in many countries over the last 20 years (Slemrod and Bakija, 1999; Auerbach, 2006; Alvaredo and Saez, 2006). And as long as capital income is leniently taxed, inheritance taxation reinforces its progressivity role. Indeed, capital gains are taxed at lower rates in the IT and only when the underlying assets are sold. Furthermore, gains are not taxed at death, so only the IGT can assure they will finally not escape taxation (Gale and Slemrod, 2000)[3]. However, the very existence of IGT is also under debate both in the literature and in the public opinion. Italy and Portugal have quite recently

[1] We concentrate on personal income tax, but in fact capital is also taxed in the corporate income tax. From the person perspective, the corporate tax could be deemed as a capital tax at source.
[2] In fact there are two types of transfer tax: on inheritances or on estates, but the arguments given may refer to both.
[3] In a study for the US, Poterba and Weisbenner (2001) estimate that in 1998 more than half of all estates whose value was above $10 million had over 50% of their wealth in the form of unrealized gains.

eliminated it[4], and in the US there is currently a heated dispute about the future of estate tax and its possible abolition.[5,6] Nevertheless, the fact is most countries still levy IGT.

The literature and the tax systems have also considered another tax on capital, the annual net wealth tax. This is levied each year on the net value of wealth, besides income tax and inheritance tax, with the aim, among others, to reinforce the final redistributive effect of the whole tax system[7]. The wealth tax (WT) has usually been considered a complementary tax of income and inheritance taxes, although it could also be a substitutive for capital income taxes. Thus, as it taxes all wealth, it imposes a more uniform burden on the returns to saving compared to capital income taxes (Auerbach, 2006). However, this might encounter some difficulty as problems of assessment and/or of administrative control impede the desired uniformity in the tax treatment among assets (Smith, 2001). In fact, problems of assessment and of control along with efficiency issues have progressively taken most countries to repeal WT[8].

The aim of this paper is precisely analyzing whether those two problems are present in practice, and most important we will try to quantify them. We will do it for the Spanish WT, one of the few OECD countries that still applies this tax. In order to analyze the importance of assessment and control issues, we will focus on reported wealth by top 1% of adult population. Thus, and not least relevant, from this (fiscal) data we will also be able to analyze the evolution of wealth concentration in Spain following the flourishing literature in this field carried out for other countries (see, *e.g.*, Atkinson and Piketty, forthcoming)[9].

[4] In the eighties, Australia and Canada removed the IGT, although in both cases the elimination was the final result of a "race to the bottom" competitive process among regions. See Bird (1991) and Cooper (2006).

[5] Despite generating only about 1.5% of federal revenues and hitting only fewer than 2% of decedents the dispute is quite passionate. See, among others, Auerbach (2006); Kopczuk (2006); Kopczuk and Lupton (2005); Kopczuk and Slemrod (2000, 2003, 2005); Gale and Slemrod (2000, 2001a, 2001b).

[6] In the US current law foresees a gradual reduction of the tax which would finally be repealed only for 2010, and then reinstated it in its pre-reform structure at the following year.

[7] According to the Meade Report (1978), the possible introduction of an expenditure tax would reinforce the redistributive role of the WT, and therefore would provide a stronger argument for its inclusion in the tax system.

[8] When a general tax reform process started in the eighties, only half of the OECD countries levied the tax. Nonetheless, the situation is quite different nowadays and as a steady process of eliminating the WT seems to have started since the nineties. In 2007 only one out of six OECD countries does apply it, which means only five countries. In the last ten years approximately, seven countries repealed the tax.

[9] In fact, the results derived from this analysis for Spain are not fully new, as Alvaredo and Saez (2006) have recently done a similar exercise. However, we will argue that given the nature of the fiscal data for the Spanish case a different technique of interpolation – necessary in all these studies to "transform" the fiscal data tabulated by wealth brackets into percentiles – might be more appropriate, and in any case we will comment some legal issues not explicitly taken into account by them (*e.g.*, the change of tax unit since 1988) or will try to correct the reported values by the level of tax incompliance and the degree of under-assessment of the main asset under taxation, real estate property. In this sense, our results can be considered as complementary to theirs, who additionally also focus on the evolution of income concentration.

In order to obtain the reported wealth of top 1%, we follow an interpolation methodology proposed by Atkinson (2004). We show top 1% holds on average almost 18% of total wealth for the 1988-2001 period. The evolution, albeit not linear, illustrates a slight increase in wealth inequality. The studies that estimate wealth (or income) concentration from fiscal data, however, do not take into account the level of tax compliance, which might be especially relevant for top rich taxpayers. From our empirical estimates obtained in quantifying the importance of tax compliance and under-assessment, we are able to correct the reported values for the main asset under taxation, housing[10]. Once we do that, the conclusions regarding the evolution of wealth concentration do not change much (*i.e.*, tax compliance and the degree of under-assessment do not vary much along time), but the concentration levels rise on average up to 19%. If the aim is reducing inequality, the question to be answered is whether the (current) WT is a right mean to achieve a less unequal wealth concentration[11].

To respond the question, we have carried out an empirical analysis for the two main assets taxed in the WT, real estate property and equity shares, for the period 1983-2001[12]. Our empirical methodology is very simple. In a multivariate regression analysis, we relate the reported values by top 1% - calculated from interpolation – with representative price index and control variables that attempt to account for the propensity to accumulate each kind of asset. From the results of the econometric exercise, we are able to estimate the level of tax compliance, and as far as real estate property is concerned, also of the degree of under-assessment. Although the results in both cases (must) lie within a range, we obtain very low levels of tax compliance, which are especially low for the case of housing. Therefore, the current WT does not seem an appropriate mean to reduce inequality (given the high level of tax incompliance in both assets), while at the same it seems to distort between assets (given, for example, the even higher level of tax incompliance in housing). The conclusions obtained from this analysis are not new, especially regarding to the under-assessment of real estate property, but the novelty is that we have achieved to quantify them. Among other issues, our empirical framework also permits us to

[10] Our estimates would also permit to correct the level of tax compliance for equity shares traded in organized markets, but the effect on the wealth concentration would be very small.

[11] In Spain, as we will explain in section 3, an IGT decentralized to the regions (AC's) is also present. However, a "race-to-the-bottom" seems to have started among AC's. If this process regarding the IGT goes on, and wealth inequality is still increasing, the WT would be the only tax instrument that could contribute to reducing wealth inequality. However, that potential role of the WT is in doubt given the presumably low levels of tax compliance and the under-assessment of the main assets under taxation, among other legal factors that will be discussed in section 3.

[12] In fact, we could have added year 1982 and year 2002. However, in the former case, the data is not reliable at all, while regarding 2002, it has not been possible to consider the owner-occupied-dwelling exemption. Therefore, our analysis of wealth concentration has to restrict to 1983-2001 period, while the analysis of the performance of WT in taxing real tax capacity regarding equity shares and real estate property spans for 1983-2002 and 1983-2001, respectively.

quantify a "tax on tax revenue"[13] present by 1988, the monetary impact of the owner-occupied-dwelling exemption established in 2000, or simulate alternative tax policies aimed at increasing the level of tax compliance in the case of real estate property.

The rest of the paper is organized as follows. In the next section, we briefly explain the recent evolution of WT in the OECD countries and the key elements of the tax where applied. Section 3 describes the case under study (the Spanish WT) since its introduction in 1977 paying especial attention to its most important legal aspects. The interpolation process and how evolves the concentration of wealth is in section 4. Section 5 develops the empirical framework and presents the results of the empirical analysis. The paper ends with a section of conclusions.

2. The Annual Net Wealth Tax in OECD Countries

Countries have traditionally levied capital through personal and corporate income taxes, inheritance and gift tax and immovable property tax, but only a few have had an annual net wealth tax. In the mid eighties, half of the twenty-four OECD countries possessed a WT, while the other half did not. Nonetheless, in 2007 only five of the thirty OECD countries possess the tax (Table 1)[14, 15]. This noteworthy change is due to a process started in the mid nineties of removal of the WT. Following, we analyze the reasons for the introduction and elimination of WT and what the features of the tax are in those countries that still levy it, or have done it until recently.

[13] By a "tax on tax revenue", we refer to that situation in which the government responsible for the administration of a certain tax only keeps a fraction of each monetary unit collected. The rest of the fraction is transferred (either directly or via the central government) to other governments of the same level as a means of equalizing fiscal capacity. That is, this situation generates a substitution effect in favor of diminishing the efforts in collecting taxes. Baretti *et al.* (2002) were the authors that first named this effect in this way. In Spain, until 1988 the fraction to be transferred for equalization purposes via the central government was 100%.

[14] Before 2006 Luxembourg levied WT on both individuals and corporations. Since 2006 the tax is abolished on individuals but it continues to apply to corporations. Nowadays, only Switzerland taxes corporations. Therefore, in this paper we only consider WT on individuals, which seems more reasonable for an international analysis. Probably, the peculiarities of the tax system in Luxembourg and in Switzerland may explain why they also taxed corporations.

[15] In Sweden, the government has announced WT will be phased out during the current electoral period and as a first step the tax rate has been halved from to 1.5 to 0.75% on business capital from 2007.

Table 1. WT in the OECD countries

1985	2007
♦ Austria	♦ France
♦ Denmark	♦ Norway
♦ Finland	♦ Spain
♦ France	♦ Sweden
♦ Germany	♦ Switzerland
♦ Iceland	
♦ Luxembourg	
♦ Netherlands	
♦ Norway	
♦ Spain	
♦ Sweden	
♦ Switzerland	

Source: OECD (1988) and International Bureau of Fiscal Documentation (constantly updated database); year of elimination: Austria (1994); Denmark and Germany (1997); Netherlands (2001); Iceland (2005); and Finland and Luxembourg (2006).

The WT was first levied by some Nordic and Central European countries according to a tax system historically more based on direct taxation. The tax had usually been introduced at the early stages of the twentieth century, although in the Swiss cantons and in the Netherlands the origin comes from the XIXth (OECD, 1988). Later on, Spain and France introduced a WT in 1977 and in 1982, respectively, although the latter country eliminated it for a short period (1986-1987). In the meantime, Japan introduced a WT for a brief period (1950-1952) as well as Ireland (1975 to 1977). In conclusion, apart from few changes, the WT had remained for a very long period in some tax systems, while other countries had never considered suitable to adopt it.

What are the reasons to adopt a WT? The answer is not easy, since several factors usually play a role, not necessarily the same in all countries. Besides, the reasons may differ over time. However, based on the previous literature, an OECD report on taxation on net wealth (OECD, 1988) suggests some reasons: the administrative convenience of taxing something which is visible, particularly for the earliest WT when the bulk of wealth consisted of immovable property; the taxation of the additional ability which wealth confers on its possessor, so that reinforces horizontal equity; and the reduction of inequality, especially in those countries where the tax was later introduced. In conclusion, half of the OECD countries found enough reasons to justify a WT.

Nevertheless, the situation changes since the mid nineties, when an increasing number of countries started to eliminate the tax. Consequently, we wonder what the reasons are behind the recent elimination of the tax. However, again, it is not easy to give a single reason to the question, since several factors play a part, and frequently they are related to own political issues of each country. Nonetheless, we find one main reason: the difficulty of taxing capital. "The tax base associated with capital income and high-wealth individuals is becoming increasingly geographically mobile" (Owens, 2006, p. 161). Taking away WT often seeks to give a better treatment of capital so that makes tax systems more competitive. Therefore, if in the past a reason to justify the tax was the administrative convenience of taxing something visible, today the situation goes in the other way around. An important part of wealth consists of high movable property, not visible at all and therefore difficult to tax in a personal WT. The analysis of some countries' reforms demonstrates this situation.

In Austria the elimination of WT must be seen in a broader context, the reform of capital income taxation started in 1993. The reform introduced a final withholding tax on some capital revenues, with the aim to improve the taxation of economic activities and so the international competitiveness within the single European market (Genser, 1996). The suppression of a specific wealth tax in the Netherlands also took place in a broader reform of the IT, which after 36 years of applying the same tax was changed in 2001. The new Dutch IT offers a more favorable treatment of capital income, which is levied by a reduced proportional rate, 30%, considerably smaller than the rates on labor income[16,17]. In Iceland the removal of the WT in 2005 is one of the measures of a wider tax reform to improve competitiveness of the tax system and stimulate the economy. In Finland the final abolition of WT comes just after several changes introduced in 2005 to improve the better treatment of investment income (both in the personal and corporate income taxes) and to reduce WT (a threshold increase from 185,000 € to 250,000 € and tax rate fall from 0.9% to 0.8%). In Luxembourg, the main objective of the bill that eliminates WT is to make the tax regime which applies to Luxembourg residents more attractive, and for that reason also introduces a withholding tax in full discharge of tax on savings income in the form of interest payments[18]. In conclusion, an important aim to eliminate WT is to "improve" capital taxation, that is, to reduce it.

[16] Income is divided in three independent boxes. Box 1 consists mainly of labor income items, although also some kind of capital income, such as imputed rent from owner-occupied dwellings, and it is taxed at progressive rates up to 52%.

[17] As the 30% rate on capital income levies a presumptive return of 4% on the value of taxable assets, the new IT equals an implicit WT with a nominal tax rate of 1.2% (Meussen, 2000). However, expressed as a percentage of the *actual* return, the tax liability differs between assets, depending on the actual return (Cnossen and Bovenberg, 2001).

[18] The Act from 23 December 2005 introduces a withholding tax of 10% on interest income of residents in excess of € 250 per year.

Nonetheless, the above mentioned OECD report also points out two other reasons for the introduction of the tax: the additional ability to pay that wealth confers and the reduction of inequality. But the international experiences suggest WT also fails to achieve both objectives, quite frequently as a consequence of inherent problems of the tax caused by assessment difficulties and special concessions.

For instance, in Germany, the Constitutional Court declared unconstitutional the WT in 1995, because the law gave an unequal treatment to different types of wealth[19]. Some assets and rights were valued according to their market value, while others where assessed according to other values well far away from the market price. The used valuation of real property dated from 1964, because since that year revaluations, scheduled to occur every six years, had not been carried out. The Court declared the tax unconstitutional and gave to the legislative power a period to reform the tax. But, in addition, the court introduced two limitations (Wendt, 1997). On the one hand, the tax may not lead to a taxation of the substance, that is, it may not cause a reduction of the property itself. On the other hand, property that serves the personal needs and sustenance of the taxpayer and his family had to be exempted. In 1997, once concluded the period given by the Constitutional Court, as the Parliament had not approved a new law, the WT became inapplicable, disappearing from the German tax system[20].

In Iceland, two years before eliminating the WT, the government reduced the tax rate from 1.2% to 0.6% on both individuals and companies and increased the tax-free threshold by 20% to counter the effects of the recent general review of real property values, with the aim the revision should not lead to an increase in net wealth taxation. At the same time it decided to do away with the net wealth surtax on net wealth exceeding a certain amount. On the other hand, the Icelander tax was considered to be discriminatory between different assets (Herd and Thorgeirsson, 2001). Bank deposits were exempt to the extent that they did not exceed the indebtedness of an individual. Equities were taxed, but when hold by individuals, only up to the par value of the shares. Companies were liable to pay the tax when the book value of their equity exceeds the par value of their shares, and no wealth tax was paid on the market value of the company exceeding its net worth.

In Finland, the tax generated incentives for taxpayers to inflate their liabilities and to invest in low-taxed assets, particularly housing (Joumard and Suyker, 2002). Some quoted shares were valued at 70% of the market price. Furthermore, bank accounts and bonds, subject to the tax withheld at source from interest, were exempt from WT. Therefore, neither all assets were liable

[19] Decision from 22nd June 1995, 93/121.
[20] In 2002, ten Länder made a proposal for a new WT, but they failed in their purpose.

to the tax nor all were equally assessed. Norway, that still levies the tax, under-assesses houses (around 25% of the market price) and shares (at 80% of the company's net tax value), and financial assets accumulated in occupational pension funds escape the tax[21]. As a result, it jeopardizes horizontal equity and provokes a paradox that internationally immobile capital is more lenient taxed than mobile capital (Van den Noord, 2000). And a similar situation takes place in Spain, as we will comment in the next section and will show in the empirical section.

To know more in deep the features of WT, Table 2 shows the key parameters for the seven OECD countries levied it in 2005. Only Luxembourg and Switzerland tax both individuals and companies, while the others only tax individuals. All countries grant a general allowance, although the amount can vary considerably among countries. France has the greatest threshold, in line with the purpose of only taxing big fortunes, as the same name of the tax indicates (*impôt sur les grandes fortunes*). One the other hand, Finland, Luxemburg and Sweden have a flat tax, while the others apply a progressive schedule tax, particularly significant in France and Spain. Top marginal rates offer big differences among countries, being particularly great in Spain, where it is five times bigger than in Luxembourg or three times bigger than in Finland[22]. In Switzerland the tax is levied by cantons and municipalities, but not by the federal government[23]. Cantons and municipalities regulate *inter alia* deductions and tax rates; thereby WT has important differences within the country. In Spain, as we will see in the next section, regions (AC's) can also regulate deductions and tax rates, although for the time being differences are not significant.

The yield of the tax over total taxation is very low in all countries, but Luxembourg and Switzerland, and it has remained low for the last decades. The great bulk of revenues in Luxembourg come from taxing industrial, commercial and financing corporations, while a small part comes from individuals because the assessment of estates is very advantageous for taxpayers[24]. However, the opposite happens in Switzerland, where yield from companies only account for one fourth of the WT revenues.

We can also observe countries offer especial concessions for certain assets, being especially important those related to business assets and dwellings[25]. For example, business assets held by

[21] For 2007, the Norwegian government has proposed a 10% increase in the assessed values of real estate properties recognizing the price growth on housing amplifies the distortions characterizing the WT.
[22] Precisely the two countries with the smallest top rates, Luxembourg and Finland, do not already levy the tax.
[23] Since 1959 the federal government does not levy WT.
[24] *Projet de Loi concernant le budget des recettes et des depenses de l'Etat*, 2006.
[25] Other assets, such as human capital or pension rights, have never been taxed due to inevitable administrative difficulties. See Sandford (1992).

individuals can be exempt in France, Spain or Sweden, or enjoy a 70% deduction in Finland. Owner-occupied dwellings enjoy a 10,000 € deduction in Finland, a 20% rebate in France or are exempt in Spain, up to a maximum value of 150,253 €.

Table 2. The WT in the OECD countries

	Finland*	**France**	**Luxembourg***	**Norway**[1]	**Spain**[3]	**Sweden**	**Switzerland**[5]
Year	2005	2006	2005	2006	2006	2006	2006
Taxpayer	Individuals	Individuals	Individuals and companies	Individuals	Individuals	Individuals	Individuals and companies
Threshold ($)	200,965	597,134	2,010 + 2,010 per child	20,080[2]	86,131	129,111[4]	it varies per cantons
Minimum marginal rate	0.8%	0.55%	0.5%	0.9%	0.2%	1.5%	it varies per cantons
Top marginal rate	0.8%	1.8%	0.5%	1.1%	2.5%	1.5%	it varies per cantons
Number of brackets	1	6	1	2	8	1	-
% WT over total taxation (2004)	0,2%	0,4%	5.3% 1.2% ind. 4.1% cor.	1.3%	0,4%	0,4%	4.7% 3.5% ind. 1.2% cor.

* Finland and Luxembourg repealed WT in 2005, but we still include them to analyze the key parameters of recent WT.

(1) WT is levied by the national government and the municipalities. Tax rates include both national and municipal WT.

(2) 2006 exchange rate: 1 $ = 6.407 NOK.

(3) AC's can modify threshold and tax rates. The information given refers to the basic state regulation, since few changes have been introduced.

(4) 2006 exchange rate: 1 $ = 7.368 SEK

(5) WT is levied by cantons and municipalities, but not the federal government. Those can set threshold and tax rates, with important disparities among them.

Source: International Bureau of Fiscal Documentation, OECD *Revenue Statistics* and own calculations.

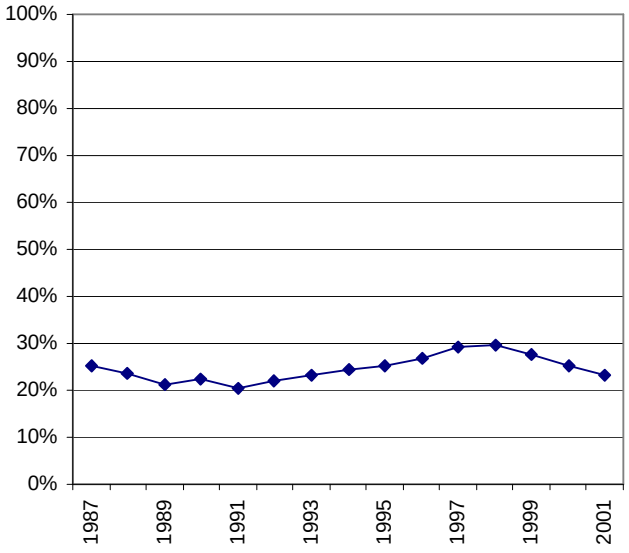
In conclusion, given the practical difficulties in taxing capital, very few countries levy a WT. Furthermore, the experience shows different assets are unequally treated, either because there are explicit special treatments or because the disparity of assessment criteria. Hence, it seems quite complicated countries can achieve any of the reasons given to justify WT. As Van den Noord and Heady (2001, p. 35) affirm, "countries using this tax could usefully reassess the merits of continuing to apply". We will precisely try to study that for the Spanish case, whose peculiarities we explain next.

3. The Annual Net Wealth Tax in Spain

Spain introduced a WT in 1977, within a package for an overall tax reform that was carried out with the arrival of democracy[26]. It was first set out as an *extraordinary* and *transitory* tax, but after fifteen years both supposed features were officially taken away[27] and nowadays the WT still remains in the Spanish tax system.

The governmental reasons to justify the tax were that (i) it complements the personal income tax (IT), since it levies an additional ability to pay and relies more on the richest taxpayers; (ii) it promotes a more productivity use of capital; (iii) it helps to control IT due to the provided information; and (iv) it has a positive redistributive effect. In 1991, when the Parliament approved a new law reforming the tax, it made reference to all these ends, but emphasizing the more productivity use of richness and the achievement of a better redistribution[28] additional to the IT one. Nonetheless, the assessment criteria of assets and rights fixed at the law and subsequent legal modifications have made very difficult to achieve any of those aims.

Graph 1. Under-assessment of Real Estate Property



Note: The series is calculated as the ration between average cadastral value and average market price.

Source: Ministry of Public Works and Cadastral Office, several years. See more details in section 5.2.

[26] Act 50/1977, 14 November.
[27] Act 19/1991, 6 June.
[28] For that reason the maximum marginal rate was increased.

The sole criterion of assessment that would assure to tax the real ability to pay that wealth confers is market price (MP). Further, it would permit an homogeneous treatment of all wealth components. To know MP is easy and direct regarding, for example, equity shares traded in organized markets or bank accounts. Nevertheless, it is quite difficult for many other assets. For instance, to assess the value of real estates taxpayers have to choose the greatest of the three following values: cadastral value (CV), price of acquisition, or declared value in other taxes checked by the tax administration[29]. However, in practice, unless there has been a recent transmission, taxpayers report the CV, which is far below MP. As Graph 1 shows for the 1987-2001 period, average CV only stands for between 20% and 30% of the average MP. As real estate represents about 70% of average net wealth of households throughout the period (according to National Accounts), the most important component of wealth is clearly under-assessed. Likewise, shares not traded in the stock market are basically assessed according to company's accountancy, therefore, taking into account historical values rather than market ones[30]. And the same happens with assets assigned to individual businesses and professional persons. In conclusion, most of the reported wealth is not assessed according to MP and the differences between MP and the fiscal criteria can be very important.

On the other hand, the 1991 WT levied all net wealth, with a few minor exemptions (among others, household furnishings or artists' own works). But in 1994 the government introduced the exemption for business assets, with the aim of favoring entrepreneur investment[31]. The exemption is both for property and rights assigned to individual businesses and professional persons and for holdings in companies whenever certain conditions are fulfilled[32]. This exemption, however, trades off with the above mentioned main objective of the Spanish WT, redistribution, as it is concentrated particularly on richest taxpayers.

In 1993, the last year before the exemption, official statistics show that about top 1% of taxpayers held 7% of all assets assigned to businesses and almost 40% of all non-traded equity

[29] The cadastral value is assessed for the property tax. The declared value in other taxes checked by the tax administration only happens when there is a transmission either *mortis causa* or *inter vivos*. Therefore, this last value can be considered as a checked acquisition price, which in fact means the MP when the estate is acquired.

[30] In fact, the law also foresees three possible values to take the greatest one: denomination of shares, net asset value per share or assessed value obtained from capitalize at 20% the average benefits from the three previous years.

[31] Act 22/1993, 29 December, later developed by Royal Decree 2481/1994, 23 December.

[32] The exemption for business activities applies to property and rights assigned to individual businesses and professional persons whenever the taxpayer carries out directly the activity and obtains from that most of his taxable income. The exemption for holdings in companies, whether or not listed on organized markets, applies whenever the taxable person owns at least 15% (5% since 2003) of the company himself or 20% along with his family; the companies concerned are not operating under the tax transparency rules, in other words, they really carry out an economic activity; the taxpayer plays an active part in the management of the company; and, finally he obtains most of his taxable income from the company.

shares. Furthermore, the exemption has become an easy tax shelter, particularly for highest wealth taxpayers, which can re-organize their wealth and enjoy the exemption quite easily. When that was first introduced in 1994, only 21% of the total individual business assets were exempt. Since then, this percentage has steadily increased and is currently over 70%. Business exemption accounted for 4% of tax base in 1994. In 2003 this percentage rose to 32%[33]. Top 10% of taxpayers accumulated 64% of all business exemptions in 2003[34]. If redistribution is an important goal of the WT, the exemption of business assets undermines this end, and also goes against horizontal equity. In addition, tax saving from the business related exemptions has been reinforced since June 1996, with the introduction of a new 95% deduction for business transmission among close relatives in the IGT[35], subject to the exemption of business assets in the WT[36]. Therefore, the business exemption has provoked a re-organization of business assets to fulfill with the legal conditions.

The evolution of the reported business assets that are exempt is shown in Graph 2. The gap between the tax base (the wealth finally taxed) and the modified base (that including reported business exempt) for top 1% of adult population boosts since 1994. It appears quite clear that tax planning has become very common in the Spanish WT for the top percentile.

A few years after the business exemption, in 2000, the government introduced another one: the exemption of owner-occupied dwellings[37]. This new exemption has had an important effect on the total number of WT taxpayers, with an almost 15% fall, and on the tax yield, that went down 8%. In Spain, where official statistics show more than 80% of people live in owner dwellings, which in addition as we said before are under-assessed, the new exemption sets many former

[33] This information is based on reported data, because taxpayers still have to declare exempt business assets. However, there is often a common belief that some taxpayers do not declare them, since they do not pay anything, and therefore they do not bother WT. Or alternatively, they declare the exempt assets or shares but assessed according to false values, very small compared to the real ones, since regardless the declared value they pay nothing. Although it is difficult to demonstrate this suspicious, for instance, the comparison between the evolution of the number of taxpayers reporting business income in the IT and the number of taxpayers reporting business assets in the WT shows an opposite trend. Thus, from 1994 to 2004, the number of IT taxpayers reporting business income has increased 11%, while the number of WT taxpayers reporting business assets has gone down 35%. Consequently, the weight of business related exemptions over tax base would probably be much greater at the present moment.

[34] In official statistics, taxpayers are always aggregated according to tax base, which do not include exemptions. Therefore, it is difficult to know the real distribution of business exemptions along "real" wealth (that is, before exemptions). Tax base is the sole proxy we can employ.

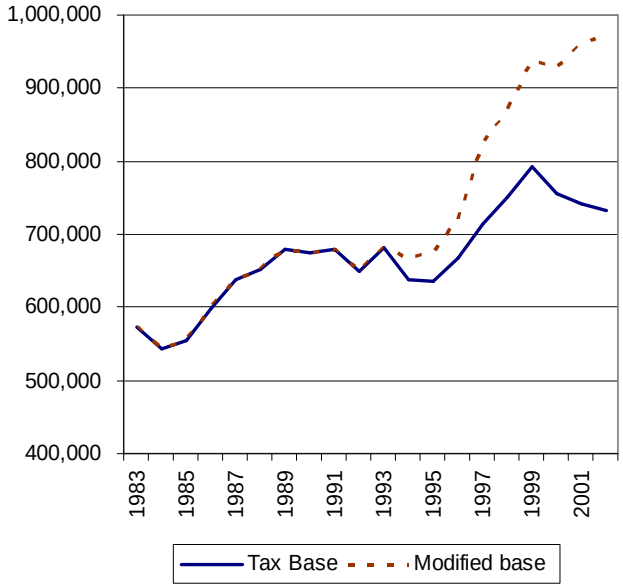
[35] The Spanish Inheritance Tax is highly progressive with nominal marginal tax rates up to 34%, but they can be higher since a multiplicative coefficient that varies 1 and 2.4 is applied depending on the level of wealth held by the heir before the transmission and the relationship with the deceased. Therefore, despite in only very few cases, marginal rate can reach 81.6%.

[36] Royal Decree-Law 7/1996, 7 June.

[37] The official justification was to conclude the improvement in the taxation of owner-occupied dwellings, started in the 1999 IT reform, when the taxation of the imputed rent was removed (Act 6/2000, 13 December).

taxpayers below the threshold, hence, out of the tax. Furthermore, it introduces more inequality between assets and more distortions in the allocation of savings.

Graph 2. The Evolution of Business Exemption for Top 1%



Note: Expressed in 2002 euros. M3odified base is tax base plus business related exemptions. Top 1% of adult population according to refined-lower bound (See section 4). Real estate assessed on fiscal criterion.

A final issue to point out is the role of WT as far as tax administration is concerned, particularly regarding the control of IT. When WT was introduced, the tax was administered by the central government, also engaged in the administration of IT and other taxes. However, the development of a financing system for the then just created AC's provoked that the yield was later given to them, along with the power to administer and collect the tax. This has been criticized by undermining the function of the tax as a means of control (De Pablos, 2006; Esteller, 2004; Pedrós, 1981), given the difficulties of collaboration among national tax administration and regional tax administrations[38].

[38] Since 1997 AC's also have some legislative power, extended in 2002, thereby they can regulate without any limitation important tax parameters: threshold, tax rates and tax credits. Nonetheless, they cannot modify other issues, as the assessment rules or the exemptions. For the time being, Spanish AC's have been quite passive and they have only introduced few and minor changes, with the only exception is Cantabria, a northern region, that in 2006 increased considerably the threshold, from 108,182.18 € to 150,000 €, and the top marginal rate from 2.5% to 3%. Nonetheless, AC's have been very active in other taxes on wealth, such as IGT, where a clear competitive race among Spanish AC's seems to have started, similar to what happened in the eighties in Australia and Canada (Durán and Esteller, 2006).

To sum up, from this descriptive analysis it does not seem Spanish WT fulfils any of the aims that justified its introduction. Both central and regional governments do not currently pay much attention to the tax and even lobbies do not care, since they already obtained what they wished. In section 5, we will study empirically the Spanish WT, analyzing how exemptions, assessment criteria and under-compliance appear to undermine the WT goals. With that aim, we calculate declared values by top 1%, which requires carrying out an interpolation from the tax statistics. This will also permit us to describe the evolution of wealth concentration in Spain.

4. Wealth Concentration from Fiscal Data

In this section we first explain the interpolation methodology. Next we analyse in detail the evolution of wealth concentration from WT data.

4.1 Methodological issues

We focus our analysis on top 1% of richest adult population. There is a widespread assumption rich taxpayers are more responsive to tax changes, both because their marginal rates are higher and because they have more opportunities for altering their behavior (see, *e.g.*, Moffitt and Wilhelm, 2000). Furthermore, since its adoption the Spanish WT has only levied a small percentage of adult population, between 2% and 4%, as the threshold, following the progressivity aim, seeks to concentrate on wealthiest individuals. Likewise, by considering all population instead of taxpayers, our target group remains more stable and the number of members is less sensitive to legal modifications, such as new exemptions or thresholds[39].

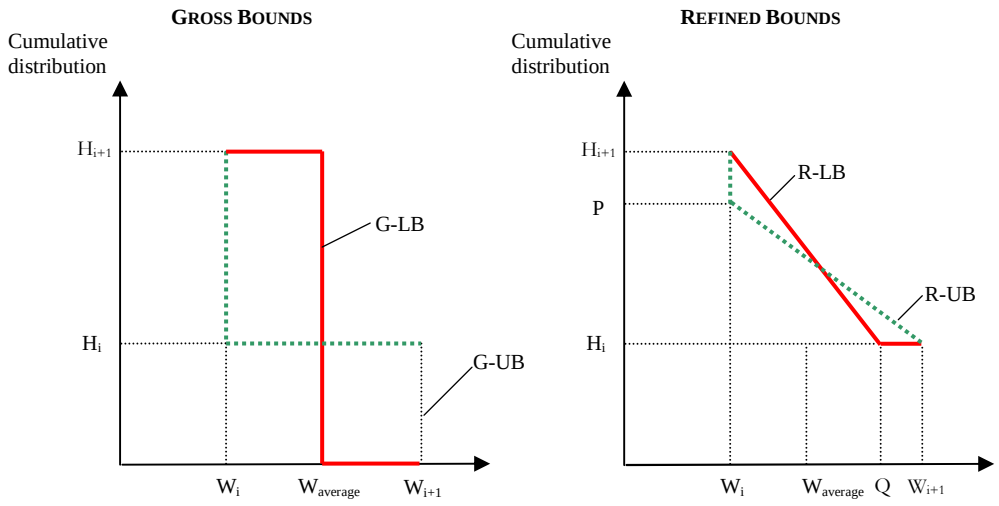
In absence of micro-data, we have had to work with aggregate data. As usual for this kind of information, in the statistics taxpayers are gathered into several brackets according to their level of tax base, regardless of the number of people within each interval. Therefore, it is necessary to interpolate to know the wealth for specific percentiles (top 10%, top 1%, etcetera). The most common method employed in the literature, and also by Alvaredo and Saez (2006) in a recent work for Spain, is "Pareto interpolation" (from now on, PI)[40], which is based on the assumption that the distribution of wealth at the top is Pareto in form. However, Atkinson (2004) argues that

[39] For instance, the total number of taxpayers over the year before fell about 15% in 1988, in 1992 and in 2000 due to different legal modifications (individual tax unit, new act and housing exemption, respectively).

[40] Among many others, see Feenberg and Poterba (1993 & 2000) and Piketty (2001 & 2003). Atkinson (2004) explains this follows a tradition since a Pareto interpolation was already used in a 1906 report of the House of Commons Committee on Income Tax.

"the potential error in making such interpolation depends on the width of the ranges" (p. 13). This is an especially important issue for the Spanish case because the number and width of intervals in the data are not the same along the studied period (1983-2001), and changes are quite important. Hence, we use an alternative methodology proposed by the very Atkinson (2004), which does not depend on the assumption of the distribution is Pareto in form, but on assuming a non-increasing density for the upper brackets (Gastwirth, 1972). This methodology is illustrated in Graph 3.

Graph 3. Methodology of interpolation: Lower and Upper Bounds



On the one hand, the gross lower bound (G-LB) supposes that within that range (*i.e.*, W_{i+1}-W_i) all the mass of population is concentrated at the average of the range ($W_{average}$). Hence, this bound implies maximum equality regarding the distribution of wealth within that interval (see Cowell, 2000). On the other hand, the gross upper bound (G-UB) implies maximum inequality within the interval, and it is calculated assuming that within that range a certain percentage of taxpayers is concentrated at the minimum amount of wealth of the interval (W_i) while the rest is concentrated at the maximum (W_{i+1})[41]. In Table 3, we can see that differences between the G-LB and the G-UB for top 1% are not very important. The greatest differences are concentrated in the 1988-98 period (up to 10.5% and 5.9% on average), when the tax statistics only offer 10 intervals. Hence, during that period, the results of the interpolation are less precise. For that reason, when possible we also calculate a refined lower bound (R-LB) and a refined upper bound (R-UB).

[41] The percentage of taxpayers in each extreme of the interval has to be calculated in order to guarantee that the resulting average coincides with the real one. For example, the percentage of taxpayers concentrated at the minimum value of the interval (y_i) is $(W_{i+1}-W_{average})/(W_{i+1}-W_i)$. The percentage of taxpayers at the other extreme is simply $1-[(W_{i+1}-W_{average})/(W_{i+1}-W_i)]$.

Table 3. Top 1% Average Wealth: Gross and Refined Lower and Upper Bounds

	G-LB	R-LB	G-UB	R-UB
1983	572,823	572,823	574,708	574,708
1984	543,704	543,704	547,598	547,598
1985	553,905	553,905	556,896	556,896
1986	599,036	599,036	606,168	606,168
1987	636,798	636,798	639,262	639,262
1988	646,323	651,095	651,414	651,414
1989	661,426	679,136	685,565	684,884
1990	650,298	674,525	692,165	690,169
1991	651,544	678,203	709,156	698,508
1992	623,067	649,573	687,874	670,580
1993	655,427	680,857	724,403	701,726
1994	642,367	668,798	702,362	684,983
1995	650,469	674,790	698,667	687,528
1996	700,582	720,801	734,537	729,045
1997	785,473	797,577	801,910	800,628
1998	863,876	868,562	869,260	869,118
1999	938,538	938,538	942,932	942,932
2000	982,447	982,447	980,742	980,742
2001	1,013,951	1,013,951	1,014,011	1,014,011

Note: Expressed in 2002 Euros. The data is obtained from fiscal data. Includes reported wealth (and so it is estimated according to the fiscal criteria of assessment) and from 1994 onwards business assets reported but exempt. In 2000 and 2001 also includes the assessed value of owner-occupied housing exemption using our empirical estimates as no fiscal data are available regarding this exemption (see section 5.3.1; the value of the estimated exemption depends on the use of the MP as assessment criterion, here we have supposed the percentage use is equal to 10%).

The calculus of the refined bounds is based on Atkinson (2004), who supposes non-increasing density at the top of the whole distribution of taxpayers (Gastwirth, 1972). The procedure to obtain these refined bounds is also shown on Graph 3. In order to obtain the lower bound, instead of assuming that the whole mass of taxpayers are concentrated right at the mean, Atkinson assumes that they tend to concentrate around it. In particular, they concentrate within a range located a certain distance left to the average (until W_i) and the same distance to the right (until Q). Around those values (Wi − Q), density is linearly decreasing, and from Q onwards the density is zero. Similar to the calculus of the G-UB, in order to obtain the corresponding

refined, Atkinson assumes that taxpayers concentrate at W_i and at W_{i+1}. Thus, in contrast to the lower bound, there must be taxpayers in both extremes. Then, given the restriction of maintaining the average of wealth at its real values, which is also binding for the calculus of the R-LB, we obtain point P. This means that the percentage of taxpayers at the bottom of the interval is given by (H_i − P). From then on, the density is decreasing till point W_{1+1}. This (refined) methodology certainly offers a more precise interpolation, as shown in Table 3, and now the greatest differences are up to about 3% and 1.67% on average.

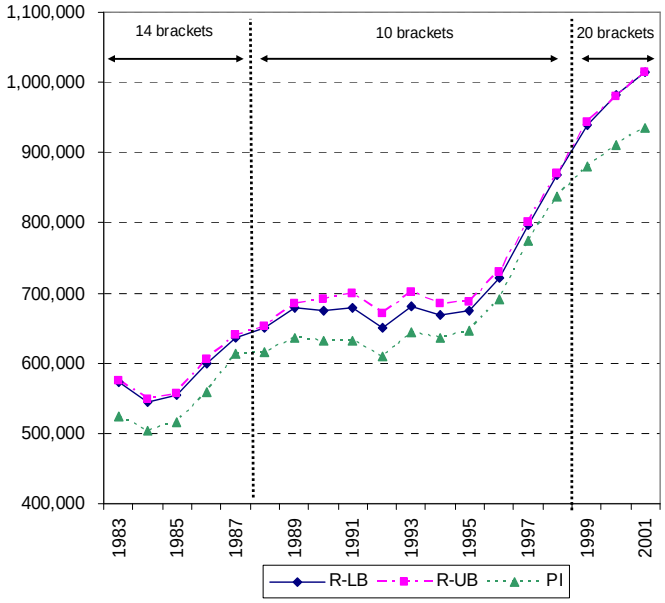
By applying this alternative methodology of interpolation our results can be compared with those obtained by Alvaredo and Saez (2006) using the PI[42]. Graph 4 shows the evolution of the reported average wealth for top 1% according to the different methods of interpolation[43]. In spite of being difference in absolute terms, we can observe all assessed values evolve in a quite similar way. Both refined bounds are always very similar and they give a higher amount of wealth compared to PI. The highest differences take place when the number of brackets is smallest (10 brackets), which seems to confirm Atkinson's words that the potential error in interpolation depends on the width of the ranges [44]. From now, in order to perform an analysis of the evolution of wealth concentration, we will use the interpolated values using Atkinson's proposed methodology. The differences between R-LB and R-UB values are on average about one percent, therefore fairly small. For that reason, in order to avoid an excess of data we mainly concentrate on R-LB values, which are slightly closer to the PI values.

[42] Before making the comparison, we have to take into account that Alvaredo and Saez (2006) rectify upwards the declared value of real estate in order to consider the MP. Consequently, we have reconstructed their interpolated values assessing real estate property according to the CV. We sincerely thank Alvaredo and Saez for making us available the annual coefficients they use to rectify the CV. However, those values might be slightly upward biased, since they suppose that all reported real estate property is assessed according to the CV.

[43] The definition of wealth includes all reported goods and rights, including declared business related exempts and owner-occupied-dwelling exemption. There are not data in the fiscal statistics about this last exemption, but we use our assessed values estimated in the model explained in section 5.3.1.

[44] The top difference is 67,523 € in 1991 between R-UB and PI, but in relative terms differences are always well below 10%. In fact, differences in 2000 and 2001 are greater, but they might be due the different procedure to estimate the value of owner-occupied-dwelling exemption. In our case, we followed the methodology explained in section 5.1.1 (see also previous footnote).

Graph 4. A Comparison of Interpolation Methodologies for Top 1%



Note: Wealth expressed in 2002 euros.

Source: Alvaredo and Saez (2006) and own calculations (see note of Table 3)

4.2 Analysis of Wealth Concentration in Spain

One of the arguments to justify WT is its role in redistributing wealth, so the rationale for maintaining this tax might crucially depend on how inequality evolves. However, in Spain, there are not studies about wealth concentration due to a historic lack of proper data[45]. For that reason, data from WT could be useful to know the level and evolution of wealth concentration during the application of the tax. The lack of proper data to analyze concentration is common in many countries. A literature originated in Kuznets (1953) proposes to estimate income distribution using fiscal data (see Atkinson and Piketty, forthcoming)[46]. This methodology consists of employing income data from tax returns to compute the level of upper incomes and national accounts to compute the total income denominator. Hence, by considering all population and all income one can deduce from tax data the share of top income recipients in total income. A similar process permits to estimate the distribution of wealth.

[45] Recently, starting in 2002, the Bank of Spain conducted a household wealth survey, similar to the *Survey of Consumer Finances* (SCF) of the Board of Governors of the Federal Reserve System in the United States. This survey is supposed to be conducted periodically, but for the time being it is only available for year 2002. See Bover (2004) and Bover *et al.* (2005).

[46] Atkinson and Piketty (forthcoming) have recently edited a collective volume with results of income distribution for Australia, Canada, France, Germany, Ireland, Netherlands, Switzerland, United Kingdom and United States. Most of studies follow Kuznets' methodology.

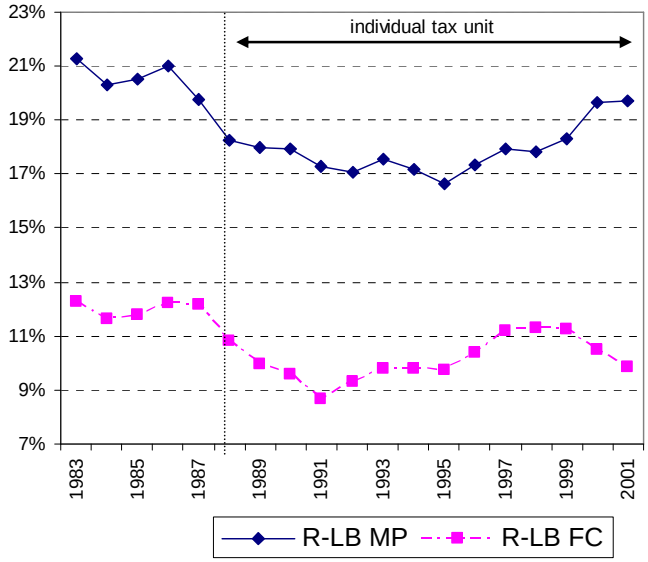
Indeed, wealth tax data can also provide useful information to analyze the distribution of wealth, particularly on the upper tail of the distribution, as different studies for the Nordic countries shown (Spant, 1987; Tuomala and Vilmunen, 1988; Ohlsson *et al*., 2006.). Following all this literature, Alvaredo and Saez (2006) have recently estimated income and wealth concentration for the Spanish case. Regarding the numerator of wealth concentration (*i.e.*, wealth for a top percentile) they interpolate fiscal data using PI as we already know, while in the denominator (*i.e.*, total wealth from National Accounts) they calculate total net wealth, that is real estate, fixed claim assets, stock and other assets minus mortgage debt and other debts. In this paper, we will basically perform the same kind of analysis using as numerator the interpolated values obtained from Atkinson's proposed methodology of interpolation, and taking advantage of the data presented by Alvaredo and Saez (2006, Table A2, p. 57) to calculate the denominator of total wealth.

However, the use of tax data for distribution analysis is not without criticisms. Atkinson (2004) points out four potential serious problems: tax evasion, tax avoidance, legal definitions not suitable to study distribution and no contextual data to help to understand the determinants of the distribution. Likewise, tax data only provide comparable information along time as long as the pattern of tax evasion for richest groups of taxpayers remains equal along time. Further, legal changes, such us the change of tax unit, the introduction of new exemptions or the rise in the threshold required to declare, may cause additional troubles. In fact, those later circumstances occur in Spain, and so we will try to take them into account in the analysis of wealth concentration[47].

Nonetheless, at the same time tax data have points in their favor, as the very Atkinson affirms. Alternative sources also suffer problems: non-reporting or under-reporting by respondents or failure to correctly tailor questions particularly if the employed survey is conducted for other purposes. And, which is particularly important in the Spanish case, tax data are especially relevant when no other sources exist that span along time (see fn. 45). In conclusion, it is interesting to analyze the evolution of wealth distribution but being cautious about the possible conclusions.

[47] Fiscal data excludes two regions, Navarre and Basque Country, because due to a particular financing system, they have their own WT. Therefore, the analysis does not include both regions, which account for 6.3% of the Spanish adult population.

Graph 5. A comparison of assessment criteria: Top 1% Total Wealth Share according to Fiscal Criteria *vs*. Market Price (1983-2001)



Note: One Refined-Lower Bound (R-LB MP) is calculated taking the MP to assess real estate properties, while the other (R-LB FC) is calculated taking the fiscal criterion to assess real estates, that is, mainly CV. The impact of the owner-occupied-dwelling exemption is assessed according to the model explained in section 5.1.1 and shown in section 5.3.1, but only for R-LB MP. We use the Alvaredo and Saez coefficients to estimate MP (see fn. 42).

The average wealth for top 1% of adult population rises in real terms during the period (see Graph 4). Wealth reported in tax returns is assessed according to fiscal criteria, which is especially relevant for real estate property, rather under-assessed as we said in the previous section. This would provide an untrue image of the wealth distribution, further because the denominator, total wealth, is based on national accounts, that is, in MP values. Therefore, to know the real weight of wealth held by top 1% of population over total wealth requires converting real estate values in MP[48]. In Graph 5, we show the top 1% share over all wealth according to both fiscal criteria (FC) and MP. Indeed, the fiscal criteria would grant a false image of wealth distribution. The disparity refers mainly to the absolute value of the series, but also to their evolution, as the ratio CV/MP varies along time, as pointed out in Graph 1. The introduction of the owner-occupied-housing exemption since 2000 makes this disparity larger. The average difference is almost 8 percentage points, with a minimum value in 1998, 6.55 points, and a maximum at 9.84 points in 2001.

[48] Recall business assets and shares not traded in the stock market are not reported according to MP, but we do not have enough information to convert them in real prices. However, they account for a much smaller share of wealth.

In Graph 6 we compare our series with those obtained by Alvaredo and Saez (2006). Although our estimations are slightly higher, on average around one percentage point, the two series evolve in a quite similar way, except since the introduction of the housing exemption. Due to the absence of fiscal data, we have estimated its value according to the procedure established in section 5.3.1. General speaking it appears wealth concentration goes down between 1983 and 2001. However, before making that assertion, we must consider an important legal modification which could alter this initial impression.

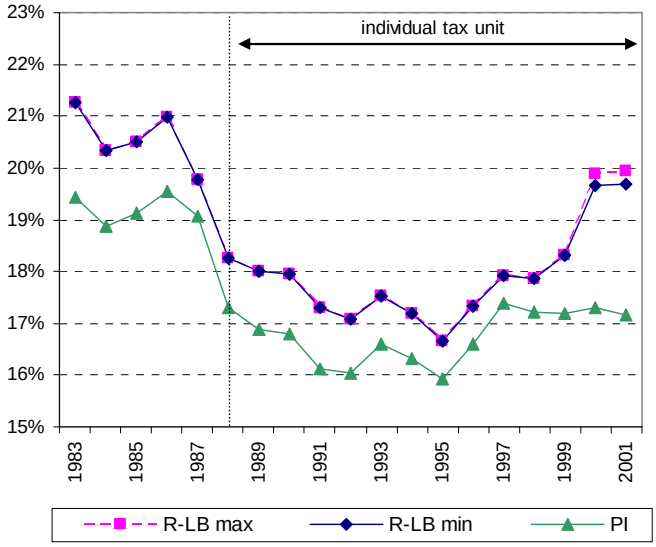
The tax unit changes since 1988 when the compulsory joint taxation for marriages was replaced by an exclusively individual system. Consequently, wealth held by marriages was split into two tax units, one for each spouse[49], which logically reduces the concentration of wealth in 1988 compared to the previous years. Recall top 1% is made of adult population, which only coincides with the number of taxpayers since 1988, but before that date means including more persons, since in joint tax units there are two persons. Obviously, the concentration of reported wealth must be greater, as more person's wealth is included, than when the top 1% is only formed by individual tax units. This legal change in the tax unit does not appear to be considered by Alvaredo and Saez (2006), but it seems to be relevant because, as Graph 6 illustrates, there is an important fall on the wealth share held by top 1% in 1988, in fact the most important annual fall of the period[50]. Therefore, in order to obtain a correct conclusion about the evolution of wealth concentration, we should start the analysis since 1988[51]. Before, between 1983 and 1987, our results suggest there is a fall in the concentration level, while Alvaredo and Saez' results indicate concentration remains quite stable.

[49] How wealth is distributed between spouses depends on the marriage settlements, but the most common settlement in Spain establishes an equal distribution of wealth obtained during the marriage.

[50] The change in tax unit derives from a Constitutional Court sentence declaring unconstitutional compulsory joint taxation for marriages in the income tax. Consequently, the government also changed the tax unit of WT, which then on is only individual. That could have provoked a rise in the number of taxpayers, but the government decided at the same time an outstanding increase in the threshold. The overall effect was as 15% fall in the number of taxpayers.

[51] An alternative would be to convert tax units in persons, but the lack of proper information in Spain to find a liable value of conversion for top taxpayers makes us to give up this possibility.

Graph 6. A Comparison with Alvaredo & Saez (2006): Evolution of Top 1% Total Wealth Share (1983-2001)



Source: Alvaredo and Saez (2006) and own calculations.

Note: The values of the impact of the owner-occupied dwelling exemption are assessed according to the model explained in section 5.1.1 and shown in section 5.3.1. We use two alternative degrees of utilization of "MP" as criterion of assessment of housing: 50% (R-LB max) and 10% (R-LB min). We use the Alvaredo and Saez coefficients to estimate MP of real estates.

From 1988 to 2001, we can identify four different sub-periods: 1988-1992, the top 1%'s share goes down; 1992-1995, it remains rather stable; 1995-1997, it rises; and from 1997, the evolution of the two series is diverse because while the share for the PI stays stable, our results indicate a clear increase in the concentration of wealth, especially since 2000. Therefore, both series show a fairly similar evolution, except once the owner-occupied-housing exemption is introduced. Again, a fiscal change alters the estimated shares and the possible conclusions. Alvaredo and Saez results illustrate top 1%'s share of wealth remains stable during the 1988-2001 period. On the contrary, our results point out a rise in the level of wealth concentration (see fn. 44).

Table 4. % Composition of Wealth for Top 1%

Year	Housing	Equity Shares	Other assets	Total
1983	65.87	11.16	22.98	100.01
1984	67.19	11.10	21.71	100.00
1985	66.66	11.76	21.58	100.00
1986	65.04	13.65	21.31	100.00
1987	63.46	14.95	21.59	100.00
1988	62.04	17.09	20.87	100.00
1989	63.89	16.54	19.57	100.00
1990	65.28	14.62	20.11	100.00
1991	67.52	15.40	17.08	100.00
1992	64.17	17.44	18.40	100.00
1993	62.35	20.26	17.39	100.00
1994	61.90	20.98	17.12	100.00
1995	60.66	21.85	17.49	100.00
1996	59.47	24.64	15.89	100.00
1997	56.27	29.66	14.07	100.00
1998	54.51	32.34	13.15	100.00
1999	55.41	31.05	13.55	100.01
2000	55.83	29.77	14.40	100.00
2001	58.37	27.45	14.18	100.00

Source: Alvaredo and Saez (2006).

Note: Composition based on fiscal data. Housing net of debts and assessed according to MP using transformation coefficients provided by Alvaredo and Saez.

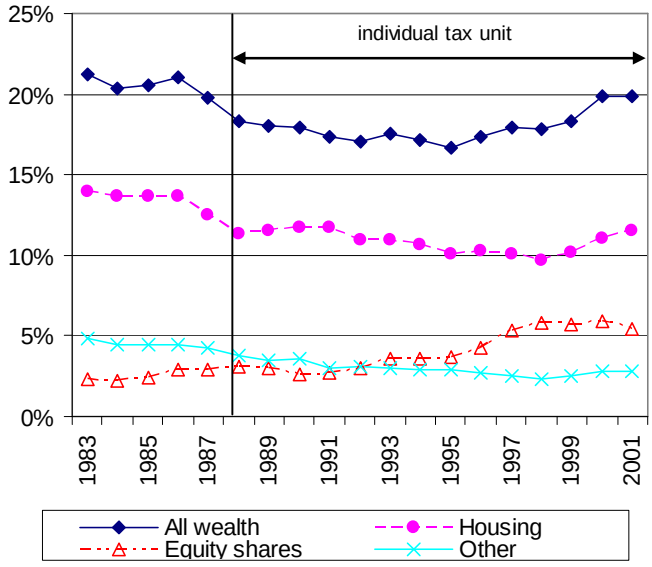
To be able to go further in this analysis, we are going now to concentrate on the particular evolution of the two main assets in the composition of wealth, real estates and shares, which represent the greatest part of all wealth (Table 4). Our purpose is to know how their evolutions influence on the overall share of top 1%.

The weight of housing and equity shares over all wealth varies along time for top 1% (Table 4). To know if each one follows the same evolution or differs, we have decomposed the annual variation in the general wealth share into separate parts for the Refined-Lower Bound (Table 5). Thus, we isolate the effect according to the type of asset that causes the change: housing and equity shares, while the rest is assigned to the remaining assets. The evolution is also shown graphically (Graph 7) for the R-LB.

Table 5. Annual Variation in the Wealth Share of Top 1%

	84-83	85-84	86-85	87-86	88-87	89-88	90-89	91-90	92-91	93-92	94-93	95-94	96-95	97-96	98-97	99-98	00-99	01-00	01-88
All wealth	-0.93	0.18	0.49	-1.22	-1.50	-0.28	-0.04	-0.64	-0.23	0.45	-0.34	-0.54	0.68	0.60	-0.08	0.47	1.34	0.03	**1.43**
Housing	-0.35	0.01	-0.02	-1.10	-1.21	0.16	0.23	-0.03	-0.73	-0.03	-0.29	-0.54	0.21	-0.22	-0.36	0.42	0.83	0.52	**0.16**
Equity shares	-0.12	0.15	0.45	0.09	0.17	-0.15	-0.35	0.04	0.31	0.57	0.06	0.03	0.63	1.05	0.46	-0.08	0.17	-0.45	**2.28**
Other	-0.47	0.01	0.05	-0.21	-0.45	-0.29	0.09	-0.65	0.19	-0.09	-0.11	-0.03	-0.16	-0.23	-0.18	0.13	0.35	-0.04	**-1.02**

Graph 7. Evolution of Top 1% Shares on All Wealth, Housing and Equity Shares



Before changing the tax unit in 1988, the top 1% share in housing falls more than one percentage point, which is partly compensated by a light increase in the concentration of equity shares. Once individual tax unit is introduced, housing concentration shows a reducing trend, partly compensated by a growth in the concentration of equity shares. Therefore, each asset has an opposite effect. However, the process for housing upturned the last year of the period, when there is a rise in concentration and, consequently, the final level of all concentration is slightly greater than at the beginning. Regarding concentration of equity shares, there is a quite steady increase throughout the period until 2000, when starts a more stable evolution.

In conclusion, between 1988 and 2001 the overall level of concentration remains very stable for housing but rises for equity shares. Generally speaking, housing evolution reduces concentration while equity shares increases it. However, this seems to change for the last years of the period, when housing prices are booming and starts an increasing concentration process. And at the

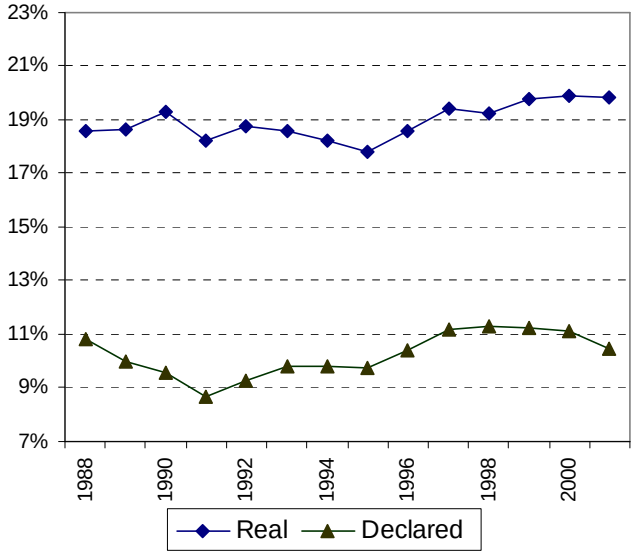
same time, the concentration of equity shares remains more stable, and so does not contribute to increase wealth inequality in contrast with the previous years. In fact, housing and equity shares concentration very often varies in opposite ways. Shady cells of Table 5 mean housing and equity variations have opposite signs, that is, when one goes up the other goes down. The stock market booming period starting in 1996 provokes an increase in the concentration level, but the evolution of housing share partly offset that effect. The subsequent fall of stock market reduces concentration, but this change is again partly offset by the increasing share in housing.

Nevertheless, fiscal data may give a misunderstanding picture of the evolution in wealth concentration if tax evasion does not remain stable along time, as we mentioned before when pointing out the criticisms of using fiscal data. In the model explained in the next section, we estimate the possible impact of tax fraud as far as housing and equity shares in organized markets are concerned. In particular, as indicated in section 5.4, the gap between declared housing values and the real ones, regardless the existing level of under-assessment due to fiscal criteria, is quite high and increasing along time, especially when housing prices are booming. For that reason, we calculate the top 1%'s share taking the results obtained in the empirical model, that for housing includes the level of under-assessment, the owner-occupied-dwelling exemption and the level of tax fraud. The results are shown in Graph 8 and also suggest concentration increases between 1988 and 2001. The impact of the housing exemption is probably under-assessed, as we will explain in the section 5.3.1, but regardless this issue, the results suggest again an increase in the share of wealth held by top 1% of adult population.

The share of top 1% (Graph 8) varies between a minimum value of 17.80% (1995) up to close to 20% from 2000, being on average 18.84%. This average value is two percentage points greater than the one calculated by Alvaredo and Saez, 16.77%. Compared to other countries (Table 6), the level of wealth concentration in Spain does not seem to be high, although differences in the unit of analysis or in the employed data may difficult comparisons among countries[52]. For similar periods, the concentration of wealth also rises in Italy, Switzerland and the United Kingdom, while it goes down in the United States.

[52] See Davies *et al*. (2006) for a wider comparison of wealth distribution within countries and the methodology difficulties.

Graph 8. Tax Incompliance: Declared vs. Real Wealth. Top 1% Share (1988-2001)



Note: Real wealth is calculated adding to declared wealth real estate properties at MP and tax incompliance, according to section 5.4. The owner-occupied-dwelling exemption is considered in both series.

Table 6. Wealth Concentration for Other Countries. Top 1%

Country	Period	Unit	Average	Minimum	Maximum
France	1994	Adult	21.30%	-	-
Italy	1989-2000	Household	11.55%	9 % in 1991	13.80% in 2000
Spain	*1983-2001*	*Adult*	*18.84%*	*17.80% in 1995*	*19.90% in 2000*
Switzerland	1981-1997	Family	33.80%	33.04% in 1981	34.80% in 1997
UK	1988-2001	Adult	19.64%	17% in 1988	23% in 2000
US	1988-2000	Adult	21.43%	20.79% in 2000	21.96% in 1989

Source: Piketty *et al.* (2006), for France; Brandolini *et al.* (2004), for Italy; Dell *et al.* (2005), for Switzerland; Revenue & Customs (2006) for the UK; Kopczuk and Saez (2004), for the US. For Spain, the values are assessed according to market price and rectified by tax incompliance for real estate property.

5. Empirical analysis

In this section, we will first establish the empirical framework we will use to assess the effectiveness of WT in taxing real tax capacity. Next, we will carry out the empirical analysis. We will do it for the two most important assets taxed in the Spanish WT, housing and equity shares, and for top 1% of adult population.

5.1. Empirical framework

We assume the following simple functional form of declared values at WT for any asset:

$$p_t^D q_t^D = \left(p_t^R \times q_t^R\right)^{\beta} \qquad [1]$$

where p is the price of the asset, and q, the physical quantity of the asset (*i.e.*, number of houses or number of equity shares), while β is a parameter to be empirically estimated. Subscripts *D* and *R* stand for declared and real variables, respectively, while *t* indicates the moment of time. Thus, we suppose that declared values keep a certain relationship with the real ones, both regarding the price and the quantity. This is the justification of the above expression. Obviously, the declared values could be randomly chosen or could remain at the same level independently of the real ones. That is why, the above expression is not an identity and should be transformed in the following way:

$$p_t^D q_t^D = \left(p_t^R \times q_t^R\right)^{\beta} \times e^K \times e^{\mu_t} \qquad [2]$$

where *K* is a constant term, while u_t is a random error with the usual properties. In order to empirically estimate expression [2], we linearize it taking (natural) logs:

$$\log\left(p_t^D q_t^D\right) = \beta_1 \log p_t^R + \beta_2 \log q_t^R + K + u_t \qquad [3]$$

The parameters β_1 and β_2 can be directly interpreted as elasticities, that is, as the percentage change in the declared value of an asset when its real price or its quantity varies in 1%, respectively. As long as p^R is a perfect indicator of the real price of the asset, the maximum (minimum) value of β_1 should be equal to one (zero). In particular, for a given value of *K*, if $\beta_1 = 1$ ($\beta_1 = 0$), we should conclude that the level of tax compliance is 100% (0%)[53,54].

[53] Later on, we will call the level of tax compliance obtained given *K* and per dwelling as *marginal* tax compliance.

However, given that we do not have micro-data, but only aggregate data, we will only be able to employ imperfect indicators of the real prices (*i.e.*, basically, average values) of the declared assets in the WT by top 1%[55]. This limitation makes it necessary to re-interpret the coefficient β in expression [2]. That is why, we have introduced in [3] a different β for p^R and for q^R. If the proxy we use for the price of the asset wrongly estimates its real value, β_1 will include both the degree of tax compliance, θ ($0 \leq \theta \leq 1$), but also the very degree of under or over assessment of the most appropriate price for top 1%, δ ($\delta \geq 0$):

$$p_t^D q_t^D = \left(p_t^{R\,\delta} \times q_t^R \right)^{\theta} \times e^K \times e^{\mu_t} \qquad [2']$$

Thus, even if there is full tax compliance ($\theta = 1$), the estimated elasticity with respect to the indicator of the price of the asset might be less (more) than 1 as long as our price indicator over-values (under-values) the real price of the asset, that is, $\delta < 1$ ($\delta > 1$). As we will explain later, by means of our empirical analysis, we will try to disentangle both effects as far as housing is concerned.

According to what we commented in section 3, the Spanish AC's administer this tax since the beginning of the eighties. Until 1987, the equalization grant system generated an implicit 100% "tax on tax revenue", since any increase in the amount of tax collected by the AC's supposed a decrease in the amount of unconditional grant received from the central government. Thus, we would expect that the parameter θ in expression [2'] (and so of β in expression [3]) were lower for the 1983-1986 period due to the *a priori* (very) low incentive of AC's to collect tax revenue, including that yielding by the WT[56]. We will try to take this into account in the empirical analysis[57]. In principle, this reasoning applies both to housing and to equity shares.

Finally, we will try to control for q^R by means of proxies of the propensity to accumulate each type of asset (including the variable income as independent variable), of the cost of debt (interest rate), or of the financial profitability of alternative assets (*e.g.*, long interest rate).

[54] This empirical framework does not permit us to detect the non-compliance due to "ghosts", that is, to nonfilers (see, *e.g.*, Erard and Ho, 2001).

[55] For instance, on the one hand, given the supposed better financial information at hands of rich people and their better processing (Peress, 2003), we would expect that their financial portfolio generated returns over an average stock index. Similarly, on the other hand, regarding real estate, it is reasonable to suppose that their housing prices are well above average values, since most of them probably live in exclusive areas. On the whole, in both cases the use of average prices for the assets of top 1% can only be regarded as a proxy of their real prices.

[56] This hypothesis is similar to the one tested and empirically confirmed by Baretti *et al.* (2002) for the case of the German *Länder*.

[57] Recall from section 4.2, that by 1988, the data might also be affected by the change of the tax unit. This latter fact makes that before 1988 the data is upwards biased, while the "tax on tax revenue" points out in the opposite direction. In the empirical section, it will not be possible to disentangle both effects, and so we will estimate a *net* effect.

However, given the impreciseness of the estimation of q^R, these variables will have to be considered just as controls, while the main conclusions of our empirical analysis will be derived from the estimates of p^R.

We will apply this empirical framework to two assets, housing (only urban dwellings) and equity shares, which prices are more easily available and in any case their price indicators can be considered as most reliable. On average these two assets account for about 60% of total wealth declared by top 1%[58]. Hence, we expect the conclusions obtained from their analysis to be rather descriptive of the performance of the wealth tax in taxing real tax capacity. In the next two sections, we explain the specificities of each one of those assets.

5.1.1. Housing

In the case of housing, the variable p^R in expression [2'] is not only conditioned by the degree of under or over assessment, but also by the fiscal rules concerning the appropriate price to be assigned to each dwelling in the WT return (see section 3). Although most of the times the CV is the price used to assess the monetary value of a dwelling, we already know that according to the fiscal law the price of acquisition (*i.e.*, an *old* "MP") has to (or should) be used when it is above the CV[59] (see also fn. 29). That is, at any moment of time, the (real) price of each dwelling in fiscal terms is the following:

$$p^R = MP^{\alpha} CV^{1-\alpha} \qquad [4]$$

where α is the degree of utilization of the "MP" in order to assess dwellings, according to the fiscal legislation[60]; and *MP* is the market price. It is well known that the CV tends to under-assess the MP, so $CV = W^{1-\delta} \times MP^{\delta}$, such that $0 \leq \delta \leq 1$ and *W* is a constant (see next fn. 61). This constant will be very useful in the exploitation of the results of the empirical analysis. Taking all this into account, expression [4] can be rewritten as follows:

$$p^R = MP^{\alpha}\left[W^{(1-\delta)} MP^{\delta}\right]^{1-\alpha} = MP^{\alpha+\delta(1-\alpha)} W^{(1-\delta)(1-\alpha)} \qquad [4']$$

[58] These percentages are calculated according to the declared values, while in Table 4 recall the declared value of housing was rectified in order to re-assess it according to market price.

[59] The taxpayer might declare according to the *CV* even if the *MP* is higher. Thus, the parameter α, which is defined next, might also be implicitly affected by the degree of tax compliance.

[60] Note that from expression [4], it is not possible to infer directly the percentage in the fiscal use of one or another price indicator, since p^R is expressed as a geometric mean of *MP* and *CV*. That percentage should be calculated employing the following formula: $CV / p^R = (CV/MP)^{\alpha}$ .This applies to all the rest of interpretations of the coefficients we will use.

Similarly, if we substitute by *CV* instead of by *MP*, expression [4] now becomes:

$$p^R = \left[CV^{\frac{1}{\delta}} W^{\frac{\delta-1}{\delta}} \right]^{\alpha} CV^{1-\alpha} = CV^{\frac{\alpha}{\delta}+(1-\alpha)} W^{\frac{\alpha(\delta-1)}{\delta}} \qquad [4'']$$

We will take for granted this relationship between the *CV* and the *MP*. Then, in order to avoid problems of colinearity between these two variables, we will employ each price indicator in a different regression, keeping constant the rest of the parameters of the models (*i.e.*, the proxies of q^R). Therefore, when we employ the *CV* as the real price indicator, we will obtain the following elasticity (from the estimation of expression [11], that we will later explain):

$$\hat{\varepsilon}_{p^D,CV} \equiv \hat{\beta}_{CV} = \theta\left[\frac{\alpha}{\delta} + (1-\alpha) \right] \qquad [5]$$

where we have assumed that the degree of tax compliance, θ, is independent of the assessment criterion; while, in contrast, when we use the MP,

$$\hat{\varepsilon}_{p^D,MP} \equiv \hat{\beta}_{MP} = \theta[\alpha + (1-\alpha)\delta] \qquad [6]$$

Thus, these two estimates permit us to obtain an estimate of δ, since combining both expressions, we have that $\hat{\delta} \equiv \frac{\hat{\beta}_{MP}}{\hat{\beta}_{CV}}$ [61]. Given $\hat{\delta}$, we cannot estimate point values of θ and of α, but a range for each one of them compatible with $\hat{\beta}_{MP}$ and with $\hat{\beta}_{CV}$. For instance, from expression [5], we have

$$\theta = \frac{\hat{\delta}}{\alpha + \hat{\delta}(1-\alpha)} \hat{\beta}_{CV} \qquad [7]$$

Hence, the estimated elasticity of the declared value of an asset with respect to any price

[61] According to the previously established relationship: $CV = W^{1-\delta} \times MP^{\delta}$, we can calculate the percentage of under-assessment expressed in linear terms, $(CV/MP) = (MP/W)^{\delta-1}$, which is not constant but evolves according to *MP*. Thus, given the estimate of δ, we have to calculate *W* for each year. To do so, we just use the following equality that must hold for each year: $W_t^{(1-\hat{\delta})(1-\alpha)} \times MP_t^{\alpha+\hat{\delta}(1-\alpha)} = W_t^{\left(\frac{\hat{\delta}-1}{\hat{\delta}}\right)\alpha} \times CV_t^{1-\alpha+\frac{\alpha}{\hat{\delta}}}$ (*i.e.*, expression [4'] and [4''] must be equal), from which we obtain $\hat{W}_t = \left[\frac{MP_t^{\hat{\beta}_{MP}}}{CV_t^{\hat{\beta}_{CV}}} \right]^{\frac{1}{\hat{\beta}_{MP}-\hat{\beta}_{CV}}}$, where recall $\hat{\beta}_{MP}$ and $\hat{\beta}_{CV}$ are the estimated elasticities of the declared value with respect to the market price and the cadastral value, respectively. Note that this procedure is no more than replicating the real CV/MP.

indicator does not have a direct interpretation, but depends on the value of α and of θ, which we do not know, although according to what we explained in section 3 the reasonable value of α should be close to zero. That is, according to [7], the most likely is that $\hat{\theta} \to \hat{\beta}_{CV}$. In general, if $\alpha = 1$ (maximum value), the degree of under-assessment is irrelevant, and we obtain the minimum (estimated) value of θ, $\hat{\beta}_{MP}$, while for $\alpha = 0$ (minimum value), we obtain the maximum value of θ, $\hat{\beta}_{CV}$. That is, $0 \le \hat{\beta}_{MP} \le \hat{\theta} \le \hat{\beta}_{CV} \le 1$, so we will be able to assure that there is tax incompliance only as long as $\hat{\beta}_{CV} < 1$. In any case, recall that this level of tax compliance is per unit of dwelling and given the value of the constant, *K*. This is what we call *marginal* tax compliance. Thus, even if we do not mention the adjective "marginal", we have to understand that this is the proper significance of the level of tax compliance we will talk about from now on. In section 5.4, from the results of the empirical analysis, we will also try to calculate the *absolute* levels of tax compliance, that is, taking into account the constant *K* and for the whole amount of dwellings per taxpayer.

Interestingly, given the relationship established by [7] between α and θ, and expression [4'] (or expression [4'']), we can infer the importance of each factor (marginal tax compliance and under-assessment) in the declared price, p^D, with respect to the real price (given a value of α):

$$\frac{p^D}{p^{R^*}} = \underbrace{\frac{MP^{\theta[\alpha+(1-\alpha)\hat{\delta}]} \times W^{\theta(1-\alpha)(1-\hat{\delta})}}{MP}}_{\text{Net Tax Compliance (\%)}} = \underbrace{\frac{MP^{\theta[\alpha+(1-\alpha)\hat{\delta}]} \times W^{\theta(1-\alpha)(1-\hat{\delta})}}{MP^{[\alpha+(1-\alpha)\hat{\delta}]} \times W^{(1-\alpha)(1-\hat{\delta})}}}_{\text{Gross Tax Compliance (\%)}} \times \underbrace{\frac{MP^{[\alpha+(1-\alpha)\hat{\delta}]} \times W^{(1-\alpha)(1-\hat{\delta})}}{MP^{[\alpha+(1-\alpha)]}}}_{\text{Under-assessment (\%)}} =$$

$$= \underbrace{MP^{(\theta-1)[\alpha+(1-\alpha)\hat{\delta}]} \times W^{(\theta-1)(1-\alpha)(1-\hat{\delta})}}_{\text{Gross Tax Compliance (\%)}} \times \underbrace{MP^{(1-\alpha)(\hat{\delta}-1)} \times W^{(1-\alpha)(1-\hat{\delta})}}_{\text{Under-assessment (\%)}} \qquad [8]$$

where p^{R^*} is the real price in absence of under-assessment and of tax incompliance[62]. We then calculate the importance of *gross* tax compliance comparing the obtained elasticity with that that would have been obtained for θ=1, but $\hat{\delta} < 1$; while the importance of under-assessment is similarly calculated, but keeping θ=1 in both cases, and comparing with respect to $\delta = 1$. We define the multiplication of the % of *gross* tax compliance and the % of under-assessment as the % of marginal *net* tax compliance. Thus, the percentage of *net* tax compliance evolves along time according to the evolution of both factors. In section 5.3.1, we will calculate expression [8]. In order to do it, among other exploitation of our empirical results, given the value of δ, we

[62] If we knew the value of α that legally should hold, α^*, and the one that is effectively applied we could also add another factor of decomposition, the % of fiscal underutilization of the market price. However, both real values are unknown to us (see also fn. 59).

will fix α (the parameter about which we can have *a priori* more information), which also implies a certain value of θ, and will analyze how *net* tax compliance and each of its factors evolve along time. In this way, our empirical framework will permit us to analyze to what extent the WT achieves taxing real tax capacity, and comparing the results with those obtained for equity shares to ascertain whether there is any difference in this achievement between both assets. Note that in order to know the level of net tax compliance is not necessary the above decomposition. However, it is obviously interesting to know it, since the design of the tax policy aimed at obtaining a higher level of net tax compliance depends on the importance of each factor. If gross tax compliance is predominant, a more severe tax auditing policy is needed, while if the degree of under-assessment is relatively more important an update of cadastral values (joint with a check of the proper use of α from the fiscal point of view) should be priority.

Nevertheless, this basic framework is not valid from 2000 onwards. As we already know from section 3, in 2000, the government introduced an exemption for the owner-occupied dwelling. In particular, the maximum amount to be deducted from the declared price was set at 161,148 euros (expressed in prices of 2002)[63]. *Ceteris paribus*, this fact can be interpreted as a change in the real price to be included in the regression in the following way:

$$p_{AE}^{R} = p^{O\lambda} p^{O\_1-\lambda} = \left\{CV^{(1-\alpha)\beta} E^{-(1-\alpha)\beta} MP^{\alpha\beta'} E^{-\alpha\beta'}\right\}^{\lambda} p^{O\_1-\lambda} \qquad [9]$$

where p_{AE}^{R} is the price after the introduction of the exemption, p^{O} is the price of the owner-occupied dwelling and p^{O-} is the price of the rest of dwellings. The definition of the price of both kinds of dwellings follows the pattern already established by means of expression [4]. We distinguish between p^{O} and p^{O-}, as recall the exemption only applies to the former dwellings. Thus, p^{R} only changes with respect to the share of owner-occupied dwellings, λ. The exemption makes that all those dwellings below the maximum monetary amount of the exemption, *E*, are not taxed at all, while the rest are taxed according to the *net* price, *CV*/*E* or *MP*/*E*, depending on the criteria of assessment. Then, in expression [9], β is the % of those dwellings assessed according to the CV (see fn. 60) that apply 100% of the exemption (*i.e.*, their price is above *E*), while β' has the same interpretation but for those dwellings assessed according to the MP.

[63] In real terms, the value of the (maximum) exemption has decreased, since the initial value expressed in nominal terms has not been indexed according to the inflation rate. That is why, in 2001 the maximum amount of the exemption was 155,572 euros, and in 2002 it was 150,253 euros. All amounts are also expressed in euros of 2002.

Hence, the fiscal impact of the exemption on p^R is the following:

$$\frac{p^R_{AE}}{p^R_{BE}} = \frac{p^{O^\lambda}_{AE} \times p^{O_-{}^{1-\lambda}}}{p^{O^\lambda}_{BE} \times p^{O_-{}^{1-\lambda}}} = \frac{CV^{(1-\alpha)\beta\lambda} E^{-(1-\alpha)\beta\lambda}}{CV^{(1-\alpha)\beta\lambda} CV^{(1-\alpha)(1-\beta)\lambda}} \times \frac{MP^{\alpha\beta'\lambda} E^{-\alpha\beta'\lambda}}{MP^{\alpha\beta'\lambda} MP^{\alpha(1-\beta')\lambda}} = CV^{(1-\alpha)\lambda(\beta-1)} MP^{\alpha\lambda(\beta'-1)} E^{-\lambda[(1-\alpha)\beta+\alpha\beta']}$$

[10]

where p^R_{BE} is the price before the introduction of the exemption. Thus, *a priori* the exemption has a level effect through *E*, but also an effect on the elasticity through affecting the slope of p^R. However, given that β and β' are probably very small, we expect the latter to dominate the former. The effect of the exemption can also be expressed in terms of the MP:

$$\frac{p^R_{AE}}{p^R_{BE}} = MP^{\lambda\{(1-\alpha)\delta(\beta-1)+\alpha(\beta'-1)\}} V^{-\lambda\{(\delta-1)(1-\alpha)(\beta-1)\}} E^{-\lambda[(1-\alpha)\beta+\alpha\beta']} \qquad [10']$$

where *V* is the parameter that relates the CV and the MP of those owner-occupied dwellings that do not fully apply the exemption, and which account for $\lambda[(1-\alpha)(\beta-1)+\alpha(\beta'-1)]$ of total dwellings declared in the WT[64]; in terms of the CV:

$$\frac{p^R_{AE}}{p^R_{BE}} = CV^{\frac{\lambda}{\delta}\{(1-\alpha)\delta(\beta-1)+\alpha(\beta'-1)\}} V^{\frac{\lambda}{\delta}\{(\delta-1)\alpha(\beta'-1)\}} E^{-\lambda[(1-\alpha)\beta+\alpha\beta']} \qquad [10'']$$

Expressions [10'] and [10''] should be equal. In order to get such equality, we must obtain the parameter *V*, just as we did when in absence of the exemption, we calculated *W* (see fn. 61), which is crucial in order to develop the decomposition established in expression [8]. Now the calculus of *V* will be crucial to infer the estimated impact of the exemption on tax collection. In order to calculate *V*, we suppose $\beta = \beta' = 0$.

On the whole, regarding housing, the basic model we will estimate is the following:

$$\log\left(p^D_t q^D_t\right) = \beta_1 \log p^R_t + \left(\beta_2 \times D_{\geq 2000}\right) \times \log p^R_t + \left(\beta_3 \times D_{\leq 1986}\right) \times \log p^R_t + \\ + \beta_4 \log GDP_t + \beta_5 \log i^S_t + K + u_t \qquad [11]$$

where $D_{\geq 2000}$ is a dummy equal to 1 for the year 2000 onwards in order to control for the exemption of the owner-occupied dwelling (expression [10'] or [10'']), while the dummy $D_{\leq 1986}$ controls for the hypothetical lower incentive of the tax administration to force tax

[64] Therefore, the value of δ (and in comparison with *W*, that of the constant *V* in [10'] and [10'']) that appears in expression [10] is not necessarily the same than that in expressions [5] or [6].

compliance due to the 100% "tax on tax revenue" before 1988; *GDP* controls for income and i^S is a short term interest rate, in particular, the most common one year interest rate used for the mortgages, which is so-called MIBOR. We expect $\beta_1 \geq 0$, $\beta_2 \leq 0$, $\beta_3 \leq 0$, $\beta_4 \geq 0$ and $\beta_5 \leq 0$. As we have shown before, from the combination of the estimates of the elasticity of declared values with respect to p^R, we will be able to obtain an estimate of the degree of under-assessment and of the level of marginal tax compliance depending on the degree of utilization of each price according to the fiscal legislation.

5.1.2. Equity shares

The price used to assess those equity shares traded in organized markets is their average official MP for the last three months of the year. We will employ the official MP which is available for the longest period of time, in particular, the Madrid Stock Index (in Spanish, "Índice General de la Bolsa de Madrid", IGBM). Then, in the case of equity shares, the equation we will estimate is the following:

$$p_t^D q_t^D = \left(IGBM_t \times q_t^R\right)^{\theta} \times e^K \times e^{\mu_t} \qquad [12]$$

The elasticity we will estimate with respect to IGBM will be interpreted as marginal tax compliance[65].

In contrast with housing, there is some additional specificity related with the fact that the price is expressed as an index, and not as euros per asset. Thus, in a similar way to expression [8], marginal tax compliance is calculated as:

$$\frac{p^D}{p^{R*}} = \left(\frac{IGBM_t}{IGBM_0}\right)^{\theta-1} = \underbrace{IGBM_t{}^{\theta-1}}_{Tax\ Compliance\ (\%)} \times IGBM_0{}^{1-\theta} \qquad [13]$$

That is, we will have to multiply the value of the ration by $IGBM_0{}^{\theta-1}$, where *IGBM0* is the MP in the base year, 1983. Unfortunately, we do not have that value, although we can provide a relatively reasonable range for it. In order to obtain that reasonable value, we proceed as follows. We look for the current MP of those firms which MP is considered to obtain the IGBM. Then, comparing the current index price of those firms (about 1,580) with that in the last

[65] We also run a regression using another stock market index, so-called IBEX-35. This index is supposed to be more selective in the choice of the firms included, as it includes the 35 largest Spanish corporations. However, during the analyzed period the evolution of both indexes has not differed much. Hence, there is not a clear presumption about which one is a more precise indicator for the shares owned by top 1%, and so in the case of equity shares we cannot disentangle tax compliance from under-assessment, if this latter factor is present. Therefore, we decided to work with IGBM, since IBEX-35 is only available from 1990.

trimester of 1983 (about 122), we are able to obtain a MP expressed in 2002 euros for all those firms that are currently taken into account in order to calculate the IGBM. This is simply an approximation, as some of the businesses included in the calculus of the index were not included in the index calculated in 1983. Operating in this way, we obtain that the average MP in 1983 were 5.52€ (or 5.45€, if we calculate a weighted average using the weights attached to each firm in the calculus of the index), expressed in 2002 euros. We will use this value as a reference in order to obtain a reasonable range of values for tax compliance in the case of equity shares.

On the whole, in the case of equity shares, the basic model we will estimate is the following:

$$\log\left(p_t^D q_t^D\right) = \beta_1 \log IGBM_t + \left(\beta_2 \times D_{\leq 1986}\right) \times \log IGBM_t + D_{\geq 1994} + \\ + \beta_3 \log GDP_t + \beta_4 \log i_t^L + K + u_t \qquad [14]$$

GDP controls for income and i^L for a long term interest rate as proxy of the relative profitability of investing in equity shares, while again $D_{\leq 1986}$ is a dummy variable to control for the supposed lower incentives of the AC's to force tax compliance before 1988. We expect $\beta_1 \geq 0$, $\beta_2 \leq 0$, $\beta_3 \geq 0$ and $\beta_4 \leq 0$. In 1994, the government introduced an exemption for family business without any limit, but subject to certain conditions (sees fn. 32). Thus, given that there is not any limit in the value of this exemption, its inclusion will be easier than in the case of housing, and will be controlled just by means of a dummy from 1994 onwards, $D_{\geq 1994}$, which sign we obviously expect to be negative. In 1997, a 95% deduction was also introduced in the Inheritance and Gift Tax (IGT), which conditions were similar to those established in the WT. We will also test whether this new deduction generates a cross-effect between the IGT and the WT.

5.2. Data

Reported wealth is based on taxpayer's returns. Data are gathered into several intervals and published each year by the Ministry of Finance in the "Memoria de la Administración Tributaria".

In section 4, we obtained an upper and a lower bound of total declared wealth for top 1%. Then, in absence of a clear-cut theory regarding the pattern of wealth composition by levels of wealth, we performed a simple linear interpolation to calculate the wealth composition of that percentile. Those values will be our endogenous variables in the empirical analysis. In

particular, on the one hand, we will regress housing wealth (only urban dwellings), and on the other hand, we will do the same for equity shares, differentiating between the total monetary amount of equity shares and only of those traded in organized markets, since only for the latter we have been able to obtain a reliable price indicator.

In order to analyze the evolution of reported values, we will the make use of the following exogenous variables, which source is external to the fiscal database:

- Value of dwellings: on the one hand, the market price (MP) has been obtained from the Spanish Ministry responsible for Public Works ("Ministerio de Fomento")[66]. The statistics also offer information for capitals and for exclusive areas of the big cities (from zone 1, where prices are the highest to zone 4, where prices are the lowest). Data are only available since 1987. On the other hand, the Cadastral Value (CV), which is available for the whole period, is assessed by a national agency (so-called "Dirección General del Catastro") for the property tax, but it is well below the market value. In the official statistics, the CV is expressed per urban unit, while the MP is expressed by square meter. That is why, we have multiplied each year the latter by 125 square meters, in such a way that the absolute values of the resulting MP per urban unit are equal to those employed by García-Vaquero and Martínez (2005).

- Index of publicly traded shares: it is obtained from the general index of the Stock Market of Madrid (IGBM). We calculate its value for each year by applying the wealth tax criterion of assessment, that is, the average value of its MP for the last three months of the year.

- Other data: data about the National Gross Domestic Product (having excluded the Basque Country and Navarra, since the endogenous variable does not include the declared wealth of those regions) and consumer prices (necessary to transform monetary amounts expressed in nominal terms into real terms) have been obtained from the Spanish Statistical Institute (INE). As short term interest rate we use the so-called MIBOR, the most common index of reference for the mortgage market; while as long term interest rate we employ the interest rate of Public Debt for a period between three and six years. Both indexes are annually published by the Bank of Spain.

[66] Those market values are obtained from the assessments carried out by the financial entities – through a corresponding expert valuation - in order to set the maximum value of a mortgage. That is why, we expect those values to be upward biased. The full report of the Ministry of Public Works can be downloaded from: http://www.fomento.es/NR/rdonlyres/F401ADD0-1B62-4FFB-BD5E-AEEE43379DC4/3693/ivivienda.pdf (last accessed 2/21/2007).

In Table 7, we show the main descriptive statistics of the data employed in the empirical analysis. As we can check, those equity shares traded in organized markets represent on average about 35% of total equity shares. Regarding CV, on average this is 22.33% of the average MP, but only 10% of the price of those dwellings in the most exclusive areas of Barcelona and Madrid. Obviously, this latter comparison is not fully correct, as we should also have the average of the CV in those areas in order to offer a proper comparison.

Table 7. Descriptive Statistics

	Average	Max	Min	Standard deviation
Interpolated Wealth per adult (Top 1%)				
R-LB (Dwellings)	215,850	245,875	179,137	20,501
R-UB (Dwellings)	217,847	246,810	179,142	21,317
R-LB (Total Equity Shares)	173,271	218,942	140,902	22,851
R-UB (Total Equity Shares)	174,818	219,418	141,490	23,006
R-LB (Equity Shares traded in organized markets)	60,194	108,058	30,301	23,810
R-UB (Equity Shares traded in organized markets)	60,620	108,062	30,427	23,659
Real Estate Price				
CV (per urban unit)	24,476	36,299	15,478	5,787
Market price (p.u.u.)*	108,687	152,616	74,693	18,144
Market price (capitals) (p.u.u.)*	134,470	216,344	82,377	29,564
Market price (BCN & Mad, zones 1&2) (p.u.u.)*	222,328	327,307	129,749	45,011
Market price (BCN & Mad, most exclusive zones: 1) (p.u.u.)*	244,073	355,284	144,251	48,903
Equity Shares Index				
IGBM (Madrid Stock Exchange index)	165.055	327.120	87.970	75.896
Proxies of Propensity to Save				
Interest rate (short run) (%)	6.840	13.664	0.431	4.201
Interest rate (long run) (%)	5.925	10.310	0.428	3.308
GDP	13,309	17,801	9,615	2,541

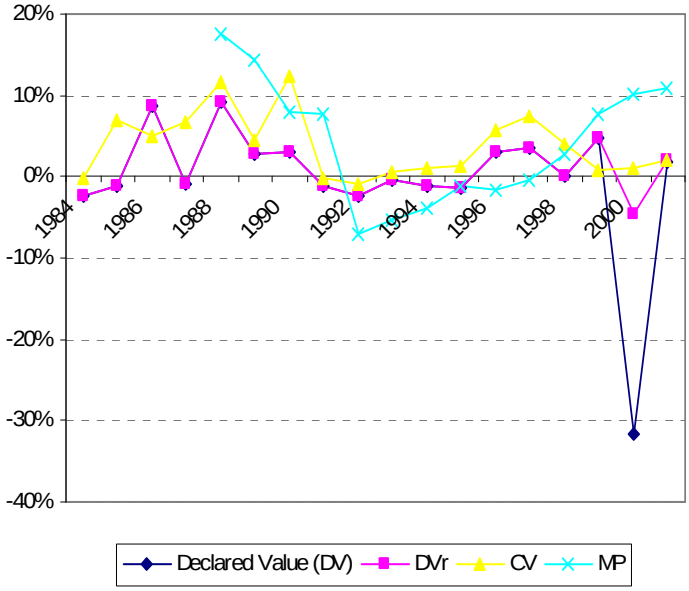
Note: Monetary amounts are expressed in 2002 euros.

*: only available since 1987

5.3. Results

We have carried out the empirical analysis for housing (section 5.3.1) and for equity shares (section 5.3.2) employing as endogenous variable the amount of wealth obtained both from the refined lower and upper bounds in section 4. However, the resulting empirical results from both interpolated values are almost identical. That is why, we will usually only comment those obtained from the Refined Lower Bound (R-LB), although we will also show the results from the Refined Upper Bound (R-UB).

Graph 9: Evolution of Declared Values of Housing (1984-2001): Cadastral Value *vs.* Market Price



Note: the percentages of real annual variations are log points (that is, *e.g.*, the series of the MP is calculated as $\log MP_{t+1}$-$\log MP_t$). The DV are calculated using the R-LB. The impact of the exemption – which is obtained using expression [10'] – permits us to obtain a corrected series of the declared values (DVr). Once we assume $\beta = \beta' = 0$, the impact of the exemption is equal to $MP^{\hat{\beta}_2} V^{\frac{\hat{\beta}_2(1-\alpha)(1-\hat{\delta})}{(1-\alpha)\delta+\alpha}}$, where $\hat{\beta}_2$ is the estimated elasticity that accounts for the exemption in expression [11] when we use the MP. Therefore, the impact depends on α, while *V* was calculated following a procedure similar to that explained in fn. (61). The greater the value of α, the greater the impact of the exemption. In the graph, we have assumed α =0.075, which approximately corresponds with a percentage of fiscal use of the MP equal to 10%. In fact, for low values of α, the quantification of the exemption does not vary much.

5.3.1. Housing

Before commenting the results of the empirical analysis, in Graph 9 we show the temporal evolution of the average declared value of top 1% from the results of the R-LB *vs.* both price indicators (CV and MP). All percentage values are expressed as annual (log) variation rates. In 2000, the declared value shows an important fall, which (to a great extent) must be due to the introduction of the exemption of the owner-occupied dwelling. In the empirical analysis, we control for this fact as we justified in section 5.1.1. (see expression [11]). That is why, in the graph we have also included a new series of the declared value (DVr) having used the estimates of the empirical analysis to correct the original series. Even after having controlled for the impact of the exemption, the declared value shows a moderate estimated decrease in 2000 (-4.5%). The increase of the declared values in 1999 (above the increase in the CV, which is very abnormal according to what we observe in the graph for the whole period) could be due to an increase in the use of the MP in the WT as assessment criterion. This makes sense, since at that moment the prices in the housing market started a sharp increase, in part, due to an increasing demand of new houses (Rodríguez, 2006). Then, the corrected series of the declared value in Graph 9 should be interpreted as a conservative estimate of the impact of the exemption, as we have calculated it supposing the fiscal use of the MP is 10%. If we suppose that since then on the MP is used more often, the estimated impact of the exemption is greater, and so declared values should not have necessarily decreased (see the note of the graph).

During the period 1992-1998, we can see that the CV increases above the MP, which permits to reduce a little the degree of under-assessment. In 1998, the level of under-assessment (CV/MP) is the minimum of the period, 29.53%, while the maximum level is achieved right before that period. In 1991, it is 20.59%. In any case, we can easily observe that the declared value follows very closely the path of the CV, while the MP is always well above or below the variations in the declared value. This is coherent with the (supposedly) massive use of the CV as price indicator in the WT. In any case, note that the variation of the declared values cannot only be due to variations in the price of the asset, but also to changes in the decision to acquire a dwelling. We will try to control for that fact in the (multivariate) regression analysis, which we comment next.

In Table 8, we show the results for housing when we use the CV as the price indicator[67]. Model 1 estimates the basic model established in expression [11]. All the estimates have the foreseen

[67] We have restricted our period of analysis to 1983-2001, since the inclusion of 2002 distorted very much our results; while in the equation where we use the MP recall we are restricted to the period 1987-2001, since that variable is only available since 1987.

sign, with the exception of the short run interest rate and the GDP. However, most of the estimates are statistically insignificant, which may be due in part to the correlation among the variables, which show an important trending component. In Model 2, we try to isolate the trending effect by means of including a time trend, which is statistically significant[68]. However, the problem of colinearity among the variables does not seem to be completely solved. That is why, we test the possibility of excluding some variables of Model 2 by means of a log-likelihood ratio test, and obtain a new basic model, Model 3. In Model 3, all the variables have the expected sign, once we accept the exclusion of the variable that controlled for the level of income, *GDP*. The elasticity of CV – which recall establishes the maximum level of tax compliance - is 0.678. This is the basic result of our empirical analysis that we will later use to assess the effectiveness of this tax to levy real estate property. However, before 1988 it was slightly lower due to the disincentives to force tax compliance, 0.662 (*i.e.*, 0.678-0.016)[69], although the most important change in the elasticity occurred in 2000 due to the introduction of the exemption of the owner-occupied dwelling, when it decreased up to 0.602 (*i.e.*, 0.678-0.076). An increase of one percent in the short term interest rate decreases the accumulation of real estate property in 0.029%, while *ceteris paribus* the amount of declared real estate property shows a declining trend. The residuals of the original estimation of Model 3 show second-order serial correlation, so we estimate a transformed version of that model using nonlinear regression techniques, where AR(1) and AR(2) are the first and second-order serial correlation coefficients, respectively.

Next, we have tried alternative specifications to Model 3, but none of them is preferred to Model 3 once we use a log-likelihood ratio test to compare the significance of nested models (*i.e.*, Model 3 *vs.* the corresponding alternative). In Model 4, we test the possibility that the exemption also has a level effect. In Model 5, we have included a lag of the endogenous variable. In Model 6, we have tested the possibility that the decision to invest in housing – as long as housing can be considered as an investment asset – is affected by the profitability of alternative investments, in particular, equity shares (the expected sign is then negative). The (lagged) value of the stock price index (IGBM) is also statistically insignificant. Finally, in Model 7, we test the possibility that the exemption for family business had an effect on the declared value of housing. The hypothesis behind this test is the fact that some taxpayers could have reorganized their investment in housing in order to take advantage of the exemption. Then, regarding this possibility, we would expect a negative sign. However, even having introduced

[68] We also tried the inclusion of a squared time trend, but it was not statistically significant.

[69] We also introduced a dummy to control for a level effect due to the change of the tax unit. However, the estimate of the dummy was not statistically significant, and so we were not able to accept its inclusion in any model. Then, the estimate of the impact of the "tax on tax revenue" is probably also picking up the effect of the change of the tax unit.

one and two year ahead dummies (not shown in Table 8), once we recognize the possibility of transaction costs, that effect is not statistically significant either.

Table 8

Table 9

In Table 9, we present the results when we use MP as the price indicator for housing. None of the alternative hypotheses tested in Table 8 is accepted either, so Model 3 is still the preferred one. However, in contrast when we use the CV, in that model we include the GDP as a control variable instead of the short term interest rate. The elasticity of the MP is very low, 10%, and statistically significant only at 90%, and almost null once we take into account the exemption from 2000 onwards, 0.028 (0.1-0.072). As expected, when we include market prices that are probably closer to the real prices of top 1% (Model 2b to Model 2d), the elasticity is logically even lower. However, given that we aim at working with the results of Table 8, where we have an *average* CV, from now on we will keep using the results of Model 3 in Table 9. In Table 10 and Table 11, we offer the results obtained for the R-UB.

Table 10

Table 11

In Table 12, we offer the first exploitation of the results of our empirical analysis. As we already know from section 5.1.1., from the estimates of CV and MP, we can infer the parameter δ, which accounts for the degree of under-assessment of CV with respect to the MP. For instance, from models 3 (Table 8 and Table 9), this value is equal to 0.1475 (*i.e.*, 0.1/0.678). However, this value is not immediately interpretable, as we still have to calculate the constant *W* in the expression $CV = W^{1-\delta} \times MP^{\delta}$, which is different for each year (see fn. 61). However, once we have an annual point value for that ration, we cannot be sure about the rest of parameters that are part of the elasticity of CV or of MP, and so the estimated elasticities do not have a direct interpretation. Then, according to expression [7], we can only interpret those elasticities ($\hat{\beta}_{CV} = 0.678$ and $\hat{\beta}_{MP} = 0.1$), from a combination of the maximum and minimum values of θ and α. This is precisely shown in Table 12.

Table 12: Maximum and Minimum Estimated Values of Marginal Net Tax Compliance Disaggregated into Gross Tax Compliance and Under-assessment (1987-2001)

	Refined Lower Bound (R-LB)						*Refined Upper Bound* (R-UB)					
	NTC-M	GTC-M	UA-m	NTC-m	GTC-m	UA-M	NTC-M	GTC-M	UA-m	NTC-m	GTC-m	UA-M
1987	9.74%	38.96%	25.01%	2.06%	2.06%	100%	10.75%	42.98%	25.01%	3.03%	3.03%	100%
1988	8.83%	37.54%	23.52%	1.76%	1.76%	100%	9.78%	41.57%	23.52%	2.62%	2.62%	100%
1989	7.88%	37.01%	21.30%	1.55%	1.55%	100%	5.79%	41.04%	21.30%	1.55%	2.33%	100%
1990	7.91%	35.56%	22.26%	1.44%	1.44%	100%	5.79%	39.60%	22.26%	1.44%	2.19%	100%
1991	7.33%	35.59%	20.59%	1.34%	1.34%	100%	5.33%	39.62%	20.59%	1.34%	2.06%	100%
1992	7.82%	35.68%	21.92%	1.43%	1.43%	100%	5.72%	39.72%	21.92%	1.43%	2.18%	100%
1993	8.27%	35.62%	23.22%	1.50%	1.50%	100%	6.08%	39.66%	23.22%	1.50%	2.27%	100%
1994	8.67%	35.49%	24.43%	1.56%	1.56%	100%	6.40%	39.53%	24.43%	1.56%	2.35%	100%
1995	8.86%	35.33%	25.06%	1.57%	1.57%	100%	6.54%	39.37%	25.06%	1.57%	2.37%	100%
1996	9.35%	34.69%	26.96%	1.59%	1.59%	100%	6.94%	38.73%	26.96%	1.59%	2.40%	100%
1997	9.88%	33.87%	29.18%	1.60%	1.60%	100%	7.35%	37.91%	29.18%	1.60%	2.41%	100%
1998	9.88%	33.44%	29.53%	1.56%	1.56%	100%	7.34%	37.48%	29.53%	1.56%	2.36%	100%
1999	9.19%	33.36%	27.54%	1.46%	1.46%	100%	6.78%	37.40%	27.54%	1.46%	2.21%	100%
2000	8.35%	33.26%	25.11%	1.33%	1.33%	100%	6.11%	37.29%	25.11%	1.33%	2.04%	100%
2001	7.60%	33.03%	23.02%	1.21%	1.21%	100%	5.51%	37.07%	23.02%	1.21%	1.87%	100%

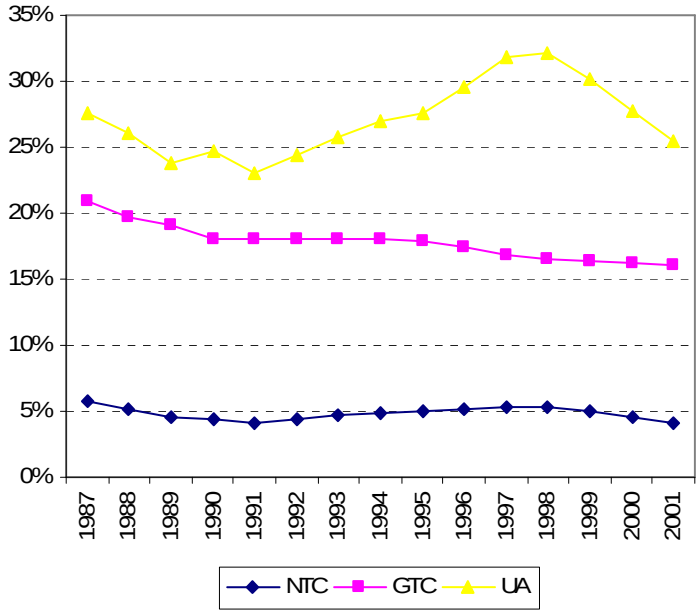
Note: NTC-M & NTC-m: maximum and minimum percentage of net tax compliance, respectively; GTC-M & GTC-m: maximum and minimum percentage of gross tax compliance, resp.; and UA-M and UA-m: maximum and minimum percentage of under-assessment, resp. All those percentages have been calculated using expression [8]. For each year the maximum value of net tax compliance has been obtained for $\theta = \hat{\beta}_{VC}$ (maximum value of gross tax compliance) and $\alpha = 0$, while for the minimum, $\theta = \hat{\beta}_{MP}$ (minimum value of gross tax compliance) and $\alpha = 1$.

Probably, the most reasonable values are those closer to the maximum level of tax compliance, since we expect the degree of utilization of the MP to be very low. That is why, we will focus our comments on the maximum values of net tax compliance. For instance, regarding those values obtained by means of the R-LB, in 2001, if $\alpha = 0$, net tax compliance is equal to 7.60%, and the most important negative factor is the degree of under-assessment (23.02%) which value is obviously coincident with the ratio CV/MP for that year[70], while the estimated level of gross tax compliance is 33.03%. The level of net tax compliance is extremely low. However, probably even more important, since in fact the level of net compliance is affected in part by legal decisions (both regarding α and regarding δ), is that along time the (maximum) percentage of gross tax compliance is decreasing with the exception of years 1991 and 1992. On the contrary, the level of net compliance does not linearly decrease along time due to the fact that the percentage of the degree of under-assessment shows a more irregular evolution that in some occasions tends to compensate the negative evolution of gross tax compliance. The values of R-

[70] When α=0, we obtain then the average degree of under-assessment, while for higher values of α, we obtain the effective degree of under-assessment, that is, rectified taking into account that some dwellings are assessed according to the MP. This latter definition of under-assessment is the one we obtain in the decomposition of net tax compliance.

UB are slightly higher than those obtained under the R-LB, although the main conclusions do not change.

Graph 10: Decomposition of Marginal Net Tax Compliance (1987-2001)



Note: Those series are constructed using expression [8] in the main text, from the values obtained from the R-LB, and supposing that the percentage of fiscal use of the MP is 10%.

In Graph 10, we show the evolution of the decomposition of marginal net tax compliance when we consider that the average use of the MP in fiscal terms during 1987-2001 is 10%, and from the values of the R-LB. Gross tax compliance shows the decreasing trend previously commented. This makes that in those years where the problem of under-assessment is (very slightly) mitigated, period 1992 to 1998, the level of net tax compliance does not decrease much or even increases a little bit. From 1998, both the level of gross tax compliance and the degree of under-assessment go in the same direction, that is, towards lowering net tax compliance.

The result regarding the temporal evolution of gross tax compliance is robust, since it does not depend on the value of α. However, its value is very sensitive to the value of α (very especially for low values of α), as we can check from Table 13 and from

Our empirical analysis has also permitted to obtain an estimate of the impact of the exemption of the owner-occupied dwelling for 2000 and 2001 (Table 14), and of the disincentives to force tax compliance before 1987 (Table 15). The parameterization of the former effect is not easy. From expression [10'] (or expression [10'']), we know that first we need to calculate V, which we do in a similar way to the case where the exemption is absent (see fn. 61). Once we have this

value, and working again with expression [10'] (or expression [10''']), the impact of the exemption depends on the value of α (see note of Graph 9). That is why, in Table 14, we show a maximum ($\alpha = 50\%$) and minimum ($\alpha = 10\%$) impact of the exemption depending on the fiscal use of the MP. Lower or higher (average) values of α for the years 2000 onwards are probably not reasonable. In any case, the differences in the estimated impact of the exemption depending on α are not too great. In all cases, the average impact of the exemption for top 1% is well above the maximum value of the exemption (see fn. 63), which is consistent with having supposed that $\beta = \beta' = 0$. They all are about 35% of that value. In parenthesis, we show the effective subsidy rate for owner-occupied dwellings (i.e., the value of the exemption divided by the gross estimated value of housing).

Graph 11. Thus, if we suppose the most reasonable value of α is 0%, the level of gross tax compliance is between 39% and 33% during the period, while if consider as more reasonable a value of α equal to 10%, the level of gross tax compliance is between 21% and 16%. Despite this ambiguity, the values can be regarded as extremely low, which is even more serious once we take into account the unambiguously decreasing trend we observe in all cases.

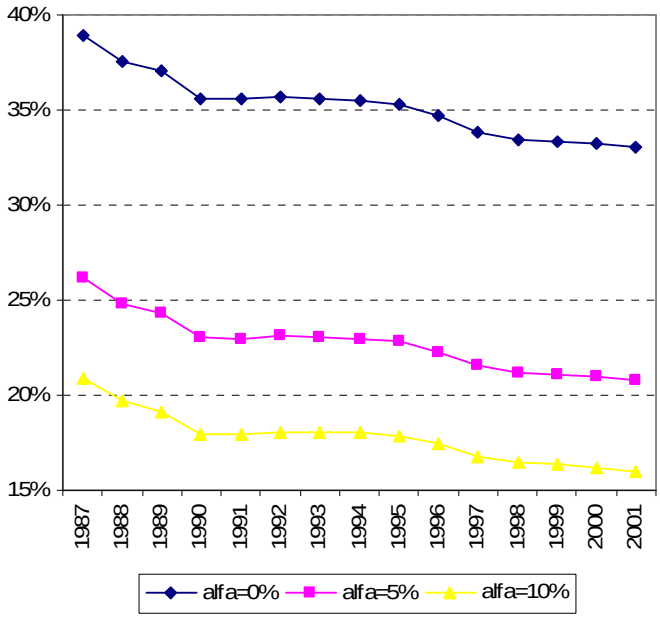
Table 13: Decomposition of Net Tax Compliance (1987-2001), for Different Levels of Use of the Market Price as Criterion Assessment

	Use of the market price=10%			Use of the market price=5%		
Year	% Net Tax Compliance	% Gross Tax Compliance	% Under-assessment	% Net Tax Compliance	% Gross Tax Compliance	% Under-assessment
1987	5.76%	20.92%	27.55%	7.07%	26.85%	26.32%
1988	5.12%	19.67%	26.03%	6.19%	24.83%	24.93%
1989	4.55%	19.15%	23.73%	5.51%	24.30%	22.66%
1990	4.45%	17.99%	24.73%	5.44%	23.00%	23.64%
1991	4.13%	17.96%	22.99%	5.04%	22.99%	21.93%
1992	4.41%	18.07%	24.38%	5.38%	23.10%	23.29%
1993	4.65%	18.07%	25.72%	5.68%	23.07%	24.62%
1994	4.85%	17.99%	26.97%	5.94%	22.98%	25.85%
1995	4.94%	17.88%	27.61%	6.05%	22.84%	26.49%
1996	5.15%	17.41%	29.55%	6.34%	22.30%	28.41%
1997	5.34%	16.80%	31.80%	6.62%	21.59%	30.65%
1998	5.30%	16.46%	32.17%	6.58%	21.21%	31.01%
1999	4.93%	16.36%	30.14%	6.12%	21.12%	28.99%
2000	4.49%	16.23%	27.66%	5.57%	20.99%	26.53%
2001	4.08%	16.00%	25.51%	5.07%	20.76%	24.41%
Average	4.81%	17.80%	27.10%	5.91%	22.80%	25.98%
Standard Deviation	0.48%	1.36%	2.81%	0.59%	1.64%	2.78%

Note: Series are constructed using expression [8] in the main text, from the values obtained from the R-LB.

Our empirical analysis has also permitted to obtain an estimate of the impact of the exemption of the owner-occupied dwelling for 2000 and 2001 (Table 14), and of the disincentives to force tax compliance before 1987 (Table 15). The parameterization of the former effect is not easy. From expression [10'] (or expression [10'']), we know that first we need to calculate *V*, which we do in a similar way to the case where the exemption is absent (see fn. 61). Once we have this value, and working again with expression [10'] (or expression [10'']), the impact of the exemption depends on the value of α (see note of Graph 9). That is why, in Table 14, we show a maximum ($\alpha = 50\%$) and minimum ($\alpha = 10\%$) impact of the exemption depending on the fiscal use of the MP. Lower or higher (average) values of α for the years 2000 onwards are probably not reasonable. In any case, the differences in the estimated impact of the exemption depending on α are not too great. In all cases, the average impact of the exemption for top 1% is well above the maximum value of the exemption (see fn. 63), which is consistent with having supposed that $\beta = \beta' = 0$. They all are about 35% of that value. In parenthesis, we show the effective subsidy rate for owner-occupied dwellings (*i.e.*, the value of the exemption divided by the gross estimated value of housing).

Graph 11: Gross Tax Compliance Depending on the Fiscal Use of the Market Price (1987-2001)



Note: see Table 13.

Table 14: Estimated Impact of the Owner-Occupied Dwelling Exemption (2000-01)

	Refined-Lower Bound (R-LB)		*Refined-Upper Bound* (R-UB)	
	Minimum (α=10%)	**Maximum (α=50%)**	**Minimum (α=10%)**	**Maximum (α=50%)**
2000	54,729€ (23.40%)	60,804€ (25.34%)	51,078€ (22.19%)	58,535€ (24.63%)
2001	56,248€ (23.56%)	62,901€ (25.63%)	52,494€ (22.34%)	60,552€ (24.91%)

Note: 2002 euros

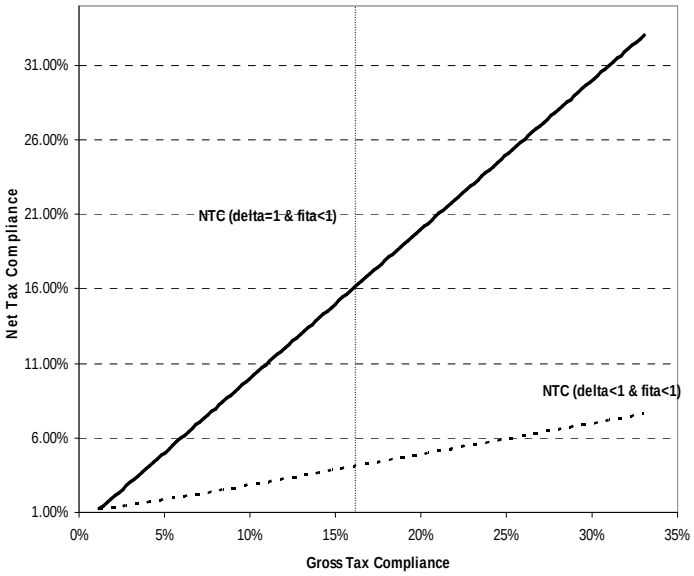
The effects of the disincentives to force tax compliance before 1987 are much more modest. We have not been able to test those effects from the equation using the MP, since this variable is only available from 1987. In this sense, their estimation is easier and can be directly calculated from Model 3 in Table 8 (R-LB) and in Table 10 (R-UB). In both cases, the impact is simply $CV^{\hat{\beta}_3}$, where $\hat{\beta}_3$ is the estimated negative difference in the value of the elasticity between pre-1987 and the rest of the period (see expression [11]). In parenthesis, we show the percentage reduction in tax revenue collected.

Table 15: Housing: Estimated Impact of the "Tax on Tax Revenue" (1983-1986)

	Refined-Lower Bound (R-LB)	*Refined-Upper Bound* (R-UB)
1983	8,659 (4.29%)	4,300 (2.17%)
1984	8,452 (4.29%)	4,219 (2.17%)
1985	8,578 (4.40%)	4,256 (2.22%)
1986	9,523 (4.47%)	4,741 (2.26%)

Note: 2002 euros

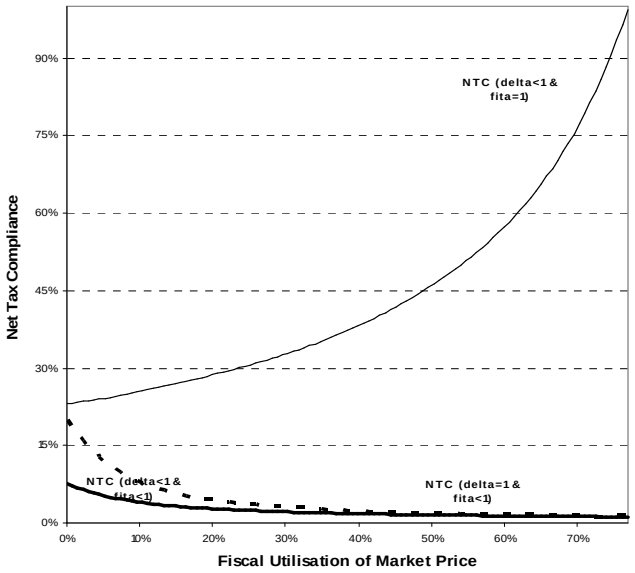
Graph 12: Simulated Effect on Net Tax Compliance of a full update of cadastral values: How Much Does the Profitability of Tax Auditing Change?



Note: the dotted line is the original one, where gross tax compliance (GTC) and net tax compliance (NTC) are calculated using expression [8]. If $\delta = 1$, NTC=GTC, and the procedure to obtain it is explained in the note of Graph 13.

Finally, in Graph 12 and Graph 13, we show the results of different tax policies with respect to their effect on the level of net tax compliance, from the results of the R-LB and for year 2001. In Graph 12, we simulate the effect on net tax compliance of a full update of cadastral values, that is, setting $\delta = 1$ keeping constant the rest of the parameters (compatible with the estimated elasticities, $\hat{\beta}$). Obviously, for $\delta = 1$, there is no difference between gross and net tax compliance. If we consider that a reasonable value of gross tax compliance is 16% (*i.e.*, the percentage of fiscal use of the MP is about 10%), that change in the degree of under-assessment would dramatically increase the profitability of conducting a tax auditing regarding real estate property, from 21% till 100% (*i.e.*, in what percentage increases NTC in front of a 100% increase in GTC).

Graph 13: Simulated Effect on Net Tax Compliance of Alternative Policies: Full Update of Cadastral values *vs.* Full Tax Compliance



Note: The thicker line is the original one. If $\delta = 1$ (dotted line), net tax compliance (NTC) is calculated as $MP^{\left\{\frac{\hat{\beta}_{MP}}{\alpha+(1-\alpha)\delta}-1\right\}}$, where δ is the original value of delta. In this way, and using expression [8], we get the new value of NTC keeping the rest of parameters constant. Similarly, for $\theta = 1$, NTC is calculated as $\left(\frac{MP}{W}\right)^{(1-\alpha)(\delta-1)}$.

In Graph 13, we simulate again a full update of cadastral values. Obviously, the advantage of that policy cancels out the more the use of the MP. However, given a level of gross tax compliance, for low levels of α, that reform more than doubles the level of net tax compliance. In contrast, if we do not update cadastral values but follow a policy of guaranteeing 100% gross tax compliance – as long as it were possible – we see that the level of net tax compliance is increasing in the use of the MP and for $\alpha = 1$ we achieve a level of net tax compliance of 100%.

On the whole, from the analysis of real estate property declared in the WT, we can conclude that the performance of the tax is very poor in the sense that it does not achieve taxing real tax capacity (*i.e.*, the level of net tax compliance is very low). This is due both to a very low level of (gross) tax compliance, but also to the fact that the real estates are very poorly assessed. This second factor – which throughout the paper has been named as "level of under-assessment" – was already very well known. However, the novelty of our analysis is that we have also identified a very low level of (gross) tax compliance. Both factors make that the tax levies less

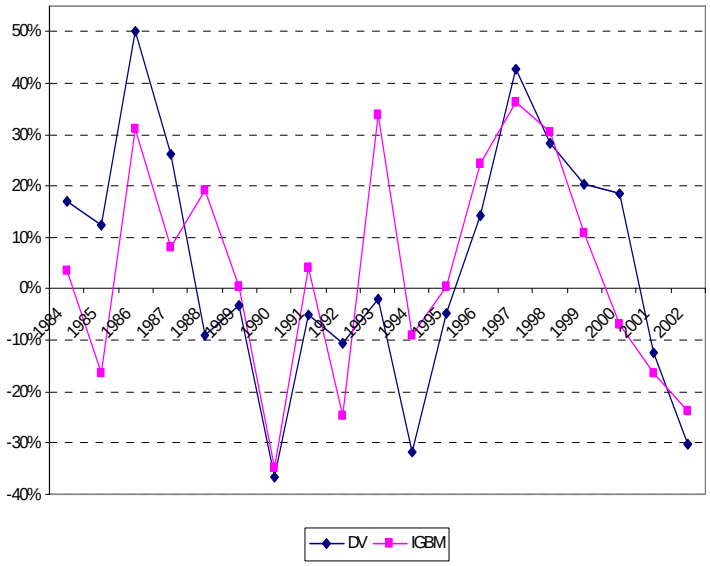
than 10% of real tax capacity per dwelling, given the value of the constant *K*. Moreover, although the evolution of the degree of under-assessment is variable, we have found that the level of (gross) tax compliance is linearly decreasing. Thus, we expect that in the near future the performance of this tax will be even worse. Finally, we have simulated those tax policies that should be carried out in order to increase the level of net tax compliance. Comparing the policy of fully updating the CV and that of guaranteeing full tax compliance, the latter seems much more profitable (Graph 13). However, it is obvious that that profitability of this policy is even higher as long as the level of under-assessment is low (*i.e.*, the ratio CV/MP is high) (Graph 12).

5.3.2. Equity Shares

In Graph 14, we see that the volatility of declared values of equity shares traded in organized markets is much greater than that observed in Graph 9 as far as housing is concerned. In the graph, we only show the evolution of equity shares traded in organized markets, since in this case we can obtain a much more accurate index for the price of the asset. From 1995 onwards, the declared value follows quite closely the evolution of the (market) price index, while during the previous period, there are moments in which the variation in the declared value is well above that of the price index, and vice versa. During the beginning of the period (1984-87), the fact that the declared value evolves above the growth of the price index might be due to the expansion of the stock market, that is, to the increasing holding of equity shares as an investment asset.

In Table 16 and Table 17, we have performed a multivariable regression analysis. As we said in the previous paragraph, we have considered two alternative definitions of the endogenous variable, first, a generic one ("Total Equity Shares"), and second, a more particular one ("Equity Shares Traded in Organized Markets"). The latter group of equity shares is less important in quantitative terms than the rest (1/3 *vs.* 2/3). However, for that group, we have available a price indicator that might not be perfect, but is much better than any indicator we could try to use for the rest of equity shares. Then, first, in Table 16, we show the results for "Equity Shares Traded in Organized Markets" according to the basic model established in equation [13]. Again, we cannot reject the inclusion of a time trend (*i.e.*, Model 2 is preferred to Model 1), while in contrast with the case of housing, we cannot reject the inclusion of the lagged endogenous variable (*i.e.*, Model 3 is preferred to Model 2). Thus, this suggests certain persistence in the portfolio of the equity investors (probably, expecting for long run profitability), if we discard the possibility of (important) transaction costs for recomposing the portfolio. We will come back to this issue later. In all models, though, the disincentive effect due to the "tax on tax revenue" is not statistically significant.

Graph 14: Evolution of Declared Values of Equity Shares Traded in Organized Markets (1984-2002): IGBM



In Model 4, we test the possibility that the legal exemptions both in the WT (from 1994) and in the IGT (from 1997) have an effect on the declared values. Given that the conditions to benefit from those exemptions might need some time for reorganizing the firm, we have tried introducing a dummy for the same year and two ahead, but none possibility has been statistically accepted. This makes sense, since most of those firms which shares are traded in organized markets are not under the control of a single family (recall that both exemptions apply to family businesses), but their control is usually shared among many shareholders. Thus, finally, the preferred model is Model 5 once we have tested the rejection of certain control variables and also of the legal exemption, which is accepted by means of a ratio likelihood test. The elasticity of the IGBM is 0.759, that is, an increase of 1% in IGBM provokes an increase of 0.0759% in the declared value. As usual, in Table 17, we have performed the same analysis, but for the Refined-Upper Bound.

Table 16

Table 17

Given the result about the persistency in the investment portfolio, that is, given the statistical significance of the endogenous lagged variable, in Model 6 we have tested whether that is due

to a long term financial position of investors. In particular, we have tested whether that is picking up the fact that investors decide the composition of their portfolio taking into account the past performance of the stock market. We account for past performance by means of a moving (or weighted moving) average over last three years. Once we include this MA (or WMA) variable, the lagged value loses all its statistical significance. Model 7 and Model 8 show the results of taking into account past performance of the stock market. In any case, we will take Model 5a to perform the next simulations.

In Table 18 and Table 19, we have carried out the same empirical exercise, but for "Total Equity Shares". Given that the total amount of shares includes those shares non traded in organized markets, and so there being included the shares of some family business, we would expect that the effect of the legal exemption were now significant and with a negative sign. We would also expect a lower coefficient of the price index, since it is a poor indicator for the whole set of equity shares taxed in the WT. All these hypotheses hold. The preferred model is Model 3, where the estimated elasticity is 0.194 The impact of each exemption is only significant regarding the WT, while the negative impact of the "tax on tax revenue" effect is now statistically significant.

Table 18

Table 19

Table 20: Equity Shares: Estimated Impact of the "Tax on Tax Revenue" (1983-86)

	Refined-Lower Bound	*Refined-Upper Bound*
1983	28,500 (16.82%)	30,192 (17.59%)
1984	29,229 (16.94%)	31,130 (17.71%)
1985	31,406 (16.40%)	33,246 (17.14%)
1986	37,746 (17.43%)	40,115 (18.22%)

Note: 2002 euros

Precisely, in Table 20, we present the quantification of the "tax on tax revenue effect". In comparison with the impact detected for housing, this is greater, both in percentage and absolute

values. Hence, it seems that the disincentives to properly administer this tax carried a much more inefficient administration and control of equity shares than of real estate property. In Table 21, we show the estimated impact of the business exemption. If we compare it with the housing exemption from 2000 onwards (Table 14), the impact of the business exemption is relatively less important, about half the importance of the housing exemption.

Table 21: Estimated Impact of Family Business Exemption at WT (1994 onwards)

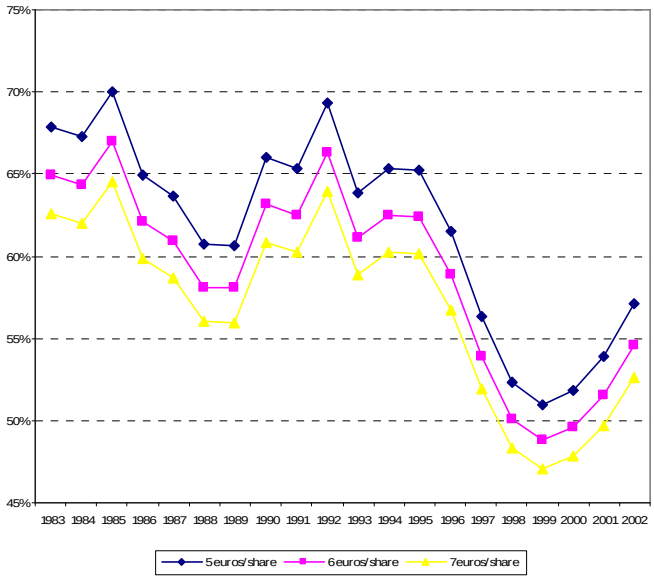
	Refined Lower Bound	*Refined Upper Bound*
1994	44,157 (23.43%)	44,653 (23.28%)
1995	45,078 (23.43%)	45,459 (23.28%)
1996	52,282 (23.43%)	52,455 (23.28%)
1997	44,632 (23.43%)	44,481 (23.28%)
1998	49,010 (23.43%)	48,666 (23.28%)
1999	54,840 (23.43%)	54,579 (23.28%)
2000	60,253 (23.43%)	59,741 (23.28%)
2001	56,522 (23.43%)	56,043 (23.28%)
2002	46,371 (23.43%)	46,083 (23.28%)
Average	50,349	50,240

Note: 2002 euros

Finally, in Graph 15, we show the evolution of the level of tax compliance during the analyzed period for those equity shares traded in organized markets, that is, for those shares which price index is relatively more accurately measured. All series have been constructed from the results of Model 5 in Table 16. In order to transform the elasticity of the stock market index we have employed different prices, all around the average value of 5.5 euros per share we calculated in section 5.1.2. In contrast with the case of housing (see, *e.g.*, net tax compliance in Graph 10, there is not a clear linear trend in the temporal evolution of the level of tax compliance, although on average there also seems to be a decreasing trend. Independently of the price used to

transform the elasticity of the index, the temporal evolution of tax compliance is the same, although the differences in absolute values are relatively significant. For instance, for a price equal to 6 euros per equity share, the maximum level of marginal tax compliance was in 1992 (66.33%) and the minimum in 1999 (48.80%), since then on there is an increasing trend. On the whole, in contrast with the case of housing, there is not a clear linear trend, and the levels of marginal net tax compliance are higher.

Graph 15: Estimated Evolution of Marginal Tax Compliance: Equity Shares Traded in Organized Markets (R-LB)



5.4. An attempt to estimate Absolute Net Tax Compliance

The previous analysis has permitted us to check to what extent the Spanish WT achieves taxing real capacity, and how that performance has evolved along time. We have checked the poor performance of the tax both due to tax incompliance (housing and equity shares) and under-assessment (housing). In this section, we will attempt to quantify in monetary terms the consequence of that performance, that is, what is on average the money not declared by taxpayer, either due to (gross) tax incompliance or to a wrong assessment of the assets under taxation.

5.4.1. Housing

In the case of housing, the estimated declared value is obtained from the following equation:

$$p_t^D q_t^D = e^K \times \left(p_t^R\right)^{\theta_1} \times \left(q_t^R\right)^{\theta_2} \quad [14]$$

In section 5.3.1, when we carried out the exploitation of the empirical results, we only focused our analysis on what we called *marginal* tax compliance, and we did that from the estimates of the elasticity of the price used to assess each dwelling. As we argued in section 5.1.1, we were not able to include but proxies of the propensity to accumulate this asset, that is, some variables that attempted to control for q_t^R. Given the impreciseness of the estimates obtained from those controls, it made sense to focus only on the estimates of the elasticity of p_t^R. However, we would expect that the estimation of gross tax compliance referring to p_t^R were equally applicable to q_t^R, once we take into account that the elasticity of p_t^R is (potentially) different from the elasticity of q_t^R due to the assessment criterion.

Then, in contrast with the definition of marginal tax compliance, we define *absolute* tax compliance as follows:

$$\frac{p_t^D q_t^D}{\left(p_t^R q_t^R\right)^*} = e^K \times \left(p_t^R\right)^{\theta_1 - 1} \times \left(q_t^R\right)^{\theta_2 - 1} \quad [15]$$

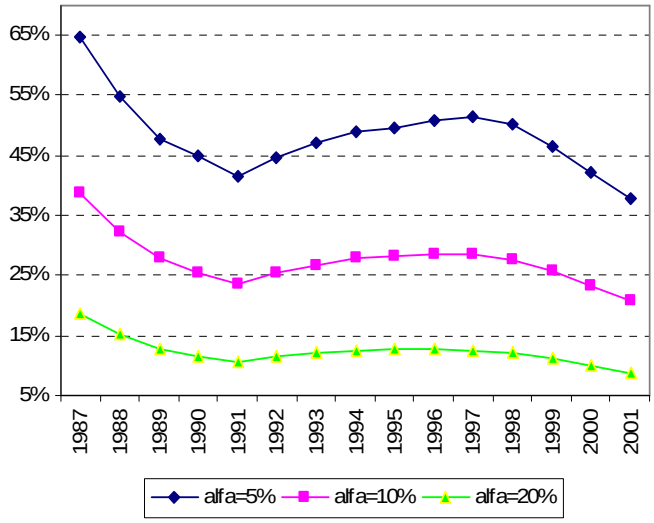
That is, absolute tax compliance does not only include the impact on the number of dwellings declared, but it also takes into account the constant, *K*. Unfortunately, as we have just said above, we do not have a precise estimation of the elasticity of q_t^R, although in the empirical analysis we obviously controlled for the propensity to accumulate this asset by means of GDP, a short run interest rate and a time trend. Then, we use the impact of gross tax compliance obtained from the elasticity of p_t^R to estimate that related to q_t^R. Taking this fact into account and also the fact that the estimated elasticity of p_t^R also includes the impact of a potentially wrong assessment of the MP,

$$\frac{p_t^D q_t^D}{\left(p_t^R q_t^R\right)^*} = e^K \times \left[Gross\ Tax\ Compliance\right]^2 \times \left[Underassessment\right] \quad [16]$$

Therefore, in order to estimate the absolute level of net tax compliance, we have to employ the

(squared) level of gross tax compliance and the level of under-assessment obtained from the estimates of the price index, and also the constant term. In Table 13, we provided values of under-assessment and gross tax compliance depending on the fiscal use of the MP. Then, in Graph 16, we show the evolution of absolute net tax compliance for several levels of use of the MP. In spite of the slight improve in net tax compliance since 1991 (in that year, underassessment achieves its l00owest level, that is, the ratio CV/MP is minimum), absolute net tax compliance is decreasing. The temporal evolution is equal to that obtained from marginal tax compliance (see Graph 10).

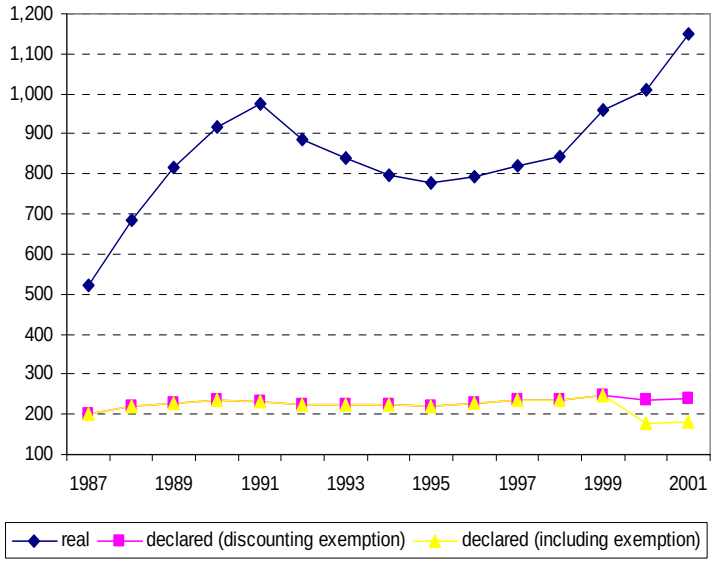
Graph 16: Housing: Absolute Net Tax Compliance (1987-2001)



Note: all series constructed using expression [16], and the corresponding values shown in Table 13 (similarly for alfa=20%), while the value of the constant is that obtained from the estimation of Model 3 (Table 8).

Then, given those levels of absolute net tax compliance, we can calculate the evolution of the average monetary amounts of housing that should be declared by top 1% in absence of under-assessment and tax incompliance. We suppose MP is used in 1 out of 10 assessments. As can be checked from Graph 17, the differences between real and declared amounts are very significant; while declared absolute values show a very flat evolution, real values are much more volatile and on average present an increasing trend.

Graph 17: Housing: Evolution of Declared Values *vs*. Real Values (1987-2001)



Note: monetary amounts expressed as 1,000 euros (2002); all series have been corrected for the impact of the owner-occupied dwelling (see Table 14); and have been calculated for α=0.075 (*i.e.*, for a 10% fiscal use of the MP), and from R-LB. The yellow line has been calculated for δ=0.15, which corresponds approximately with a 20% of under-assessment (*i.e.*, CV/MP=0.20), that is, the real average degree of under-assessment.

5.4.2. Equity Shares

The procedure established in the previous section cannot be directly applied to the case of equity shares due to the nature of the exogenous variable used as price indicator (IGBM) in expression [13]. The variable we used was a stock market index. Thus, in the case of equity shares expression [14] is:

$$p_t^D q_t^D = e^K \times \left(\frac{p_t^R}{p_0^R} \right)^{\theta_1} \times \left(q_t^R \right)^{\theta_2} \qquad [17]$$

where p_0^R is a constant, the average price of equity shares in the base year, 1983. Thus, we implicitly estimated the following equation:

$$p_t^D q_t^D = e^{K'} \times \left(p_0^R \right)^{\theta_1} \times \left(\frac{p_t^R}{p_0^R} \right)^{\theta_1} \times \left(q_t^R \right)^{\theta_2} \qquad [17']$$

However, we do not know the value of p_0^R, and so cannot disentangle from the estimate of *K*,

the value of *K'* and that of p_0^R. Then, as usual, in order to calculate the level of tax compliance, we calculate it using expression [17],

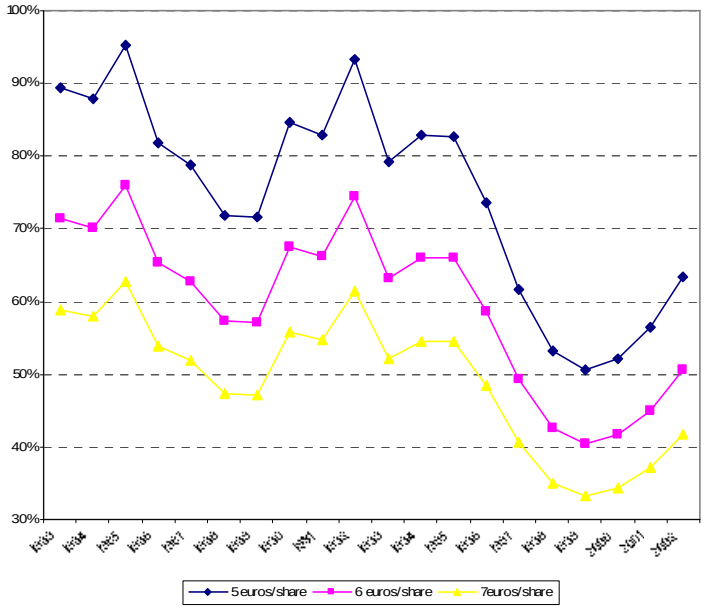
$$\frac{p_t^D q_t^D}{\left(p_t^R q_t^R\right)^*} = e^{K'} \times \left(p_0^R\right)^{\theta_1} \times \left(\frac{p_t^R}{p_0^R}\right)^{\theta_1 - 1} \times \left(q_t^R\right)^{\theta_2 - 1} = \underbrace{e^{K'} \times \left(p_0^R\right)^{\theta_1}} \times \underbrace{\left(p_t^R\right)^{\theta_1 - 1} \times \left(p_0^R\right)^{1-\theta_1}} \times \left(q_t^R\right)^{\theta_2 - 1} \quad [18]$$

That is, we rectify the original constant term multiplying it by $\left(p_0^R\right)^{-\theta_1}$, while the marginal net compliance is multiplied by $\left(p_0^R\right)^{\theta_1 - 1}$ as we already explained in section 5.1.2 by means of expression [13]. The value of marginal tax compliance obtained in this way is also applied to explain the level of marginal compliance related to *q*.

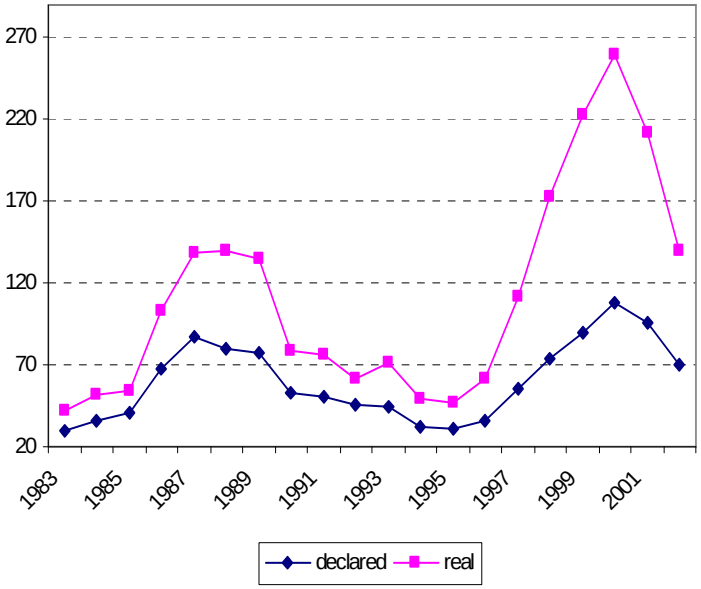
Then, in Graph 18, we show the evolution of absolute net tax compliance of those equity shares traded in organized markets for three (possible) values of the MP of equity shares in 1983. All of them are very close to the approximate average we obtained in section 5.1.2, which recall it is about 5.5€/share. Again, that evolution is fully compatible with that obtained for marginal tax compliance in Graph 15.

As can be checked from Graph 19, the discrepancy between real and declared values expressed in monetary terms is not as spectacular as that obtained for housing. On the whole, although the absolute levels of tax compliance are not very high, they are slightly higher than those obtained for housing. In the case of equity shares, it is very clear that the gap between declared and real values, that is, tax incompliance, increases in the booming years (1986-1991 & 1997-2000).

Graph 18: Equity Shares traded in Organized Markets: Absolute Net Tax Compliance (1983-2001)



Graph 19: Equity Shares: Evolution of Declared Values *vs*. Real Values (1983-2001)



Note: monetary amounts expressed as 1,000 euros (2002); the real has been calculated using the percentage of absolute net tax compliance compatible with a MP of equity shares equal to 6 euros; and from R-LB.

6. Conclusions

Spain is one of the few countries still taxes the possession of wealth, being one of the main arguments to justify a WT its redistributive role. However, differences when assessing assets and particular concessions characterize the Spanish tax. Thus, housing, the most important component of wealth, is under-assessed, and business assets and owner-occupied dwellings are exempt, which introduces distortions and inequalities, promoting tax avoidance. These factors, along with presumptive high evasion, make difficult to achieve in practice any possible redistributive effect. These features are not particular of the Spanish WT, since we find similar situations in other countries' WT, which along the practical difficulties in taxing capital is taking an increasing number of countries to repeal WT[71].

Our empirical analysis has tried to test whether those potential failures of WT are relevant, being the following the main conclusions:

- Regarding the main asset under taxation, real estate property, the level of net tax compliance – which includes gross tax compliance and under-assessment – is well below 50% and shows a decreasing trend. This characteristic has also been detected regarding equity shares, although to a lesser extent. Therefore, we conclude that the WT fails in reducing vertical inequity, as only a small part of wealth is really taxed, while horizontal equity might also be questioned given the differences in the level of tax compliance between the two main assets.

- Given this negative assessment of the tax regarding under-assessment and tax incompliance, we have simulated two different policies regarding real property: a full update of the CV and enforcing tax compliance. Comparing both, the latter one would be much more profitable.

In conclusion, WT does not achieve taxing real tax ability, and so does not accomplish its main aim of reducing wealth concentration. This would be especially serious if wealth inequality were either high or showed an increasing trend. The evolution of wealth distribution for top 1% shows concentration has risen in Spain since 1988. Therefore, if the objective is to reduce concentration, taxation could be a means to that end, but the issue is to find the proper means. Current WT is definitively not. Then the question is: should it be eliminated or reformed? From the international experience, the first possibility has been the rule.

[71] See Bertocchi (2007) for a theoretical model that adopting a historical perspective (both regarding the process of wealth accumulation that tends to diminish wealth inequality, and the change in wealth composition from hard-to-avoid taxes to easy ones) corroborates the international experience regarding the less important role of wealth taxes, in particular, bequest taxes.

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Table 8: Real Estate: Declared Value *vs.* Cadastral Value (Refined Lower Bound) (1983-2001)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
Constant	4.499 (5.250)***	3.429 (9.914)***	3.528 (35.571)***	3.534 (34.740)***	3.401 (15.322)***	3.534 (39.723)***	3.495 (23.296)***
Endogenous (-1)	-.-	-.-	-.-	-.-	0.041 (0.626)	-.-	-.-
CV	0.362 (1.020)	0.623 (3.296)***	0.678 (19.768)***	0.675 (19.077)***	0.647 (9.750)***	0.601 (11.723)***	0.691 (12.869)***
CV × (Exemption >2000)	-0.081 (-5.891)***	-0.078 (-11.550)***	-0.076 (-28.906)***	-0.974 (-0.670)	-0.076 (-26.381)***	-0.077 (-32.328)***	-0.075 (-21.563)***
CV × (Disincentive <1987)	-0.011 (-0.731)	-0.015 (-4.009)***	-0.016 (-5.024)***	-0.016 (-4.929)***	-0.016 (-4.132)***	-0.011 (-2.971)**	-0.015 (-4.687)***
Exemption >2000	-.-	-.-	-.-	3.077 (0.617)	-.-	-.-	-.-
GDP	-0.094 (-0.134)	0.104 (0.299)	-.-	-.-	-.-	-.-	-.-
$i_{\text{-short run}}$	0.003 (0.097)	-0.027 (-2.170)*	-0.031 (-5.317)***	-0.030 (-4.845)***	-0.032 (-4.619)***	-0.006 (-0.436)	-0.031 (-4.999)***
Family Business (>1994)	-.-	-.-	-.-	-.-	-.-	-.-	0.003 (0.320)
Time trend	-.-	-0.021 (-13.363)***	-0.021 (-14.270)***	-0.021 (-13.523)***	-0.020 (-11.221)***	-0.016 (-4.938)***	-0.022 (-7.685)***
$IGBM_{t-1}$	-.-	-.-	-.-	-.-	-.-	0.028 (1.567)	-.-
AR(1)	-.-	-1.115 (-5.129)***	-1.102 (-5.402)***	-1.136 (-5.229)***	-1.052 (-4.131)***	-1.183 (-5.656)***	-1.113 (-5.009)***
AR(2)	-.-	-0.691 (-3.099)***	-0.687 (-3.367)***	-0.674 (-3.170)***	-0.602 (-2.235)*	-0.677 (-3.107)**	-0.702 (-3.068)***
Adjusted R^2	0.911	0.986	0.988	0.987	0.984	0.988	0.986
Log-likelihood	43.775	58.841	58.744	59.156	55.450	57.030	58.860
DW	1.821	2.205	2.184	2.208	-.-	2.343	2.243
Breusch-Godfrey Lagrange Multiplier (B-G LM)	0.250 [0.617]	0.400 [0.527]	0.306 [0.580]	0.349 [0.554]	0.072 [0.788]	1.259 [0.262]	0.785 [0.375]
F-test	38.044 [0.000]	146.213 [0.000]	185.845 [0.000]	151.771 [0.000]	114.318 [0.000]	156.174 [0.000]	146.543 [0.000]

Notes: robust t-statistics in parentheses, []: level of significance; *: significant at 10%, **: significant at 5%, ***: significant at 1%

Table 9: Real Estate: Declared Value *vs.* (Estimated) Market Price (Refined Lower Bound) (1987-2001)

	Model 1	Model 2a	Model 2b	Model 2c	Model 2d	Model 3	Model 4	Model 5 (1st. Diff.)	Model 6	Model 7
Constant	4.104 (9.940)***	2.785 (4.642)***	2.673 (4.669)***	2.756 (4.856)***	2.720 (4.686)***	2.541 (5.288)***	2.541 (5.018)***	-.-	3.148 (3.592)***	2.538 (5.025)***
Endogenous (-1)	-.-	-.-	-.-	-.-	-.-	-.-	-.-	0.089 (0.563)	-.-	-.-
Market Price	0.231 (3.101)**	0.129 (1.830)*	-.-	-.-	-.-	0.100 (1.781)*	0.099 (1.645)	0.609 (2.443)**	0.173 (1.660)	0.089 (1.213)
MP × (Exemption >2000)	-0.070 (-14.118)***	-0.072 (-17.911)***	-.-	-.-	-.-	-0.072 (-18.975)***	-0.052 (-0.222)	-0.078 (-6.749)***	-0.073 (-17.483)***	-0.072 (-17.959)***
Exemption >2000	-.-	-.-	-.-	-.-	-.-	-.-	-0.097 (-0.085)	-.-	-.-	-.-
Market Price of Capitals	-.-	-.-	0.098 (1.815)*	-.-	-.-	-.-	-.-	-.-	-.-	-.-
MPCapitals × (Exemption >2000)	-.-	-.-	-0.069 (-17.864)***	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Market Price BCN & Madrid (only exclusive areas)	-.-	-.-	-.-	0.089 (2.005)*	-.-	-.-	-.-	-.-	-.-	-.-
MPExclusive × (Exemption >2000)	-.-	-.-	-.-	-0.062 (-18.426)***	-.-	-.-	-.-	-.-	-.-	-.-
Market Price BCN & Madrid (only most exclusive areas)	-.-	-.-	-.-	-.-	0078 (1.842)*	-.-	-.-	-.-	-.-	-.-
MPMostExclusive × (Exemption >2000)	-.-	-.-	-.-	-.-	-0.062 (-17.990)***	-.-	-.-	-.-	-.-	-.-
GDP	0.111 (0.539)	0.857 (2.613)**	0.959 (3.326)***	0.920 (3.230)***	0.953 (3.306)***	0.996 (3.882)***	0.998 (3.678)***	-1.066 (-0.942)	0.532 (0.865)	1.016 (3.607)***
$i_{\text{-short run}}$	-0.020 (-0.921)	-0.013 (-0.712)	-0.013 (-0.723)	-0.012 (-0.740)	-0.011 (-0.645)	-.-	-.-	-.-	-.-	-.-
Family Business (>1994)	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-0.006 (-0.244)
Time trend	-.-	-0.015 (-2.624)**	-0.018 (-3.505)***	-0.016 (-3.171)***	-0.016 (-3.081)**	-0.016 (-2.851)**	-0.016 (-2.704)**	0.034 (1.184)	-0.007 (-0.655)	-0.015 (-2.600)**
$IGBM_{t-1}$	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	0.036 (0.833)	-.-
Adjusted R^2	0.944	0.965	0.964	0.966	0.965	0.966	0.963	0.758	0.965	0.963
Log-likelihood	39.405	43.667	43.590	44.044	43.694	43.256	43.262	26.196	43.813	43.305
DW	1.201	2.133	2.064	2.038	1.981	2.254	2.254	-.-	2.348	2.204
B-G LM	2.491 [0.114]	0.383 [0.535]	0.219 [0.640]	0.105 [0.745]	0.055 [0.815]	0.588 [0.443]	0.597 [0.440]	0.190 [0.662]	0.943 [0.331]	0.470 [0.493]
F-test	60.009 [0.000]	77.640 [0.000]	76.837 [0.000]	81.738 [0.000]	77.927 [0.000]	101.950 [0.000]	73.465 [0.000]	-.-	79.205 [0.000]	73.901 [0.000]

Notes: robust t-statistics in parentheses, []: level of significance; *: significant at 10%, **: significant at 5%, ***: significant at 1%

Table 10: Real Estate: Declared Value *vs.* Cadastral Value (Refined Upper Bound) (1983-2001)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
Constant	4.216 (4.825)***	3.001 (6.358)***	3.341 (25.087)***	3.351 (24.808)***	3.040 (13.952)***	3.307 (13.909)***	3.471 (18.210)***
Endogenous (-1)	-.-	-.-	-.-	-.-	0.099 (1.676)	-.-	-.-
CV	0.369 (1.019)	0.521 (2.054)*	0.711 (15.378)***	0.708 (15.096)***	0.633 (10.129)***	0.711 (8.170)***	0.662 (9.544)***
CV × (Exemption >2000)	-0.083 (-5.911)***	-0.077 (-8.309)***	-0.071 (-27.098)***	-1.305 (-0.591)	-0.068 (-24.118)***	-0.076 (-15.828)***	-0.073 (-20.168)***
CV × (Disincentive <1987)	-0.007 (-0.426)	-0.006 (-1.108)	-0.008 (-2.189)**	-0.008 (-2.252)**	-0.008 (-2.330)**	-0.007 (-1.129)	-0.008 (-2.275)**
Exemption >2000	-.-	-.-	-.-	4.228 (0.559)	-.-	-.-	-.-
GDP	-0.00002 (-0.00003)	0.357 (0.761)	-.-	-.-	-.-	-.-	-.-
$i_{\text{-short run}}$	0.018 (0.576)	0.012 (0.685)	-.-	-.-	-.-	-.-	-.-
Family Business (>1994)	-.-	-.-	-.-	-.-	-.-	-.-	-0.012 (-0.949)
Time trend	-.-	-0.017 (-7.894)***	-0.018 (-11.681)***	-0.018 (-11.553)***	-0.016 (-9.545)***	-0.017 (-6.157)***	-0.014 (-4.026)***
$IGBM_{t-1}$	-.-	-.-	-.-	-.-	-.-	0.007 (0.473)	-.-
AR(1)	-.-	-1.149 (-4.207)***	-1.096 (-4.720)***	-1.163 (-4.368)***	-1.207 (-4.842)***	-0.675 (-2.926)***	-1.097 (-4.492)***
AR(2)	-.-	-0.686 (-2.215)*	-0.677 (-2.614)**	-0.665 (-2.476)**	-0.699 (-2.422)**	-.-	-0.662 (-2.423)**
Adjusted R^2	0.915	0.976	0.980	0.978	0.979	0.966	0.980
Log-likelihood	43.403	53.366	52.792	53.099	51.612	48.446	53.707
DW	2.042	2.006	1.983	1.988	-.-	2.319	2.051
B-G LM	0.073 [0.787]	0.029 [0.865]	6.19×10^{-7} [0.999]	7.15×10^{-5} [0.993]	0.925 [0.336]	3.069 [0.080]	0.034 [0.853]
F-test	39.637 [0.000]	83.186 [0.000]	129.482 [0.000]	103.600 [0.000]	100.392 [0.000]	76.983 [0.000]	111.378 [0.000]

Notes: robust t-statistics in parentheses, []: level of significance; *: significant at 10%, **: significant at 5%, ***: significant at 1%

Table 11: Real Estate: Declared Value *vs.* (Estimated) Market Price (Refined Upper Bound) (1987-2001)

	Model 1	Model 2a	Model 2b	Model 2c	Model 2d	Model 3	Model 4	Model 5	Model 6	Model 7
Constant	3.845 (11.349)***	2.921 (5.399)***	2.738 (5.244)***	2.821 (5.362)***	2.776 (5.031)***	2.780 (6.517)***	2.781 (6.197)***	2.844 (5.578)***	2.775 (6.219)***	3.400 (4.427)***
Endogenous (-1)	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-0.016 (-0.265)	-.-	-.-
Market Price	0.277 (4.541)***	0.206 (3.238)***	-.-	-.-	-.-	0.189 (3.789)***	0.191 (3.578)***	0.192 (3.590)***	0.175 (2.678)**	0.263 (2.890)**
MP × (Exemption >2000)	-0.073 (-17.837)***	-0.074 (-20.356)***	-.-	-.-	-.-	-0.074 (-22.023)***	-0.116 (-0.559)	-0.074 (-18.163)***	-0.074 (-20.951)***	-0.075 (-20.549)***
Exemption >2000	-.-	-.-	-.-	-.-	-.-	-.-	0.203 (0.202)	-.-	-.-	-.-
Market Price of Capitals	-.-	-.-	0.156 (3.166)***	-.-	-.-	-.-	-.-	-.-	-.-	-.-
MPCapitals × (Exemption >2000)	-.-	-.-	-0.070 (-20.005)***	-.-	-.-	-.-	-.-	-.-	-.-	-.-
Market Price BCN & Madrid (only exclusive areas)	-.-	-.-	-.-	0.134 (3.238)***	-.-	-.-	-.-	-.-	-.-	-.-
MPExclusive × (Exemption >2000)	-.-	-.-	-.-	-0.064 (-20.270)***	-.-	-.-	-.-	-.-	-.-	-.-
Market Price BCN & Madrid (only most exclusive areas)	-.-	-.-	-.-	-.-	0.119 (2.935)**	-.-	-.-	-.-	-.-	-.-
MPMostExclusive × (Exemption >2000)	-.-	-.-	-.-	-.-	-0.063 (-19.288)***	-.-	-.-	-.-	-.-	-.-
GDP	0.127 (0.752)	0.649 (2.196)*	0.815 (3.100)***	0.790 (2.993)***	0.833 (3.039)***	0.730 (3.206)***	0.726 (3.020)***	0.734 (3.063)***	0.757 (3.044)***	0.255 (0.474)
$i_{\text{-short run}}$	-0.013 (-0.702)	-0.007 (-0.458)	-0.007 (-0.456)	-0.005 (-0.329)	-0.003 (-0.213)	-.-	-.-	-.-	-.-	-.-
Family Business (>1994)	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-0.008 (-0.378)	-.-
Time trend	-.-	-0.010 (-2.037)*	-0.015 (-3.230)***	-0.013 (-2.737)**	-0.013 (-2.587)**	-0.011 (-2.231)**	-0.011 (-2.100)*	-0.011 (-2.123)*	-0.010 (-2.006)*	-0.002 (-0.248)
$IGBM_{t-1}$	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	-.-	0.036 (0.972)
Adjusted R^2	0.965	0.974	0.973	0.974	0.971	0.976	0.973	0.973	0.973	0.976
Log-likelihood	42.372	45.216	44.971	45.186	44.456	45.043	45.077	45.101	45.161	45.792
DW	1.528	2.277	2.167	2.206	2.113	2.346	2.348	-.-	2.265	2.437
B-G LM	0.736 [0.385]	0.834 [0.361]	0.387 [0.534]	0.334 [0.563]	0.179 [0.672]	0.833 [0.361]	0.814 [0.367]	0.606 [0.436]	0.897 [0.343]	1.182 [0.277]
F-test	98.791 [0.000]	104.755 [0.000]	101.338 [0.000]	104.339 [0.000]	94.493 [0.000]	142.117 [0.000]	102.797 [0.000]	103.136 [0.000]	103.980 [0.000]	113.260 [0.000]

Notes: robust t-statistics in parentheses, []: level of significance; *: significant at 10%, **: significant at 5%, ***: significant at 1%

Table 16: Equity Shares Traded in Organised Markets: Declared Value *vs.* Stock Exchange Value (IGBM)

(Refined Lower Bound) (1983-2002)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Constant	6.584 (2.086)**	-2.775 (-0.522)	5.036 (0.853)	6.077 (0.963)	1.886 (5.218)***	3.683 (4.447)***	4.415 (50.07)***	4.398 (44.895)***
Endogenous (-1)	-.-	-.-	0.508 (2.155)**	0.534 (2.167)**	0.561 (6.043)***	0.167 (0.889)	-.-	-.-
IGBM	1.051 (6.081)***	0.949 (5.857)***	0.808 (5.171)***	0.700 (2.939)***	0.759 (5.701)***	0.827 (6.793)***	0.857 (7.394)***	0.746 (5.340)***
IGBM× (Disincentive <1987)	-0.054 (-0.981)	-0.057 (-1.144)	0.003 (0.058)	-0.007 (-0.130)	-.-	-.-	-.-	-.-
IGBM (MA; t-3)	-.-	-.-	-.-	-.-	-.-	0.625 (2.076)*	0.861 (6.167)***	-.-
IGBM (WMA; t-3)	-.-	-.-	-.-	-.-	-.-	-.-	-.-	0.865 (5.279)***
GDP	-0.915 (-0.791)	3.310 (1.450)	-1.270 (-0.435)	-1.756 (-0.565)	-.-	-.-	-.-	-.-
$i_{\text{-long run}}$	-0.188 (-1.467)	-0.254 (-2.137)**	-0.047 (-0.329)	-0.030 (-0.201)	-.-	-.-	-.-	-.-
Family Business (>1994)	-0.602 (-4.091)***	-0.208 (-0.903)	-0.267 (-1.311)	-0.268 (-1.277)	-.-	-.-	-.-	-.-
Family Business (>1997)	-.-	-.-	-.-	0.146 (0.610)	-.-	-.-	-.-	-.-
Time trend	-.-	-0.151 (-2.075)*	0.011 (0.116)	0.020 (0.198)	-0.037 (-4.155)***	-0.076 (-4.171)***	-0.090 (-8.604)***	-0.085 (-7.509)***
Adjusted R^2	0.779	0.824	0.865	0.857	0.876	0.899	0.901	0.876
Log-likelihood	8.883	11.800	15.142	15.489	12.984	14.623	14.080	12.193
DW	1.880	1.719	-.-	-.-	-.-	-.-	1.573	1.340
B-G LM	0.001 [0.974]	0.073 [0.787]	0.096 [0.756]	0.419 [0.517]	0.785 [0.376]	2.180 [0.140]	0.768 [0.381]	1.728 [0.189]
F-test	13.705 [0.000]	15.044 [0.000]	17.472 [0.000]	14.463 [0.000]	43.280 [0.000]	36.660 [0.000]	49.414 [0.000]	38.712 [0.000]

Notes: robust t-statistics in parentheses, []: level of significance; *: significant at 10%, **: significant at 5%, ***: significant at 1%

Table 17: Equity Shares Traded in Organised Markets: Declared Value *vs.* Stock Exchange Value (IGBM)

(Refined Upper Bound) (1983-2002)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Constant	3.590 (2.194)*	-5.731 (-1.160)	4.877 (0.880)	6.596 (1.144)	1.880 (5.212)***	3.715 (4.566)***	4.426 (51.29)***	4.409 (45.883)***
Endogenous (-1)	-.-	-.-	0.506 (2.164)**	0.532 (2.167)**	0.563 (6.091)***	0.162 (0.879)	-.-	-.-
IGBM	1.031 (6.044)***	0.931 (5.808)***	0.798 (5.211)***	0.697 (2.972)***	0.748 (5.706)***	0.809 (6.833)***	0.835 (7.364)***	0.724 (5.287)***
IGBM× (Disincentive <1987)	-0.053 (-0.968)	-0.055 (-1.126)	0.004 (0.085)	-0.005 (-0.095)	-.-	-.-	-.-	-.-
IGBM (MA; t-3)	-.-	-.-	-.-	-.-	-.-	0.630 (2.157)*	0.857 (6.273)***	-.-
IGBM (WMA; t-3)	-.-	-.-	-.-	-.-	-.-	-.-	-.-	0.861 (5.359)***
GDP	-0.829 (-0.726)	3.313 (1.467)	-1.182 (-0.412)	-1.635 (-0.534)	-.-	-.-	-.-	-.-
$i_{\text{-long run}}$	-0.180 (-1.417)	-0.244 (-2.075)*	-0.041 (-0.301)	-0.026 (-0.180)	-.-	-.-	-.-	-.-
Family Business (>1994)	-0.603 (-4.154)***	-0.217 (-0.952)	-0.271 (-1.345)	-0.271 (-1.305)	-.-	-.-	-.-	-.-
Family Business (>1997)	-.-	-.-	-.-	0.137 (0.578)	-.-	-.-	-.-	-.-
Time trend	-.-	-0.148 (-2.056)*	0.011 (0.110)	0.019 (0.186)	-0.037 (-4.166)***			
Adjusted R^2	0.840	0.823	0.864	0.855	0.875	0.900	0.902	0.876
Log-likelihood	9.127	11.994	15.365	15.678	13.183	14.981	14.452	12.522
DW	1.870	1.702	-.-	-.-	-.-	-.-	1.592	1.356
B-G LM	0.003 [0.954]	0.103 [0.749]	0.092 [0.762]	0.375 [0.540]	0.717 [0.397]	1.972 [0.160]	0.705 [0.401]	1.648 [0.200]
F-test	13.653 [0.000]	14.907 [0.000]	17.371 [0.000]	14.321 [0.000]	42.902 [0.000]	36.928 [0.000]	49.855 [0.000]	38.852 [0.000]

Notes: robust t-statistics in parentheses, []: level of significance; *: significant at 10%, **: significant at 5%, ***: significant at 1%

Table 18: Total Equity Shares: Declared Value *vs.* Stock Exchange Value (IGBM) (Refined Lower Bound) (1983-2002)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
Constant	4.519 (2.622)**	4.424 (1.477)	4.331 (13.463)***	4.166 (3.649)***	4.251 (12.536)***	4.265 (12.919)***	3.665 (6.743)***
Endogenous (-1)	-.-	-.-	-.-	0.035 (0.160)	-.-	-.-	-.-
IGBM	0.181 (2.072)*	0.180 (1.902)*	0.194 (2.929)***	0.189 (2.758)***	0.146 (1.845)*	0.135 (1.567)	0.331 (2.953)***
IGBM× (Disincentive <1987)	-0.042 (-1.524)	-0.042 (-1.467)	-0.040 (-3.426)***	-0.031 (-1.775)*	-0.012 (-0.699)	-0.012 (-0.657)	-0.034 (-2.826)***
IGBM (MA; t-3)	-.-	-.-	-.-	-.-	0.064 (0.845)	-.-	-.-
IGBM (WMA; t-3)	-.-	-.-	-.-	-.-	-.-	0.073 (0.882)	-.-
GDP	-0.037 (-0.062)	0.007 (0.006)	-.-	-.-	-.-	-.-	-.-
$i_{\text{-long run}}$	-0.013 (-0.193)	-0.014 (-0.190)	-.-	-.-	-.-	-.-	-.-
Family Business (>1994)	-0.275 (-3.944)***	-0.271 (-2.294)**	-0.267 (-5.034)***	-0.260 (-3.894)***	-0.267 (-5.281)***	-0.267 (-5.292)***	-0.237 (-4.312)***
Family Business (>1997)	-.-	-.-	-.-	-.-	-.-	-.-	-0.148 (-1.489)
Time trend	-.-	-0.001 (-0.040)	-.-	-.-	-.-	-.-	-.-
Adjusted R^2	0.559	0.525	0.612	0.571	0.603	0.605	0.639
Log-likelihood	23.743	23.744	23.693	23.086	22.192	22.234	25.073
DW	1.571	1.568	1.549	-.-	2.072	2.096	1.467
B-G LM	0.559 [0.455]	0.561 [0.454]	0.590 [0.442]	0.014 [0.906]	0.282 [0.595]	0.334 [0.563]	1.128 [0.288]
F-test	5.810 [0.004]	4.497 [0.011]	10.986 [0.000]	6.998 [0.003]	7.085 [0.004]	7.135 [0.003]	9.422 [0.000]

Notes: robust t-statistics in parentheses, []: level of significance; *: significant at 10%, **: significant at 5%, ***: significant at 1%

Table 19: Total Equity Shares: Declared Value *vs.* Stock Exchange Value (IGBM) (Refined Upper Bound) (1983-2002)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
Constant	4.370 (2.551)**	4.407 (1.481)	4.434 (13.869)***	4.304 (3.662)***	4.358 (13.017)***	4.373 (13.415)***	3.762 (6.980)***
Endogenous (-1)	-.-	-.-	-.-	0.028 (0.124)	-.-	-.-	-.-
IGBM	0.163 (1.880)*	0.163 (1.740)*	0.175 (2.664)**	0.172 (2.557)**	0.125 (1.606)	0.114 (1.346)	0.314 (2.824)***
IGBM× (Disincentive <1987)	-0.040 (-1.484)	-0.040 (-1.430)	-0.042 (-3.651)***	-0.034 (-1.884)*	-0.014 (-0.789)	-0.013 (-0.746)	-0.036 (-3.044)***
IGBM (MA; t-3)	-.-	-.-	-.-	-.-	0.066 (0.873)	-.-	-.-
IGBM (WMA; t-3)	-.-	-.-	-.-	-.-	-.-	0.074 (0.907)	-.-
GDP	0.052 (0.088)	0.035 (0.027)	-.-	-.-	-.-	-.-	-.-
$i_{\text{-long run}}$	-0.004 (-0.061)	-0.004 (-0.057)	-.-	-.-	-.-	-.-	-.-
Family Business (>1994)	-0.275 (-3.963)***	-0.276 (-2.348)**	-0.265 (-5.010)***	-0.259 (-3.943)***	-0.263 (-5.282)***	-0.263 (-5.922)***	-0.234 (-4.290)***
Family Business (>1997)	-.-	-.-	-.-	-.-	-.-	-.-	-0.149 (1.518)
Time trend	-.-	0.001 (0.015)	-.-	-.-	-.-	-.-	-.-
Adjusted R^2	0.563	0.530	0.616	0.576	0.608	0.610	0.645
Log-likelihood	23.864	23.864	23.816	23.271	22.411	22.451	25.246
DW	1.573	1.574	1.564	-.-	2.096	2.121	1.455
B-G LM	0.512 [0.474]	0.512 [0.474]	0.498 [0.481]	0.006 [0.938]	0.414 [0.520]	0.479 [0.489]	1.159 [0.282]
F-test	5.903 [0.004]	4.568 [0.010]	11.165 [0.000]	7.114 [0.000]	7.202 [0.003]	7.250 [0.003]	9.633 [0.000]

Notes: robust t-statistics in parentheses, []: level of significance; *: significant at 10%, **: significant at 5%, ***: significant at 1%

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