

The tax gap as a public management instrument: application to wealth taxes

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Abstract: The tax gap can be defined as the difference between the total amount of taxes collected by tax authorities and the total tax revenues that should be collected under full tax compliance. Its estimation offers useful information about the relative size and nature of non-compliance, as well as its evolution over time. We point out that the tax gap is a valuable instrument to define the enforcement strategies of the tax administration but also to enhance the accountability of this public authority. Nonetheless, the methodology employed to estimate the tax gap and consequently the interpretation of the results are subject to limitations that are discussed in the paper. Moreover, we present the methodology to estimate the gap for two taxes that levy wealth (the wealth tax and the inheritance tax) administered in Spain by the regional tax authorities and, finally, we provide the results from the estimations obtained employing microdata.

Keywords: tax gap, tax administration, tax enforcement, fiscal transparency and accountability

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1. Introduction

The tax gap can be defined as the difference between the actual taxes collected by tax authorities and those which should have been collected under full compliance. Consequently, by estimating the tax gap, it is possible to obtain relevant information about the degree of noncompliance and its components for a specific tax or for the tax system as a whole, including its evolution over time. This information can be essential for tax administrations when deciding how to allocate their resources in order to improve tax compliance (Shaw et al., 2010). Since 1973, when the Internal Revenue Service (IRS), the US federal tax agency, pioneered the estimation of the income tax gap, its importance has grown. Currently 23 tax administrations calculate the tax gap for some of their taxes (OECD, 2017), while the European Union makes a similar effort for the VAT of its member states (Poniatowski et al., 2018).

Tax gaps exist primarily because of tax evasion, thus calculating the tax gap entails making an estimation and finding "evidence of the invisible", according to Slemrod and Weber (2011). Knowing the extent or the magnitude is relevant; however, it is probably more important to know how it develops over time. This means that the estimation strategy should satisfy at least three conditions in order to guarantee rigor and transparency: first, the results should be presented within confidence intervals; second, the methodology should be relatively stable over time; and, third, the data used for the estimation should be available on a periodic basis. In this manner, estimating the tax gap would make sense as it provides information that would be very useful to the tax administration as a management tool. Furthermore, the regular estimation and publication of the tax gap provides public information on the performance of the tax administration itself, thereby improving the functioning of the institutions through a better process of accountability and fiscal transparency (e.g. Heald, 2003). Finally, greater knowledge about the factors that give rise to the tax gap can also be useful for legislators when assessing regulatory changes.

Consequently, estimating the tax gap may provide crucial information for a better understanding of the tax system and the enforcement of the existing tax code (Tomkins et al., 2001). Nonetheless, as a public management instrument, it also exhibits some weaknesses. First, being an estimate, some caution should be employed when interpreting its value over time and when making cross-country comparisons. Indeed, the tax gap also depends on elements inherent to the fiscal system itself and on country-specific characteristics. There are enormous differences across countries¹ in terms of the types of taxes and their level of importance, in the composition of tax bases (for example, capital vs. labor), in the structure of production, and in the level of tax morale. These diverse sources of heterogeneity are relevant when comparing tax

¹ The key differences we identify in the various fiscal systems are expressed in qualitative terms and in terms of their greater, or lesser, impact on voluntary tax compliance. When expressing the tax gap in percentage terms, the quantitative differences in tax burden between countries are not relevant.

gaps between countries for a given period in time. For example, it would not make sense to directly compare the value of the Italian and Swedish tax gaps without incurring in biased conclusions.

In short, the first objective of this article is to analyze the concept of the tax gap, highlighting the advantages that its estimation implies, but also being aware of its limitations. Secondly, we propose a methodology to estimate the gaps for the two main direct taxes that Spain levies on wealth, and which are managed by the regional tax administrations. Specifically, we estimate the gap for the Wealth Tax (WT) and for the Inheritance and Gift Tax (IGT) by using microdata corresponding to taxpayers in Catalonia for the year 2014. This is the first time that the tax gap results of these taxes are estimated and published by a Spanish regional tax administration². Moreover, its estimation is also a useful contribution to the ongoing debate about the future of personal wealth taxes (e.g. OECD, 2018).

The estimated tax gap, calculated as a share of the potential tax revenues, is 44.34% (with a range: 37.95% - 49.6%) in WT, and 41.26% (38.44% - 44.01%) in IGT. These are high values compared with the results obtained in other countries for taxes such as personal income tax, corporate income tax or VAT. The different taxable events considered here undoubtedly affect this computed value. For example, the WT is levied on the annual net worth of resident natural persons, so every year all the assets that make up the personal wealth must be valued, regardless of their location. Additionally, special treatments should also be considered, such as exemptions on goods and shares of closely-held companies.

It is generally recognized that economic globalization, the development of new technologies and digitalization pose important challenges for current tax systems (Gupta et al., 2017), although some authors predict that these changes may allow for a progressive reduction of the tax gap. Alm and Soled (2016) suggest that the extensive use of credit cards, including through mobile devices, and access to big data leave traces of taxpayer behavior that are very useful to improve tax compliance. According to Jacobs (2017), information on private individual consumption obtained through electronic methods of payment permits verification of the consistency of expenses with the level of reported income. This can also facilitate the creation of records on properties and capital income. However, it is worth mentioning the value of institutional factors that may enhance the possible advantages of digitization, particularly the fundamental importance of the exchange of information between countries (see, for example, Johannesen and Zucman, 2014). In any case, until a general reduction of the tax gap is observed, at least in developed countries, we consider its estimation to be a worthy exercise and possibly an essential instrument for society.

² The estimation of the tax gap usually takes place within a country, although there are also regional studies such as for the State of Georgia in the USA (Alm and Borders, 2014).

The structure of the rest of the article is as follows: in Section 2, we define the conceptual framework of study, as well as its components and the main methodological aspects related to its estimation. In Section 3, we justify the relevance of its periodic calculation by identifying its uses and social utility. In Section 4, we review some relevant international experiences related to the calculation of the tax gap; and in Section 5, we describe the methodology and present the main results of its application to wealth taxes. Section 6 concludes.

2. Tax gap: definitions, components and calculation methodologies

2.1. Definitions and components

In the Introduction, we defined the tax gap in a generic way: as the difference between the actual revenues collected by tax authorities and the potential revenues that would have been collected under full compliance. More precisely, and following the IRS terminology, the tax gap can be defined as "the difference between the tax that taxpayers should pay and what they actually pay on a timely basis"³. Based on this definition, three components of the tax gap can be identified⁴:

- Non-filing: taxable events are not reported but should be declared in accordance with regulations. This happens, for example, when an inheritance is received, but the self-assessment of the IGT is not submitted; or when the wealth of a person exceeds the tax-free allowance of the WT but fails to file the return.
- Under-reporting: the taxable event is reported, but not in a complete way. For example, the declaration of assets is incomplete, the assessment is incorrect, or a tax credit is improperly applied.
- Under-payment: the tax return is filed, but the taxpayer does not pay the tax liability within the voluntary payment period.

Each component is incompatible with each other in order to avoid double counting. To illustrate, say, a taxpayer under declares the value of an asset, in the estimation of the tax gap this will be considered within the concept of under-reporting, and not in under-payment.

This decomposition provides the tax administration better knowledge to be able to determine the appropriate measures to effectively reduce the tax gap. For instance, the analysis may recommend focusing on non-filing or on under-reporting, depending

³ See Toder (2007), or the IRS Website: <https://www.irs.gov/newsroom/the-tax-gap>.

⁴ Gemmell and Hasseldine (2014) point to a fourth factor: the behavioral responses caused by the tax burden. To the extent that taxpayers respond, either by reducing labor supply or savings, the potential revenue considered in this section is below its maximum. Undoubtedly, this is an interesting approach, but difficult to quantify. Moreover, it can be argued that the objective of the tax administration is potential revenue, having already discounted those effects derived from behavioral changes due to the tax burden.

on the importance of each of these two factors and the cost of their reduction. In turn, each of these factors can be decomposed into subfactors originating from the tax gap. In our estimation for Spain, the most important factor of the tax gap in both the IGT and the WT is under-reporting. Within this, there are various elements such as the non-filing of assets located offshore, the improper use of special treatments for closely-held businesses, and the under-valuation of certain assets, basically of a sumptuary nature.

As previously mentioned, the definition of the IRS tax gap indicates the amount of tax liability not voluntarily paid on time. However, should the tax administration exert enforcement efforts, part of this shortfall may be recovered. To cite an example, thanks to audits that allow detecting under-reported bases or by means of notifying the potential seizure of a good. Alternatively, the debt may be paid after the tax deadline on the taxpayer's own initiative. For this reason, it is useful to differentiate between the gross and the net gap. So far, we have only identified the gross gap. The net refers to the share of the gross tax gap that is not collected despite the enforcement efforts of the administration. Consequently, the net gap is lower than the gross one and this difference can be interpreted as a proxy for the performance of the tax administration⁵.

The value of the tax gap can be expressed as a percentage of potential revenues, as we have indicated previously, but it can also be expressed as a share of the actual revenues collected. In this case, we obtain a variation rate, that is, how much real tax collection would increase if the tax gap is completely eliminated.

Furthermore, the tax gap definition of the IRS is expressed in aggregate terms. However, to the extent that microdata are available, it would be possible to estimate the tax gap distribution by income or by wealth. This is especially relevant when estimating the gap of *ad personam* taxes, since it is possible to infer not only the financial, but also the redistributive consequences of the gap. As we will see, the estimated tax gap on IGT and on WT is not homogeneously distributed across wealth.

To conclude the analysis of the different definitions and concepts of the tax gap, it is important to consider whether or not tax expenditures are included in the estimation. In most cases, they are not. However, we can also estimate the so-called policy gap, which includes the potential revenues lost as a result of the existence of tax benefits in the tax code. In this case, the tax gap is relativized with respect to all potential revenues that include what would be obtained under full compliance and in absence of any special treatment in the tax code. For example, for VAT, this would mean taking the total amount of revenues that would be obtained under full compliance if all the final consumption of a territory were taxed at the general tax rate. Its calculation is relevant for two reasons: first, because of the high collection cost of tax expenditures,

⁵ The net gap does not include, in any case, the amount of penalties, surcharges or interest for late payment (Toder, 2007, section II.C).

which is often not considered by policy makers; and, second, because the greater the policy gap, i.e. the weight of special treatments, the more complex the tax code and the greater the opportunities of abuse of the tax system.

2.2. Estimation methodologies

When estimating the tax gap, there are basically two types of methodologies, depending on the data used and on the degree of detail that is sought in the calculation (see e.g. Gemmell and Hasseldine, 2014):

By working with aggregate data, the macro approach (or top-down), there are two alternatives: the tax gap may be estimated by taking data from the underground economy and applying an effective tax rate; or by using macroeconomic indicators, such as national consumption or gross domestic product. In both cases, the tax gap can be expressed with respect to potential tax revenues.

The micro approach (or bottom-up) uses microeconomic data based on the tax returns reported by the taxpayers and, on the basis of the results from tax audits implemented by the tax administration, it is possible to infer the correct amount that should have been declared by each taxpayer. For this, it is necessary to have the results of the audit or enforcement activities stratified by tax brackets.

The micro approach (based on internal data from the tax administration) is clearly superior. Since it provides information by wealth or income brackets, we are then able to carry out a redistributive analysis of the tax gap. Furthermore, we can identify the subfactors behind the non-filing. Of course, the intensity of use of microdata is much greater, as well as the requirements to ensure the reliability of the estimates. Ideally, enforcement methods employed by the tax administration should be randomized, and the scope of such activity should be large enough. Otherwise, if the audits are not randomized (for example, they are concentrated in groups of taxpayers where the extensive existence of fraud is already known a priori) the estimation of the gap will be biased upwards. On the other hand, if the number of audits is not sufficiently high, we cannot ensure the statistical significance of the estimates.

Occasionally, empirical estimations will require a combination of both approximations; however, it is desirable to start from microdata, especially for *ad personam* taxes. In the case of indirect taxes, such as VAT, the use of macroeconomic data is reasonable and customary (see, for example, Keen, 2013). This dichotomy between micro and macro data does not exist when dealing with the portion of the tax gap due to non-payment. Here, the tax administration must have accounting information that identifies the accrued and unpaid liabilities.

3. Use and utility

The estimation of the tax gap is useful for the tax administration because it provides crucial information about the relative size and nature of the tax non-compliance over time (Whicker, 2017). However, its periodic estimation and publication can also improve the performance of institutions through a better accountability process. In this section we go deeper into both factors.

3.1. Use by the tax administration

In the previous section we have differentiated the gross tax gap (GTG) from the net (NTG). Depending on the desired focus of the tax administration, it may carry out the following calculations:

Emphasis on *ex ante* tax control: current GTG- previous GTG

If the current GTG is lower than the previous GTG in time⁶, we must conclude that there has been an increase in voluntary tax compliance, either due to a decrease in fraud or in the amount of uncollectible tax liabilities in the voluntary period. This improvement in voluntary tax compliance may be due to tax administration's enforcement initiatives and to assistance services offered to taxpayers, to an increase in tax morale⁷, or to environmental factors such as the economic cycle. If the time span between the "previous" period and the "current" one is relatively short, it is less likely that this decrease is due to tax morale, which usually requires a relatively long maturation period. On the other hand, a positive value, meaning the GTG has increased over time, indicates that voluntary tax compliance has decreased.

Alternatively, or in a complementary way, the tax administration may be interested in the result of the *ex-post* control:

Emphasis on *ex post* tax control: Current GTG- Current NTG

In this case, we are referring to the tax gap of the same year but differentiating between gross and net. Therefore, again, we estimate the GTG for a given year, which we call "current", and we compare it with the gap for that year to be estimated once the tax administration has carried out all the possible enforcement measures (e.g. auditing, collection). This means, at least for Spain, a minimum of four years after the end of the voluntary payment period⁸. Therefore, this perspective aims at evaluating to what extent the tax administration has been able to reduce the tax gap. Thus, we would expect the current GTG - NTG to adopt a non-negative value ranging between

⁶ The Introduction mentions the difficulties of comparing between countries. This prevents us from comparing $GTG_{countryA} - GTG_{countryB}$ for a specific fiscal year.

⁷ See the interesting review by Luttmer and Singhal (2014) on tax morale (or tax awareness) as a determinant of voluntary tax compliance.

⁸ Even for the estimation of the current GTG, there is a certain delay between the time of the obligation to submit the corresponding tax returns and the estimates of uncollected liabilities. This is because tax enforcement activities used to compute the GTG might not be carried out immediately after the end of the voluntary filing period.

two extreme cases: when the current NTG is 0, which means a complete ex-post success since the gap has vanished; and when the difference is 0, indicating that the ex-post success has been zero, and the gap has not been reduced at all.

Regardless of where the emphasis is placed, two points can be made about the results of the tax gap. First: if current GTG - previous GTG takes a positive value (negative), it does not imply a demerit (merit) for the tax administration. In making this assessment, we should know the counterfactual: what would have happened in the absence of the measures carried out by the tax administration aimed at facilitating voluntary tax compliance? As already suggested, even in the absence of these efforts by the tax administration, the GTG can vary due to a greater level of tax morale of the taxpayers, the economic cycle or, even, because of regulatory changes that affect voluntary tax compliance. The further away the "current" moment from the "previous" one is, the more likely it is that there are factors other than the actions of the competent tax administration. In short, the identification of the tax administration's impact on ex ante control is not automatic (see also Toder, 2007, section V.B). This is the reason why, subject to data availability, the time span between tax gap estimations should not be too long.

Second, the optimal tax gap (whether gross or net) is not necessarily zero (Keen and Slemrod, 2017). The existence of costs related to ex ante and to ex post control makes it necessary to reach an adequate balance between such costs and the ensuing benefits of reducing the tax gap. In addition, there may be institutional restrictions to reduce the gap, especially ex post. For example, in the Spanish case, when we refer to the WT or the IGT, the corresponding regional tax agency has limited territorial scope of action in the region⁹. Thus, if part of the gap is due to non-declared taxable bases located outside its jurisdiction (typically, "tax havens"), the fact it does not decrease could not be directly attributed to below-par performance. This interpretation is linked with the social utility (discussed in the next subsection) of the tax gap as an indicator of the performance of the tax administration.

3.2. Social utility

The periodic estimation of the tax gap may also serve as a way of reinforcing tax administration accountability to citizens. In this sense, Durán-Cabré and Esteller-Moré (2018), based on annual surveys of individuals on their perception of tax fraud prepared by the *Centro de Investigaciones Sociológicas*, show there is some evidence that taxpayers tend to overestimate (underestimate) the existence of tax fraud in times of economic crisis (expansion). Regardless of whether or not that perception is consistent with reality -of which they also obtain evidence that it is not- such

⁹ In fact, analogously, the national agency will encounter difficulties, and the ability to overcome these will depend on the degree of cooperation between national administrations.

overvaluation undermines the incentives for voluntary tax compliance (see, for example, Hammar et al., 2009).

This bias is especially serious for the public sector during times of crisis. In effect, the overvaluation in the perception of fraud - and, therefore, the disincentives to voluntary tax comply - occurs just when the financial restrictions for the public sector are greater. The publication of the results of the tax gap, so that taxpayers know that the reality is not as serious as their perception indicates, would contribute to overcoming the erosion in the credibility of public finances (see, for example, Kornhauser, 2005). In short, it should encourage voluntary tax compliance and, in the best of cases, facilitate the adoption and effectiveness of, if applicable, fiscal adjustment policies in times of crisis.

In conclusion, the social utility of the recurrent estimation of the tax gap and its comparison over time is derived from the implicit existence of a social contract through which taxpayers are able to assess the efforts of their tax administration by promoting voluntary fiscal compliance¹⁰. In this sense and being compatible with the use of other traditional indicators on the performance of the tax administration, the tax gap is a valuable instrument that facilitates the accountability process of the administration.

4. International experiences

The estimation of the tax gap by tax administrations has become popular over time¹¹, although it cannot be denied that the difficulties indicated in their estimation cause some reluctance of some administrations. Of the 55 states analyzed by the OECD (2017) in its annual report on tax administrations, 23 (40%) calculate the tax gap for some tax, although only 14 publish the results of the estimates. The estimation of the tax gap of all large taxes is published only in 8 countries. In addition, the definitions of the tax gap and calculation methodologies show important differences in practice, as well as the periodicity of the estimates and the scope of the taxes analyzed. Despite all the differences and difficulties, tax administrations highlight the usefulness of having information about the relative size and nature of the tax non-compliance over time. Next, we highlight the most relevant experiences.

The IRS was a pioneer in estimating the tax gap on income tax in 1973. For this reason,

¹⁰ For the case of Italy, Casaburi and Troiano (2016) study the impact that the fight against tax fraud has on voters and estimate that voters reward (in the form of a vote) the politicians who have been most active in this fight.

¹¹ No tax administration is perfect. Couzin (2017) points out that even during the times of the Roman Empire there was some gap of the tax that fell on the Jews as punishment for their revolt in Judea, in 66 BC. Although it was a lump sum tax, which is generally considered to be easier to enforce, Couzin estimates a tax gap of around 40%, but with considerable variations over time and across the territories of the Empire.

we have taken their definition as a basis. Since then, the calculation of the gap has generally been made every three years (although the results are published with a delay of six years) and the number of taxes analyzed has been extended. A new feature in the last official estimate is the calculation of the average annual gap for three fiscal years (2008, 2009 and 2010), because it is considered that the estimates of the under-reporting are more reliable (Internal Revenue Service, 2016). In addition, and for the first time, the net tax gap together with the gross gap of each tax is calculated, identifying each of the three components in most cases, as explained in Section 2.1: non-filing, under-reporting and non-payment. The IRS details the methodology applied to estimate the different components of each tax, which varies according to the information available. Likewise, the past estimates are updated and revised when making new estimates, in order to improve their reliability, but indicating the impact of the improvements in order to be able to make homogeneous comparisons over time.

The experience of HM Revenue & Customs in the United Kingdom is also relevant. Each year, they estimate the tax gap for all taxes administered, including social contributions. In this case, they publish the net gap. The tax gap is calculated for each tax, also according to typologies of "clients" defined by the same administration (for example, SMEs, large companies, etc.) and the behavior that causes the gap (for example, due to lack of diligence, by legal interpretation, evasion, fiscal offense). Although the administration itself recognizes that these classifications imply a certain degree of discretion on their part, the information is still considered useful (HM Revenue & Customs, 2017). In each new estimate of the tax gap, the previous ones are revised, following the availability of new data and methodological improvements that are being introduced. These revisions are specified in order to maintain their usefulness as an indicator of long-term trends.

The Australian Taxation office takes special caution in interpreting data, particularly because the tax gap, along with other indicators, provides important information on the performance and integrity of the Australian taxation system (Australian Taxation Office, 2018). With the aim of improving transparency in the estimates, a panel of independent experts has been put in place since 2013 to give guidance on their calculation.

It is also interesting to highlight the Danish experience. In 2008, the tax administration (SKAT) agreed to a new strategy on tax compliance, substituting the traditional targets of the number of actions taken and additional collection generated with indicators on the effectiveness of measures implemented (SKAT, 2008). To this end, the target set was a maximum tax gap of 3.1% of GDP for personal income taxes levied by the central government. In addition, they also agreed that its calculation would be extended to all taxes. In order to know the components of the tax gap, SKAT also set out to conduct a broad survey on the compliance of taxpayers.

More recently, in 2016, the Canadian tax administration (CRA) announced the upcoming first estimate of the tax gap, under the framework of intensive public investment to fight against tax fraud (Canada Revenue Agency, 2016). It is explicitly stated that the estimate only makes sense if the additional information obtained serves, on the one hand, for taxpayers to better understand the tasks of the tax administration and what their effectiveness is, and on the other, for the administration itself to improve the degree of tax compliance. To date, the CRA has published two studies on the tax gap in VAT and income tax.

In contrast to these favorable experiences related to tax gap estimation, we find the case of Sweden, which had performed these estimates periodically (for 2000/01 and 2006/07) and had targeted to reduce the gap by half in 2012. However, in the last update provided in 2012, the tax administration (Skatteverket, 2014) recognized the impossibility of carrying it out. The main reason cited is insufficient information from the traditional audits given that in recent years, as a result of a better selection in enforcement measures taken, the number of audits has decreased. This smaller number prevents making a reliable updated calculation of the tax gap. Other tax administrations that have evaluated the possibility of employing the calculation consider that "the costs of measuring tax gaps outweigh the benefits, given data available, resource investment required and the levels of uncertainty involved" (Whicker, 2017, p. 185).

Within the framework of the European Union, the Commission has also promoted the study of the tax gap of VAT, a harmonized tax at the European level. Thus, in 2009 the estimation of the so-called VAT gap of each member state for the 2000-2006 period was published (Reckon, 2009). Currently, it is a study with an improved methodology that has been published annually from 2013 to the present. The VAT gap is defined as the difference between the actual collection of VAT and the total that, in theory, should be collected. This amount is obtained by taking consumption and investment data from the national accounts on which the corresponding tax rate is applied in accordance with the VAT regulations of each country. Based on 2016 data, the latest published official data (Poniatowski et al., 2018), the VAT gap in the EU amounts to just over 147 billion euros, which represents 12.3% of the theoretical potential collection, almost 1% of the EU GDP. The study also estimates the VAT policy gap.

The Forum on Tax Administration of the OECD has also highlighted the role of the tax gap to better understand the functioning of a country's tax system and the effectiveness of its tax administration (OECD, 2017). In this context, and for the first time in Spain, the Tax Agency of Catalonia (ATC) agreed to calculate the tax gap within the framework of a plan to prevent and reduce tax fraud for the 2015-2018 period. In the next section, we present the methodology - this being the paper's main added value - and the main results obtained by the authors.

5. Application to the case of taxes on wealth: Catalonia (2014)

Spain is one of the few OECD countries that still has a personal annual net wealth tax (WT). It levies the wealth possessed on the 31st of December of every year; more precisely, the value of all taxable goods and rights minus their liabilities. Owner-occupied housing and closely held businesses are exempted, subject to the fulfillment of some conditions, and additionally there is a basic tax free-allowance. Progressive tax rates are applied to the net tax base. WT is a national tax but collected by Spanish regions, which can also regulate some parameters of the tax. In Catalonia, for instance, the 2014 tax-free allowance was 500,000 euros and the tax rates were set between 0.21% and 2.75%.

The Inheritance and gift tax (IGT) is levied on inheritors and donees. It is also a national tax, but collected by regions, who have legal capacity to regulate some important parameters of the tax, such as deductions, tax credits and tax rates. Therefore, the tax liability depends on the value of the transferred goods and the type of goods, but also largely on the kinship with the transferor. For spouses and descendants, tax rates ranged from 7% to 32%.

The WT and the IGT represent approximately 35% of the taxes managed by the ATC in 2014, the year used for our estimates. Next, we outline the proposed methodology for estimating the gross gap of each tax and, in particular, of its first two components (non-filing and under-reporting) and we also analyze the main results obtained. Regarding non-payment in the voluntary period, the information has been provided directly by the ATC.

5.1. Wealth tax

5.1.1. Methodology

Under-Reporting

The objective is to correct the tax base of the WT taxpayers for the assets not declared (or partially declared). In agreement with the inspection personnel of the ATC, it was considered that the main sources of under-reporting are: i) the non-filing of unproductive assets such as jewelry, antiques, among others; ii) the incorrect use of the exemption of closely held business; iii) the existence of undeclared assets located abroad; and iv) the incorrect or non-reporting of loans.

For its estimation, in general, we have proceeded as follows: first, for each source mentioned above, we computed the corresponding under-reported amount, which was subsequently added to the tax base initially declared. It is important to note that these imputations were not done at an aggregate level, but for each individual taxpayer. Once the tax base was adjusted, we computed the resulting new tax liability and deducted the tax liability initially reported. Finally, we added the tax liabilities

resulting from tax audits that had not previously been considered in the under-reporting tax gap calculations.

The main source of information used to calculate this component of the tax gap comes from anonymized 2014 WT returns of Catalan taxpayers. In addition, for each source of under-reporting, different sources and methods have been used based on the information available.

The computations associated with unproductive assets have been made in accordance with the information provided in the 2014 Survey of Household Finances (*Encuesta Financiera de la Familias*, EFF), elaborated by the Bank of Spain. The Bank of Spain (2017) details the asset composition of households for different percentiles of wealth. Taking this information for the highest percentile (90-100)¹², we calculate the proportion that jewels, works of art, antiques, etc., represent over total assets. With this percentage we can estimate the amount that should have been declared for the purposes of the WT. Additionally, from the EFF we also obtain the median value (in euros) of automobiles and other vehicles owned by households¹³. The imputation derived from this source of under-reporting corresponds to the difference between the value that emerges from the EFF and the value actually declared by each taxpayer, if the latter is lower.

Regarding the incorrect use of closely held business exemption, computations were based on tax audit results. Different imputation criteria have been considered: a) a constant share of the reported exemption; b) a share of the reported exemption which varies depending on the size of this exemption; and c) an average derived from criteria a) and b). The results presented in this article are computed using criterion c).

Regarding the imputation of undeclared assets located abroad, different alternatives have also been contemplated. Following the methodology proposed by Roine and Waldenström (2009), from the net errors and omissions¹⁴ of the Spanish Balance of Payments we have calculated a total of unreported assets located abroad owned by Spanish residents amounting to 75,062 million euros in 2014. Alternatively, Zucman's calculations for Spain (2013 and 2014) comes to a total of undeclared offshore wealth of 144,000 million euros. Next step is to compute the share of this unreported wealth corresponding to residents in Catalonia. For this, we use the proportion of reported wealth in Catalonia over the total wealth declared in Spain in 2007, the last year for which the WT data may be representative for all the Autonomous Regions.

¹² The EFF provides only national data. Given the information available, the 90-100 percentile is the most comparable to the WT Catalan taxpayers.

¹³ This is the only information provided for these particular assets.

¹⁴ The methodology proposed by Roine and Waldenström (2009) is based on using the net errors and omissions of the Balance of Payments. The authors argue that this item includes capital movements not accounted for in official statistics. The calculation of the non-reported equity located abroad consists of accumulating the values of this Balance of Payments item, applying a certain return on the stock accumulated until then.

When allocating the computed overall evaded wealth at micro level, our assumption is that the richest taxpayers, identified from initial reported wealth, are the ones who hold most of the assets located abroad¹⁵. The allocation of this undeclared wealth is proportional to the total assets initially declared by each taxpayer, until the accumulated individual amount matches with the global value previously calculated. At the end of this process, we obtain three different computations for this tax gap concept: a) from own calculations based on the net errors and omissions of the Spanish Balance of Payments; b) from Zucman's calculations (2013 and 2014); and c) an average of a) and b). As before, the results presented in this article use criterion c).

As for the incorrect reporting of loans, we did not have the appropriate disaggregated information to complete the computations. Consequently, we could only include the tax liabilities resulting from tax audits related to loans in the tax gap calculations.

Non-filing:

Here, the objective is to detect those WT taxpayers who, despite being legally bound to declare the tax, do not do so. For this purpose, we will use information from anonymized inheritance tax returns provided by the ATC.

Specifically, the first step consists in adjusting the estate of Catalans deceased in 2014 using the WT valuation rules so that it is comparable to the WT tax base. This mainly affects real estate, household items, expenses and deductible debts in the IGT but not in the WT, and exempted goods in the WT but not in the IGT (main-dwelling residence, closely held businesses)¹⁶.

Once the potential WT taxable base has been constructed from the estate, we need to identify those deceased whose computed WT tax base is above the tax-free allowance (500,000 euros in Catalonia for 2014) and, subsequently, raise this sample at the population level by applying mortality rates. This methodology, based on inferring the wealth distribution of a population from the bequests left at a given period of time, was introduced by Atkinson (1975)¹⁷. The sample used will be representative of the population - once mortality rates have been taken into account - if we assume that there are no IGT non-filers in the upper part of the estate distribution. Such assumption was validated by the ATC personnel.

Next step consists in distributing the population just estimated to different net tax base brackets¹⁸. Once such brackets have been defined, the 2014 Catalan WT

¹⁵ This assumption is consistent with the type of taxpayers that took part in the tax amnesty carried out by the Spanish government in 2012. Likewise, Alstadsæter et al. (2017) also show that are the wealthiest those who evade most of their wealth.

¹⁶ Taking into account the information declared in the inheritances tax returns, certain assumptions need to be made in relation to the main-dwelling residence and closely-held businesses.

¹⁷ There is also evidence of its use in the USA by the IRS (Johnson, 1998).

¹⁸ The net tax base is the tax base minus the tax-free allowance. The brackets of the net tax base have been defined every 100,000 euros.

taxpayers must be distributed in the same way. By comparing both distributions, we can identify the number of WT non-filers existing in each bracket¹⁹. As an example, if the histogram of the estimated population shows that there are 12,000 individuals allocated to the first tax base bracket, while in the histogram associated to WT taxpayers there are only 9,000 individuals in the first bracket, the resulting difference indicates that there are 3,000 WT non-filers in the first tax base bracket.

The last steps for calculating the WT non-filing tax gap include adjusting the average net taxable base of each bracket for undeclared assets both in WT and in IGT. These assets are mainly jewelry, antiques, etc. This is computed using the information obtained from the 2014 EFF detailed above. With the 2014 WT returns we also calculate the average tax rate associated to each bracket. Finally, for each bracket we apply the average tax rate on the adjusted average net tax base and then multiply the average tax liability obtained by the number of non-filers. The sum of the results computed for each bracket corresponds to the WT non-filing tax gap.

5.1.2. Results²⁰

Table 1 provides the main results of the WT tax gap calculations and its components. The gap associated with this tax, expressed as a proportion of potential revenues, is 44.34%. The component that explains most of the tax gap (97.28%) is under-reporting. Figure 1 details all tax gap sources. The most relevant is undoubtedly the existence of undeclared assets located abroad (explaining 56.40% of the total WT tax gap), followed by the incorrect application of the closely held business exemption (36.08% of the total).

HERE TABLE 1

Figure 2 shows tax gap calculations by wealth deciles. As expected, most of the tax gap is concentrated in the richest taxpayers since the imputations of the undeclared assets located abroad have only been applied to those located in the top of the distribution. The tax gap of the first decile is 100% because it includes only non-filers.

Figure 3 shows the gap by net tax base brackets. In contrast to Figure 2, we can see the gap decreasing as the base increases. This apparent contradiction can be explained by the fact that the taxable base does not include exempted assets, thus taxpayers with higher tax base are not necessarily the wealthiest. Exempted assets, particularly those related to closely-held businesses, can be very large²¹, so very rich taxpayers may be

¹⁹ In our estimations, we only look at the first three net tax base brackets, given that the differences between both distributions in these brackets were more prominent than in the succeeding brackets.

²⁰ To facilitate the reading of this Section, we will not show the interval results but only the main estimations. The results expressed in ranges are mentioned in the Introduction.

²¹ Mas-Montserrat (2017) shows that closely-held business exemption represents almost 60% of total assets for the richest 1% of 2015 Catalan WT taxpayers. Logically, this affects the possible redistribution intended to be achieved with the tax.

placed in the first brackets of the tax base, given that most of their assets are non-taxable. The result of the tax gap decreasing with the taxable base is due to two reasons: first, a portion of the taxpayers who are in the initial tax base brackets belong to the highest part of the wealth distribution and its tax gap is high due to the incorrect application of exemptions and non-reporting of assets located abroad, and second, all the WT non-filers are allocated to the first three brackets and for them the tax gap is 100%.

HERE FIGURE 1, 2 AND 3

5.2. Inheritance and gift tax

5.2.1. Methodology

In relation to the IGT, we have estimated the components of the tax gap derived from under-reporting and non-payment in the voluntary period, but not the non-filing component. This is due to our assumption, in agreement with the ATC personnel, that the impact on the tax liability of non-filer inheritors is highly insignificant, given that tax deductions were quite high in Catalonia in 2014 and there is a tax credit starting at 99% of the tax liability and decreasing with the tax base. Therefore, only very large bequests were levied by the inheritance tax. As mentioned in the previous section, we consider²² there are no non-filer inheritors in the upper part of the distribution. On the other hand, in terms of gifts, not reporting certain types of assets, such as cash or luxury goods may be more common. Given the difficulty to detect such types of gifts, we assume that at some point these objects are going to be transmitted via bequests and, therefore, we allocate them in the inheritance tax gap calculations instead of the gifts tax gap.

Under-reporting

The methodology followed for the under-reporting tax gap calculation is very similar to that implemented for the WT. The objective is to correct the IGT taxable base for the undeclared (or partially declared) assets that are a tax gap source. According to the ATC criteria, the main sources of inheritances under-reporting are: i) the non-reporting of unproductive assets such as jewelry, antiques, etc.; ii) the incorrect assets' valuation; iii) the existence of undeclared assets located abroad; and iv) the incorrect use of the closely held business tax deduction. Alternatively, the main sources of gifts under-reporting are: i) the incorrect assets' valuation; and ii) the incorrect use of the closely-held business tax deduction.

The general methodology followed to calculate this tax gap component for inheritances proceeds as follows: first, for each source of under-reporting, we compute the corresponding under-reported amount, which is then added to the estate initially

²² Again, according to ATC personnel.

declared. These imputations are not done at an aggregate level, but for each deceased, and later distributed among all heirs according to their initial estate portion. Next, we adjust tax deductions that might be a tax gap source (that is, the closely-held business deduction). Once the net tax base is adjusted with under-reported assets, we compute the resulting new tax liability and deduct the tax liability initially reported. Finally, we add the tax liabilities resulting from tax audits that have not yet been considered in the under-reporting tax gap calculations.

The main source of information used to calculate this tax gap component comes from anonymized 2014 IGT returns of Catalan taxpayers. In addition, for each source of under-reporting, different sources and methods have been used based on the information available. The computations associated with unproductive goods have been made using the same criteria and sources of information followed in the WT tax gap calculations (see Section 5.1.1 for more details). The only difference is when estimating the proportion of jewelry, art pieces, antiques, etc., over total assets; here we consider all wealth percentiles, instead of only the highest, as we did in the case of the WT.

In order to calculate the amount of the undeclared assets located abroad, we depart from the computations done for this concept in the WT tax gap (see Section 5.1.1 for more details). We calculate the total amount to be included in 2014 estates by multiplying the imputation made to each WT taxpayer with his mortality rate. Once the overall amount has been calculated, it is allocated among the wealthiest deceased proportional to their initial reported estate. Next, such imputation is distributed among heirs according to their initial estate portion. This procedure is followed in parallel with the two calculations of undeclared assets located abroad used in the WT²³. The results presented in the following sub-section are computed using an average of the two values.

With respect to the incorrect valuation of assets, we did not have detailed information to compute the corresponding adjustments. Therefore, we could only include the tax liabilities resulting from tax audits related to assessments in the tax gap calculations. While for the incorrect use of the closely-held business tax deduction, we have followed the same criteria used to calculate the WT tax gap (again, Section 5.1.1 for further details).

The methodology described, which has so far only been applied to inheritances, was meant to be applied to gifts as well. However, the limitations of gifts data led us to follow an alternative procedure to calculate the under-reporting tax gap. Instead of

²³ Own calculations based on the methodology proposed in Roine and Waldenström (2009) and the estimation of Zucman (2013 and 2014); see Section 5.1.1. for a detailed explanation.

correcting the tax base, we used tax audit information to directly adjust the tax liabilities²⁴.

5.2.2. Results

Table 2 provides the main results of IGT tax gap calculations. The gap associated with this tax, as a proportion of potential revenues, is 41.26%. As it happened in the WT, the component that explains most of the tax gap is under-reporting (85.64%). Figure 4 shows all tax gap sources. Similar to WT results, the most relevant is the existence of undeclared assets located abroad (in particular, it explains 37.35% of the total), followed by the incorrect use of the closely-held business tax deduction (29.11% of the total, taking into account both inheritances and gifts).

HERE TABLE 2

Figure 5 shows tax gap calculations by net tax base brackets. A large proportion of the tax gap is concentrated in the last bracket. In the case of inheritances, this can be explained by the existence of large tax deductions and tax credits for close inheritors (descendants, spouses and parents), while the case of gifts can be explained by the existence of reduced rates for close recipients. Consequently, the adjustments made have little impact on the tax liability of taxpayers located in the first brackets.

Figure 6 shows the tax gap calculations by kinship groups²⁵. One can observe that, especially in the case of inheritances, the tax gap is higher for group II (which includes descendants older than 21, spouses and parents). Group II also accounts for most of the tax gap share, which is an expected result considering that this group represents almost 90% of the tax returns and the tax bases declared in 2014²⁶.

HERE FIGURE 4, 5 AND 6

6. Conclusions

The analysis of the concept and characteristics of the tax gap allows us to highlight its usefulness as a management tool available to the tax administration, and as an

²⁴ Specifically, we computed the average ratio of tax liabilities derived from tax audits over the initial tax liabilities. This proportion has been applied to the tax liabilities of non-audited taxpayers who meet certain requirements with respect to the magnitude of the tax base and the application of closely-held business tax deduction. The application of this tax deduction complies with most of the audit reports. This is the reason why in the results (Figure 4) a distinction is made between this tax gap source and the rest of the tax audits which have not been used to make imputations for the other taxpayers.

²⁵ Group I refers to descendants younger than 21. Group II refers to descendants older than 21, spouses and parents. Group III refers to siblings, uncles, cousins and more distant relatives up to 3rd degree of relatedness. Group IV refers to relatives with 4th degree of relatedness or higher, or taxpayers with no family relationship with the deceased/donor.

²⁶ http://economia.gencat.cat/web/.content/70_tributs/arxiu/2017/Memoria_IS_meritacio_2013-2014.pdf

indicator to improve accountability to its citizens. This utility, however, it has certain limitations that we also want to point out. For one, it is an estimate that depends on, or is highly sensitive to, the methodology applied and the assumptions adopted, often conditioned by the availability of data. For another, its evolution over time, whether an upward or downward trend, not only depends on the efforts made by the tax administration, but also to external factors that may affect tax compliance.

Another contribution of this article is to propose a methodology for estimating the gross tax gap of *ad personam* taxes based on wealth, WT and IGT. In Catalonia, the gaps estimated for these taxes are above 40%, high values compared with the results obtained in other countries and for taxes such as personal income tax, corporate tax or VAT. As long as the tax administration calculates the tax gap periodically, the values can then be revised in the future if more information is available, or if the estimation techniques are improved. In this sense, we believe it is important to highlight that the usefulness in estimating the tax gap increases if its estimation is carried out regularly, in order to see how it evolves over time.

Pertaining to the results obtained, we emphasize that a very important part of the tax gap in WT and in IGT is due to the existence of financial assets located abroad and not declared. If we discount this component, the tax gap is reduced from 44.34% to 26.38% and from 41.26% to 29.67% for the WT and for the IGT, respectively. This result serves to corroborate the crucial importance of collaboration between tax administrations of different countries. At the same time, since an important part of the gap is caused by external factors and we still not have net tax gap nor gross tax gap estimations for an additional period, we cannot extract proper conclusions about the performance of the Catalan tax administration.

Finally, the estimation of the tax gap in two *ad personam* taxes, wealth and inheritances, which are justified by their redistributive functions, affirms that the tax gap not only erodes the public coffers, but also the redistributive capacity of the two taxes given the current regulation. Thus, the reduction of the tax gap would also contribute to improving the equity of our tax system.

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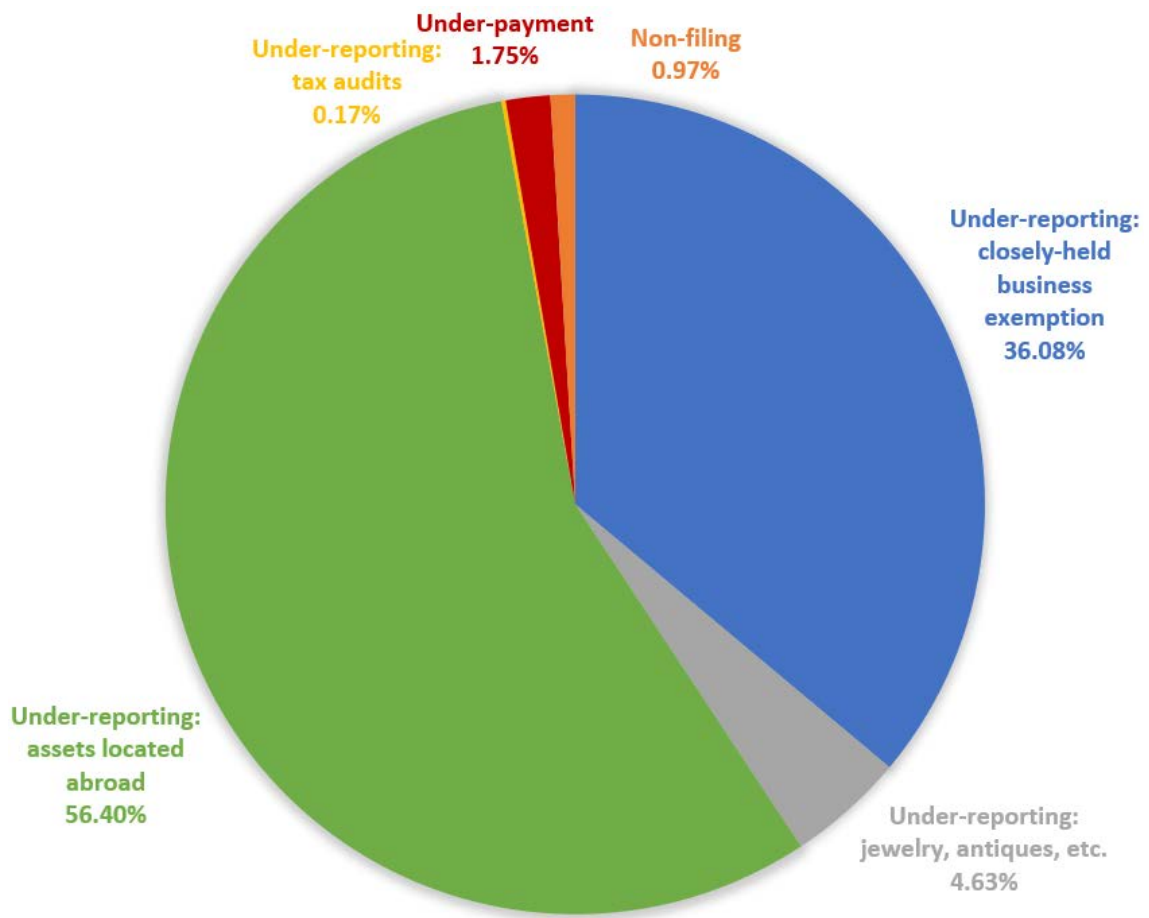
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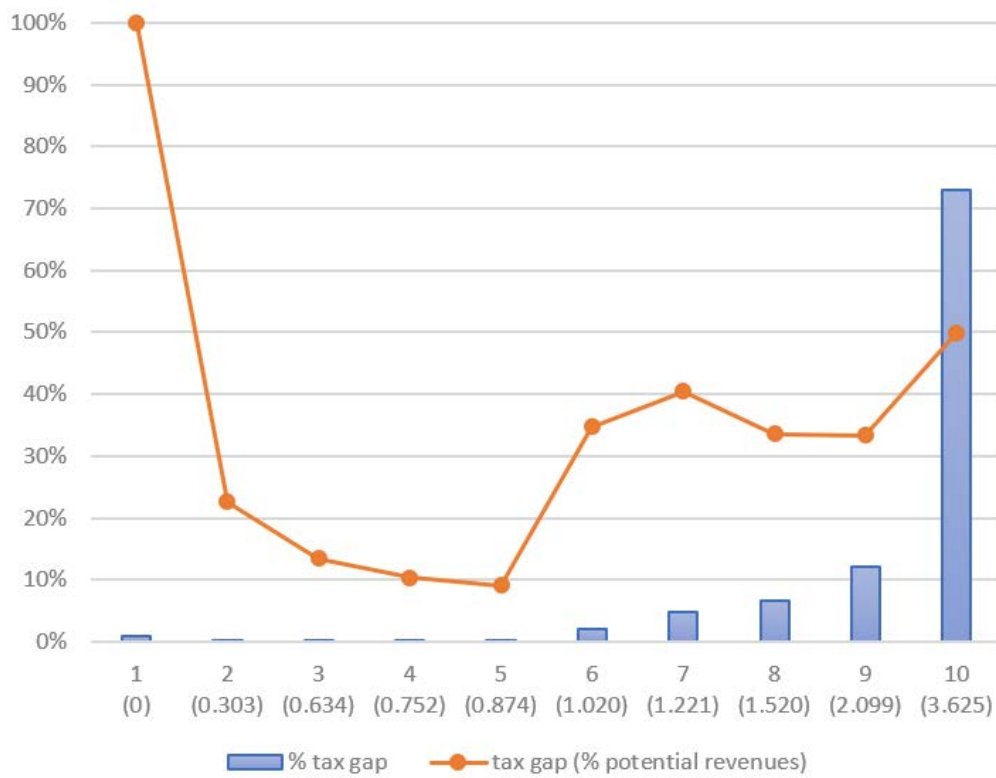
Table 1: WT tax gap. Main results

WT tax gap	Under-reporting	Non-filing	Under-payment	Total
<i>Value in 2014 euros</i>	331,629,153	3,304,866	5,961,432	340,895,451
<i>% potential revenues</i>	43.14%	0.43%	0.78%	44.34%
<i>% tax gap</i>	97.28%	0.97%	1.75%	100%

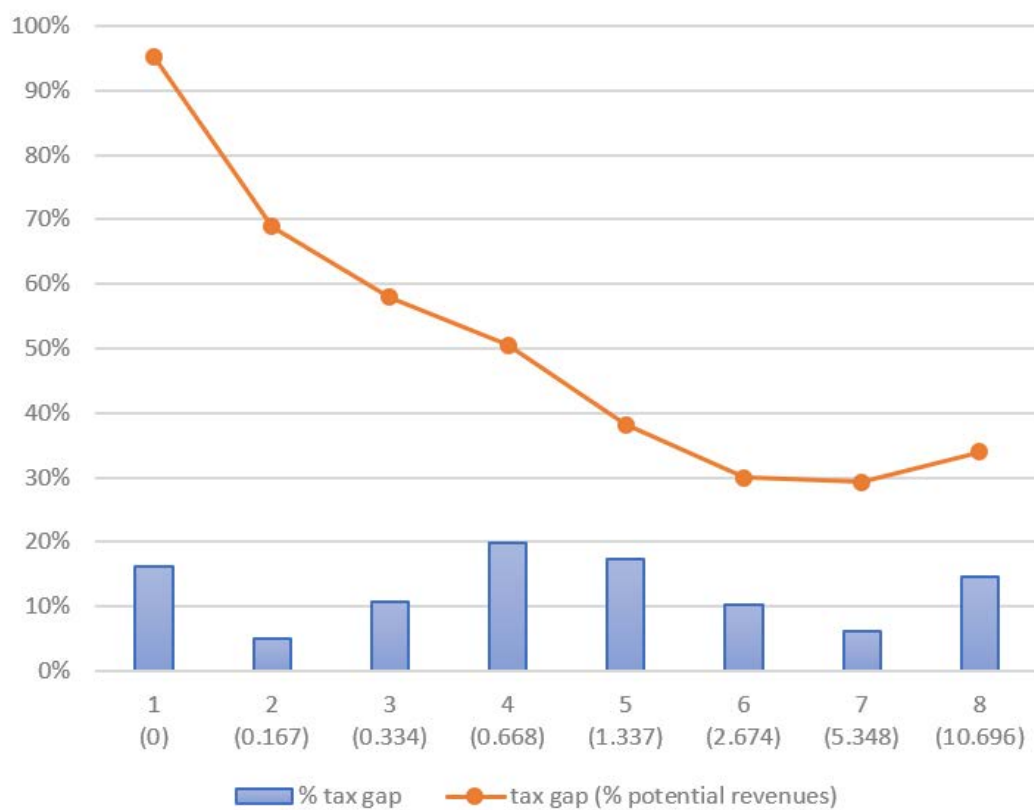
Table 2: IGT tax gap. Main results

IGT tax gap	Under-reporting	Under-payment	Total
<i>Value in 2014 euros</i>	238,013,631	39,902,512	277,916,143
<i>% potential revenues</i>	35.34%	5.92%	41.26%
<i>% tax gap</i>	85.64%	14.36%	100%

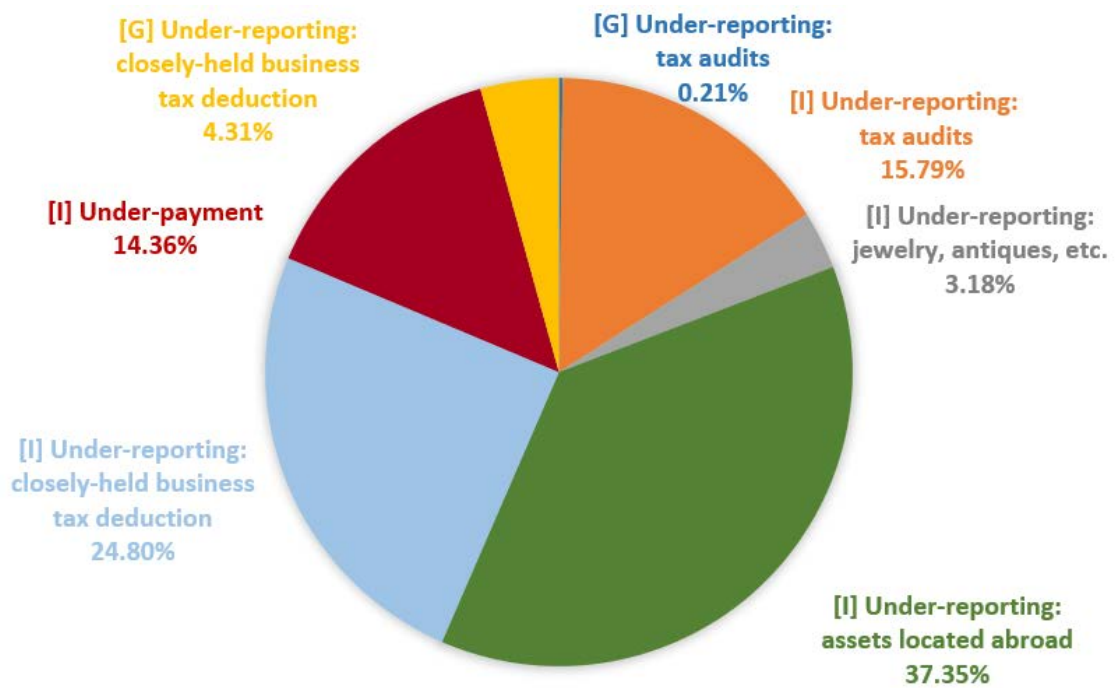




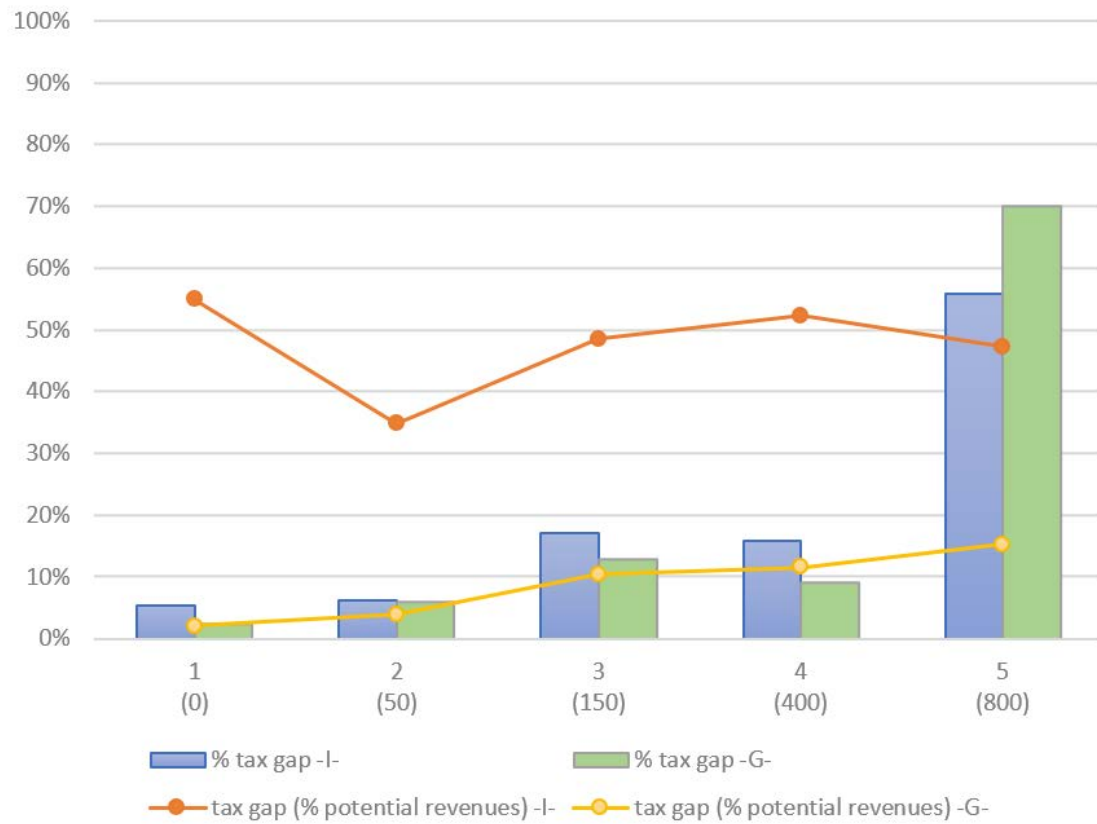
Note: Wealth deciles have been defined according to total wealth (taxable wealth + exemptions) initially reported by taxpayers. Numbers in parentheses indicate the lower bound of each decile, in million euros. The first decile tax gap is 100% given that it only includes non-filers.



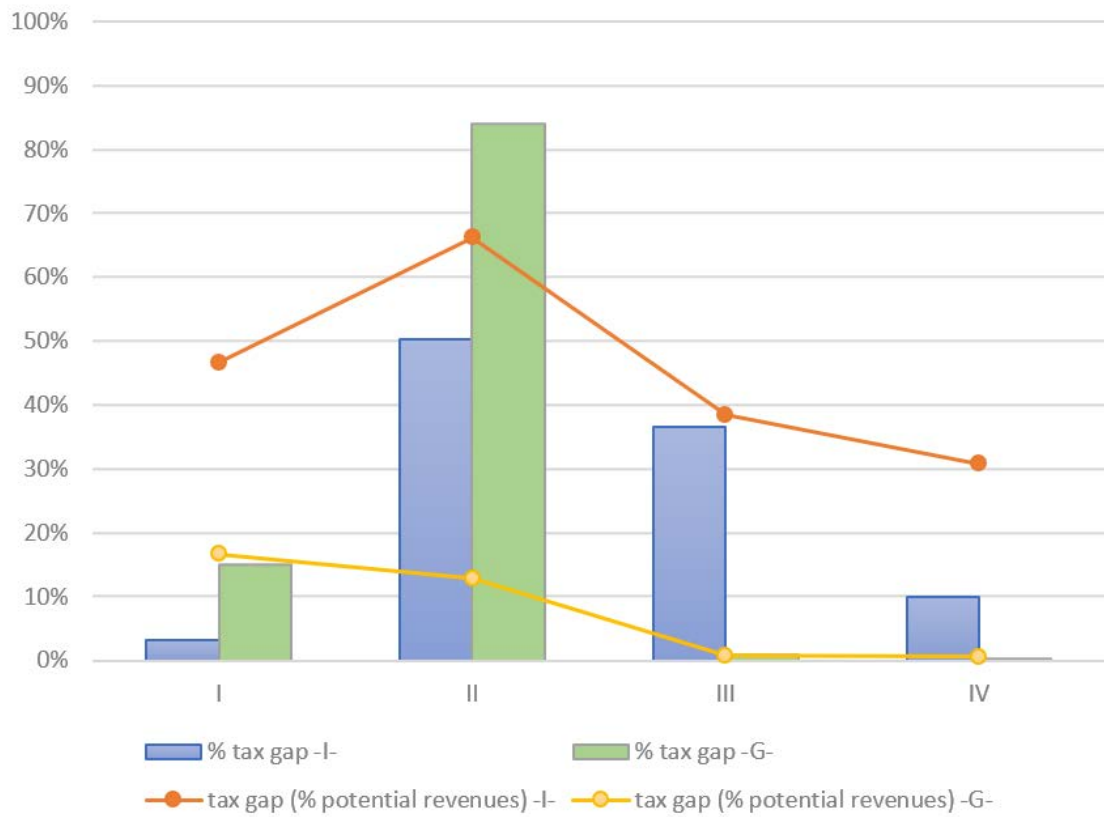
Note: Brackets have been defined according to the net tax base initially reported by taxpayers. Numbers in parentheses indicate the lower bound of each bracket, in million euros. Non-filers are distributed in the first three brackets.



Note: Tax gap composition has been distinguished between Inheritances [I] and Gifts [G].



Note: Tax gap calculations have been distinguished between Inheritances [I] and Gifts [G]. Brackets have been defined according to the net tax base initially reported by taxpayers. Numbers in parentheses indicate the lower bound of each bracket, in thousand euros.



Note: Tax gap calculations have been distinguished between Inheritances [I] and Gifts [G]. Group I refers to descendants younger than 21. Group II refers to descendants older than 21, spouses and parents. Group III refers to siblings, uncles, cousins and more distant relatives up to 3rd degree of relatedness. Group IV refers to relatives with 4th degree of relatedness or higher, or taxpayers with no family relationship with the deceased/donor.