Resources allocated to tackling the tax gap: a comparative EU study

---

November 2018
For comment and discussion

Authors

Prof Richard Murphy
City, University of London
richard.murphy@city.ac.uk

Dr Andrei Guter-Sandu
City, University of London
andrei.guter-sandu@city.ac.uk

Acknowledgements

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727145.

1. Abstract

Since the onset of the global financial crisis in 2008 and the development of austerity as a widespread economic strategy there has been continuing focus on the tax gap as an issue, which is the difference between the amount of tax that should, theoretically, be collected by a tax authority within the prevailing system that a tax jurisdiction has legislated for and the actual amount of tax collected. The efficiency, or otherwise, of a tax authority in tackling the tax gap has come to be seen as a measure of its effectiveness in raising revenue, whether to balance budgets or fund additional government spending. Despite this, relatively little formal attention has been given to technical dimensions of the tax gap, or to the link between that tax gap and tax authority spending. We have sought to address these last issues. In the process we have appraised the quality of the data available for this process, including whether available GDP data is reliable as a basis for estimation; whether data on tax collected is comparable and whether available data on tax authority spending is appropriate for this purpose. Data on estimates of the shadow economy have also been appraised as a consequence. Whilst it has proved possible to prepare new estimates of the tax gap for EU member states limitations in the resulting estimates are highlighted. In addition, weaknesses in all other data sources are noted, and their suitability is questioned. The resulting analysis of tax authority expenditure and its relationship to the tax gap is, consequently, heavily constrained, but in any event no apparent statistical association is noted. It is suggested that other approaches to the

management of the tax, and the effectiveness of tax authorities, are required, with a recommendation that tax spillover assessments be considered as an alternative.

2. Introduction

The fundamental hypothesis that the research underpinning this paper sought to test is that there might be a direct relationship between the level of expenditure that a jurisdiction commits to its tax authority and the size of the tax gap that the same jurisdiction might suffer. If true the obvious consequence would be that governments wishing to collect more funds to either balance their budget or to support additional government expenditure should commit greater resources to their tax authority. Instinctively the idea that those authorities enjoying a greater allocation of resources should suffer lower marginal tax yields, which would, however, be reflected in a reduced tax gap is economically appealing and consistent with most microeconomic thinking.

The planned work did require that there be relevant, reliable, consistent, comprehensive and comparable data on a number of activities to ensure that an effective appraisal could take place. Those activities included measures of gross domestic product (GDP), the shadow economy, or non-observed economy as it is sometimes called (NOE), tax yields by tax and the allocation of tax authority expenditure by jurisdiction. Information on the number of taxpayers and other related data was also considered to be useful for interpretation purposes. As it transpired, what was expected to be a relatively straightforward exercise when the research began proved to be anything but that as the research progressed as successive problems with data were encountered, as recounted in this paper.

The research that has resulted from this work does, as a consequence, focus as much upon the difficulty of appraising national income, the size of the shadow economy and the amount of tax collected by different jurisdictions, as it does on appraising how tax authorities use the resources available to them. This was not the research output that was anticipated when commencing this work. It is, however, suggested that given the significance of this issue the resulting work does highlight a failure on the part of governments and international agencies to address a matter of considerable importance within both national accounting and national resource allocation that must be corrected if the aim of improving the effectiveness of tax collection is to be achieved.

3. Assessing tax administrations' performance

The primary duty of tax administrations is to ensure the timely collection of tax revenues owing in a jurisdiction in accordance with prevailing tax laws (OECD 2017, 33). As a result of recent trends, however, tax administrations have found themselves in a double bind: at a wider level, they have been affected by the secular move in public administration towards 'new public management', which brought about an increased emphasis on accountability, transparency, and performance measurement (Osborne 2010), while at the operational level, they have had to confront cutbacks in resources, due not least to the fiscal strain effected by recent financial crisis which has left governments with escalating deficits and swelling debt (Alm and Duncan 2014). As a result, tax authorities face the pressure of increasing their revenue collection efficiency precisely at a time when they are not only bereft of the extra resources to do so, but also face the potential loss of their

existing ones. In other words, increasing pressure has been building up for tax authorities to do more with less. The underlying premise of this approach is, however, that firstly there is scope for tax administrations to step up their game, and that secondly the determinants of an efficient administration are known. Our object in this paper is to test these linked hypotheses.

In practice, most studies assessing tax authorities and system performance do not focus on these significant and important administrative issues. They do instead focus on external determinants of taxpayer behaviour, such as tax compliance and evasion. There is, for example, a significant literature gauging the extent of tax evasion and analysing the potential causes underlying it, and it generally spans demographic, cultural, behavioural, legal, institutional, and economic reasons (Tanzi 2017; Alm 2012; Slemrod 2007; Sandmo 2005). Despite the breadth of these studies, it has been reported that many still rely on Schneider and Enste's (2013, 2003) seminal and regularly updated surveys on shadow economies throughout the world (Khlif and Achek 2015). While there are many merits to using surveys as a methodology for estimating tax evasion, significant limitations to this approach have also been noted, especially reporting bias which might result in the overestimation of the issue (Fuest and Riedel 2010).

This concern has led to another body of literature on 'tax gaps' i.e. the difference between the theoretical amount of tax that should be collected by a tax authority during a year and the sum that is actually collected. Murphy and Petersen (2018) review both the manifold uses of this concept and the manner in which it has been employed by various tax authorities. They find that only eleven EU tax authorities prepare any tax gap estimates of their own, and that only one (the United Kingdom) does so annually for all major taxes. There is, then, a paucity of data available on the scale of the issue being faced when tackling the European tax gap. That said, the best estimates, for instance, of the VAT gap (which is the tax gap most widely covered), place it at between -1.4% (i.e. an over recovery, for Sweden) and 37.18% (for Romania) of total theoretically collectable of VAT revenues in 2015, with a total loss throughout the EU that might amount to €151.5 billion (EC DGT 2017). Murphy (2012) estimated the total EU tax gap over all taxes to be €1 trillion. Despite slow uptake and limited scope it is plausible that tax gap measurement methods will become a standard by which tax administration efficiency is gauged, but that is not the universal case at present.

What these studies have in common is their focus on looking at ways to improve tax collection performance by addressing the perceived determinants of tax evasion and, to a lesser degree, tax avoidance. In other words, they attempt to assess what decisive factors have an impact on compliance with taxation duties. This strand of research dates back to the 1970s, and is reviewed in an oft-cited paper authored by Jackson and Milliron (1986) which identified fourteen compliance variables most commonly referred to in the studies previously noted in this paper: age, gender, education, income level, income source, occupation, peer influence, ethics, fairness, complexity, revenue authority contact, sanctions, probability of detection, and tax rates. Over the following decade, some of these variables received increasing attention (e.g. ethics and income level), while others such as occupation or contact with the revenue authority were mostly buried. But even though the overall research volume increased, the findings regarding the validity or predictability of some of these variables were mixed (Sawyer 2001). Not much headway was made during this time in increasing the confidence as to the decisive factors generating compliance as a result.

Despite this, many subsequent studies built on these insights, and there is now a burgeoning literature on the multifarious dimensions that influence tax compliance and therefore tax collection. Deterrence models of tax evasion, for instance, focus on the effects of enforcement intensity and tax rate levels on compliance, and construe the latter as a product of a cost-benefit analysis based on the risk preferences of the taxpayer (Sandmo 2005; Slemrod, Blumenthal, and Christian 2001; Allingham and Sandmo 1972). Conversely, behavioural models eschew the rational, utility-maximising assumptions of deterrence approaches when it comes to the taxpayer (be it individual or business), and look at compliance as a more multifaceted phenomenon. For example, Frey (1997) makes a differentiation between deterrence elements such as harsh punishment associated with tax evasion laws, which he calls extrinsic motivation, and things like 'civic virtue', which constitute an intrinsic form of motivation, and should be placed on an similar footing with the former in its effect on compliance. It might even be the case that sometimes intensifying extrinsic motivation is counterproductive and leads to less compliance due to deteriorating intrinsic motivation (Lubell and Scholz 2001). Behavioural models also emphasise the importance of perceptions in compliance decisions. Some of these range from the perception of the fairness of the tax system itself, with perceived equitable taxation leading to more efficient tax collection (Falkinger 1995), to the perceived morality of the utilisation of tax revenues, with a negative perception – say, on non-defensive warfare – leading to less efficient tax collection (Daunton 1998), or simply the professed trust in government – more trustworthy governments seem to be, unsurprisingly, better honoured with compliance (Torgler 2003). Not least, an important factor is the extent to which tax evasion itself is perceived as a socially acceptable practice (Torgler 2004). This perception varies considerably throughout the world, and is of course correlated with the size and depth of the shadow economy.

In the end, both deterrence and behavioural models of tax evasion offer insightful information as to how to increase the efficiency of tax collection but it remains the case that the determinants in question only relate to external factors. In other words, they do not touch upon the role of tax administration in the efficiency of tax collection. To some extent, this is not a surprise: until the second half of the new millennium, data on the administration side was relatively scarce (Hasseldine 2007). This rendered the whole process of drawing reliable conclusions regarding the effects of taxpayer behavioural change on overall tax revenue rather difficult. The experimental studies done at the individual level remained simply indicative of micro-changes, and overarching or systemic conclusions stayed out of reach (Slemrod 2016). With time, though, tax administrations started reporting state-level tax-return data, and this equipped researchers with new statistical evidence upon which to base their analyses. This process was spearheaded by Nordic states (Slemrod 2016), but it soon spread to other developed countries, and it was not long before international organisations jumped on the bandwagon and started releasing supranational data aggregates, which would take the tax studies field to a whole new level.

The primary consequence was the first publication in 2004 of the OECD initiated the 'Tax Administration Comparative Information Series', which is an online database compiling information regarding various aspects of modern tax administration systems and includes trends, innovations, and best practices. Its latest report outlines data on tax administrations from 55 countries, and includes more than 170 data tables and more than 100 examples of innovation and practice in tax administrations (OECD 2017). The data categories have evolved through time, and now range from types of revenues and institutional arrangements, to allocated budget (on things like salaries, IT,

training), human resources (by function, gender, age, number of offices), taxpayer segmentation (by size, type, the number of high net worth individuals (HNWIs), registration, returns, enforcement, disputes, and others. These types of data were not all available from the beginning of the data series, but many fundamental ones have been produced throughout its history, which makes this database amenable to be used in longitudinal analysis. Alongside it sit other databases compiled by other organisations like the World Bank[1], the IMF[2], and EU's Directorate General for Taxation and Customs[3]. Nonetheless, none compare to the OECD's scope and degree of detail.

That being said, this profusion of data has not delivered much research investigating the relationship between tax administration capacity and tax collection efficiency. The academic literature on this subject, particularly, is patchy. One notable exception is the output of TARC – The Tax Administration Research Centre – which was formed in 2013 as a partnership between the University of Exeter and the Institute of Fiscal Studies (a UK independent research institute founded in 1969), which centre has the explicit remit to undertake academic research on tax administrations with a focus on of tax operations and policies. TARC is thus devoted to five research strands: understanding tax compliance, understanding tax behaviour, measuring the tax gap, understanding audit effects, and computable general equilibrium modelling[4]. Some research findings include the fact that taxpayer compliance is influenced by the pre-population of tax forms with incorrect values (Fonseca and Grimshaw 2015); that social norms campaigns can be effective in improving compliance (Onu and Oats 2014); that audits can have a long-lasting impact on reported tax liability, reaching 26 per cent by the fourth year (Advani, Elming, and Shaw 2015); and that superseding output-based performance measurements in tax administration and replacing them with outcome-based ones is not without its own negative ramifications (Boll and Oats 2014). The ongoing work that TARC undertakes is no doubt important for advancing and promoting the field of tax administration research, but as the noted descriptions of it its work make clear, it does not necessarily deal with determinants of tax compliance on the tax administration side, instead focussing, like the earlier work on improving tax efficiency, on external determinants of compliance.

There are a couple of researchers who have engaged with this issue. For example, John Hasseldine, who is a professor at the University of New Hampshire, and who he was a contributor to the Mirrlees Review of the UK tax system, suggested in the course of that review that the UK tax system was ripe for modernisation in order to benefit the UK's economic performance and improve living standards (Mirrlees 2010). While initially conventionally concerned with deterrence and behavioural models of compliance, Hasseldine then investigated so-called 'best-practices' in tax administrations (2007, 2010), which had to do with the internal management of running a tax agency. Issues he addressed included strategy and policy formation; planning, budgeting, resource allocation; monitoring and evaluation; co-ordination; and the management of finance, personnel, information technology and assets. He disappointingly concluded that there is not sufficient evidence as to what constitutes best practice in tax administration, and this is reinforced by a lack of academic research in the field (2010). There was, however, reason for optimism in his opinion given that tax

[1] https://openknowledge.worldbank.org/handle/10986/12094
[2] https://www.imf.org/en/Publications/Policy-Papers/Issues/2016/12/31/Enhancing-the-Effectiveness-of-External-Support-in-Building-Tax-Capacity-in-Developing-PP5059
[3] https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/taxation-trends-eu-union_en
[4] https://tarc.exeter.ac.uk/

administrations had begun information sharing on these issue. Despite this Hasseldine later argued that even in the case of the new methodologies for calculating tax gaps, if one does not take into account behavioural responses, then non-compliance will be exaggerated and attempts to address it will likely lead to worse rather than better outcomes for tax revenue because it will produce tax base-reducing effects (Gemmell and Hasseldine 2014). It seems the quest for identifying best practices in tax administration, at least independent of external determinants, is an inconclusive one.

James Alm and Denvil Duncan have addressed the issue of tax administration more recently than Hasseldine (2014). After noting, unsurprisingly, that there has been little research on the topic, Alm and Duncan argue that this is a worthwhile subject for research, especially in the context of the new data made available by the OECD in its data series on tax administration (OECD 2017). By utilising this resource, the relationship between administrative inputs (like personnel, equipment, and information) and outputs (i.e. revenues) can be associated. To investigate this linkage they constructed a three-step method that combined data envelopment analysis and stochastic frontier analysis to determine efficiency scores. The parameters they employed as inputs and outputs were salary and IT costs for the former and total tax revenues and a tax type breakdown for the latter. What they found was that "13 of the 28 countries are relatively efficient at collecting any of the three types of tax revenues" and that "on average, countries should be able to collect their current level of revenues with approximately 10–16 percent less inputs" (2014, 94). In other words, OECD countries sport an average performance that is high but not impressive in a context that includes non-OECD countries. Alm and Duncan's study is thus concerned strictly with measuring the relative overall efficiency of OECD tax agencies based on their adopted method, which implies that the weight of particular factors in tax administration is undetermined. To our knowledge, no other scholars developed this issue further.

To conclude this review, research on tax administration has mostly focused on external determinants of tax performance, with the old deterrence and behavioural models still constituting the basis for studying tax evasion/compliance. The extensive data on tax administration compiled by international organisations like the OECD has so far failed to produce as much academic research as warranted by the flurry of information. Despite the few studies that do grapple with internal determinants of tax collection efficiency, this, so far, constitutes a missed opportunity. It is this shortfall that we seek to address.

4. Methodology

It is our argument that assessing the efficiency of a tax administration is a more broadly based, and so complex, issue than most literature published on this issue has suggested to date. It is, of course, important that at a microeconomic level an appraisal of the effective use of the resources allocated to a tax authority for the purpose of collecting legally due tax revenues be undertaken so that the management of that authority, and those supervising them, can be assured that tax revenue is being maximised within an expenditure constraint. However, this is not the sole purpose of taxation within the macroeconomy. Murphy (2015) has argued that taxation has a much broader purpose, including redistribution of income and wealth; repricing market failure; reorganising the economy through

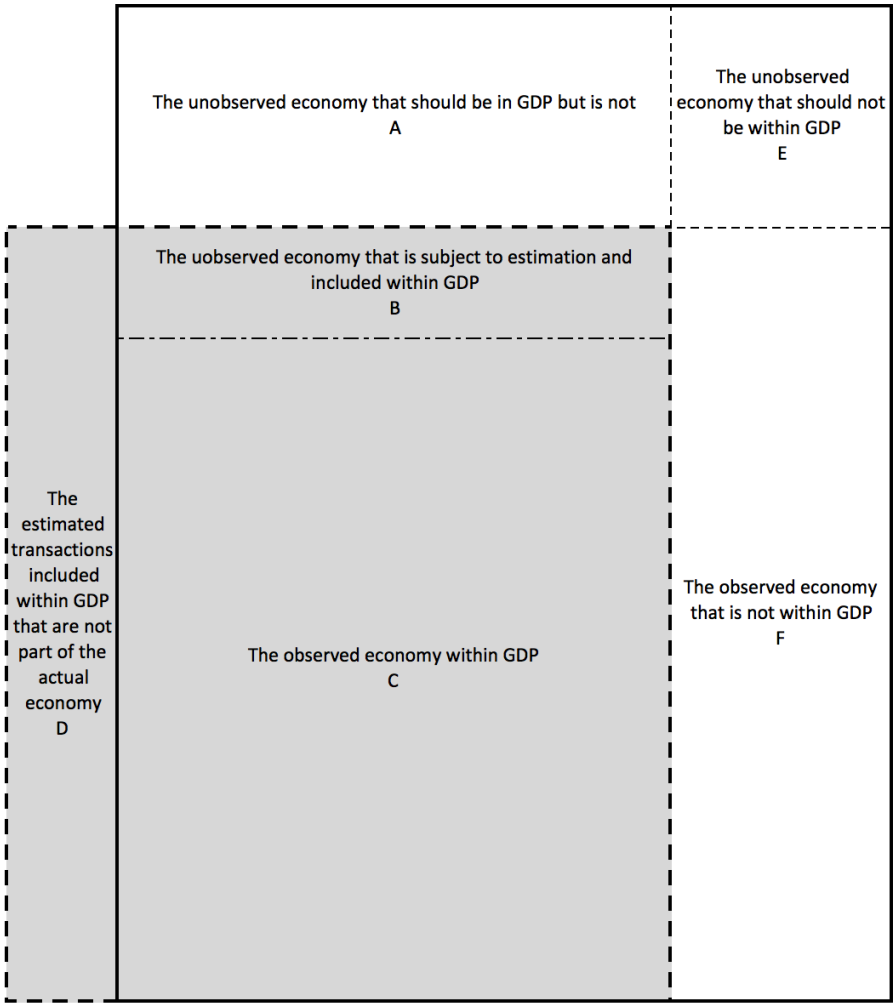
fiscal policy; the control of inflation by withdrawing money from circulation; providing money with value in exchange because of the requirement that it be used in settlement of taxation liabilities which then requires its use for other purposes, and in encouraging people to vote in democracies by engaging them with issues inherent in the social contract between taxpayers and the state. The first four of these, at least, are quite widely agreed upon. This does, then, imply that the review of efficiency of tax administrations has to be considered within the context of macroeconomic policy, as well as at the microeconomic level which has been, albeit rarely, the focus of attention to date.

The methodology that we use in this paper proceeds through a number of logical stages that relate the approach to the work that we have used and the issues that have arisen when doing so. Given that our approach is primarily intended to appraise the efficiency of tax authorities within a macroeconomic context we start with a consideration of data availability for this purpose at this level and as a result consider how tax fits into measures of GDP. This, almost inevitably, leads to a consideration of how the shadow or non-observed economy fits into such measures. Our intention in undertaking this review is to appraise whether or not measures of tax authority efficiency as indicated by revenue raised as a proportion of GDP and revenue lost to the shadow economy stated as a proportion of GDP can really be considered useful and to suggest what might need to be done to improve the effectiveness of such measures. This then leads to an appraisal of available data on tax collected, because without this information any analysis of tax authority effectiveness is not possible. Thereafter our primary concern is with data availability on particular taxes and the resources allocated to their collection to determine whether effective comparison of tax authorities at this level is possible. At this juncture the macro and micro analyses of tax authority efficiency coincide.

5. Tax and the macroeconomy

This approach does require an understanding of where and how the tax base fits into the macroeconomy. The figures that follow seek to represent this:

Figure 1 – GDP and its relationship to the macroeconomy



The macroeconomy is the bold outlined area (A + B + C + E + F).

GDP is a subset of the macroeconomy (B + C) plus some transactions the value of which are estimated and included in GDP but which are representative of values of self consumption but which do not as such represent transactions that can actually be observed within the actual economy (D). The obvious example is the inclusion of the annual value of an owner-occupier living in their own house being included in GDP as if rent was paid when this is not actually the case.

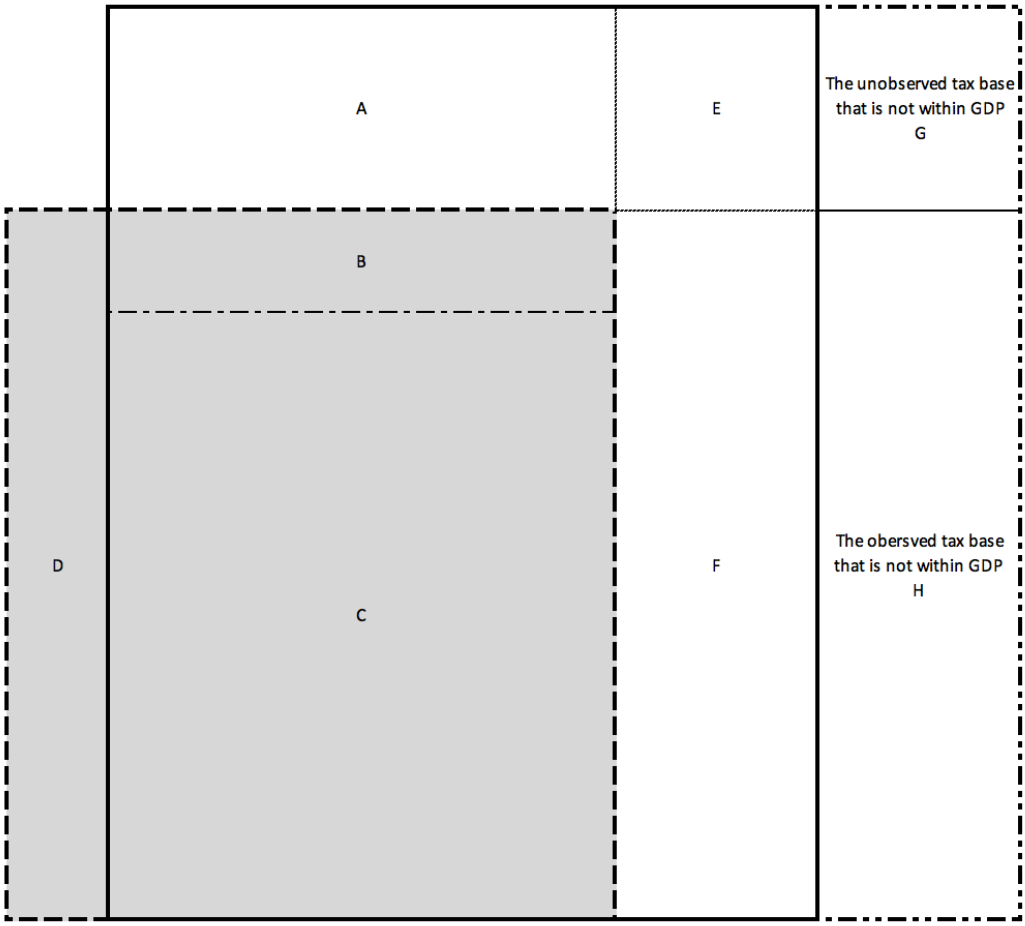
It will be noted that GDP estimates usually include an estimate that is meant to represent the shadow economy (B). However, as we note, this will in most cases be an under-estimate meaning that it is very likely that a part of the non-observed economy (A) will exist outside the measure for GDP.

As importantly, there are transactions within the economy that do not get recorded in GDP. By far the largest part of these transactions is work done within the household without motive for financial reward and without monetary exchange taking place, meaning that these transactions are always hard to detect. This is not to say, however, that they do not exist. GDP simply fails to record them, but they take place in every economy. Almost by definition they are untaxed. There are, however, other transactions within the economy that are correctly not within GDP but which are taxable.

Obvious examples are capital gains: these are profits arising on the sale of assets that do not add value to the economy but clearly do to the individuals who enjoy them. As a result many jurisdictions seek to tax them.

That said, if the perspective of the economy being taken here is based on the income statement (and it must be, since GDP is a measure of income) then there are also other transactions that are not within the economy at all when viewed from this perspective, and so not within GDP by default. These are added to diagram in Figure 1 as follows:

Figure 2 – GDP, the macroeconomy and the tax base



Each of the areas A to F has the meaning as in Figure 1. These additional transactions which can be subject to tax but which cannot be measured by GDP or any income based approach usually refer to balance sheet issues. So, for example, the taxation of wealth in its own right falls into this category. So too does a charge on the depletion of natural resources fall into this description of a tax base. Gift taxes also do so. All these relate to charges arising from the ownership, use or transfer of ownership of what are, in effect, balance sheet assets. They are as such a completely valid tax base that falls outside all measures of taxable capacity based on GDP.

These points being noted it is not true that the tax gap is represented by areas A + B + E + G. The sum of these areas might represent the unobserved value of tax bases in a period, but because a tax base is unobserved does not mean that it gives rise to a tax gap of similar value. As Murphy and

Petersen (2018) have argued, there are five tiers of tax gap. Their logic assumes in the first instance that all available tax bases are capable of taxation by default at a single standard tax rate (which need not be the same for each tax base) without any deduction for allowances, reliefs and exemptions. The five resulting tiers of tax gap are as follows:

1. **Tax voluntarily foregone** i.e. those tax bases that a government of a jurisdiction chooses not to tax for its own reasons. Wealth is an example of an untaxed tax base in many jurisdictions, but in other countries untaxed bases include capital gains, gifts and even income, whether recorded personally or by corporations. There is, of course, no compulsion on any country to tax if it does not wish to do so, but that decision has to be seen as having a cost: this tax gap records the cost of the decision not to tax at a representative tax rate;

2. **Tax spends** i.e. the cost of tax foregone from tax bases where the decision to tax has been made in principle but where allowances, reliefs, exemptions and other arrangements that have been officially sanctioned mean that the anticipated tax revenue due from the tax base is not collected as a result of a positive decision by the government of the jurisdiction in question not to do so. It should be noted that not all items caught by this measure need be a cost: if the measure is determined by variation from a standard tax rate then charges made at higher rates are recorded as negative tax gaps, or excess recoveries;

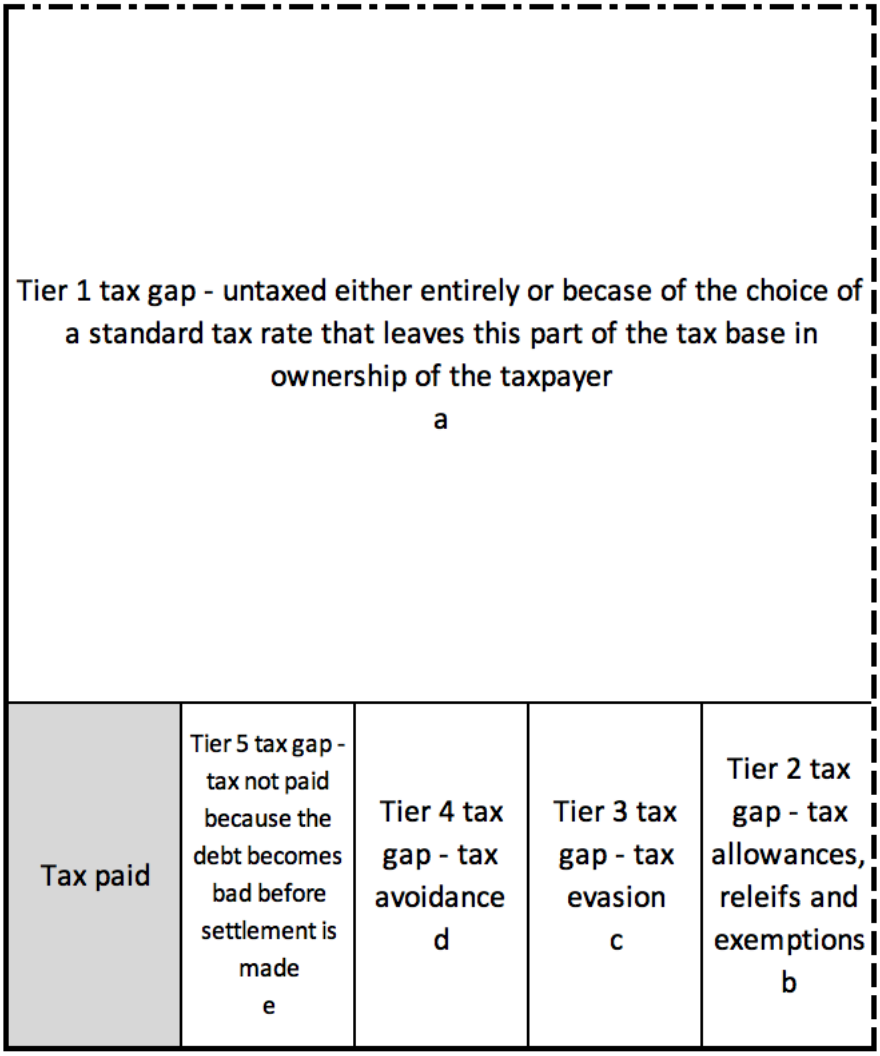
3. **Tax evaded**. This is tax due on those parts of tax bases that have been deliberately moved into the non-observed economy to avoid a tax charge. It can also include the cost of fraudulent claim for tax deductions, whether of false expenses or of allowances, reliefs and exemptions not due. It is, of course, the case that this relates to activity in areas A, B, E and G in Figure 2.

4. **Tax avoided**. This is tax not paid because whilst the economic activity to which it relates is within the recorded economy (and so within C, F or H) the transaction has been deliberately constructed in such a way that a tax charge anticipated by those who legislated does not become due. There are numerous reasons why this might arise: significant numbers of people within the accountancy and legal professions appeared to be engaged in facilitating such arrangements;

5. **Unpaid tax**. This is tax declared as a due by a taxpayer but then not collected by a tax authority when the sum becomes liable for settlement. Most commonly this is because of taxpayer default due to bankruptcy but it can also be the result of administrative and other errors by the tax authority. It is likely that only a tax authority can appropriately appraise this tier of the tax gap.

The result of applying this logic to just one part (area C, or the observed economy within GDP) of Figure 2 is as follows:

Figure 3 – The application of tax gaps to the observed economy within GDP



The representation here is, of course, symbolic, but it is intended to make three issues clear. The first is that because the tier 1 and tier 2 tax gaps are within the control of a government they have much more control over tax revenues than is commonly thought. Together these two tiers of the tax gap are usually described as the 'tax policy gap'. Secondly, tiers three four and five of the tax gap are collectively called the tax compliance gap. These are the only parts of the tax gap where it is appropriate to consider questions of the efficiency of a tax authority. Thirdly, and as this analysis is intended to make clear, even then the consideration to be used should be macroeconomic, at least in overview.

At this macroeconomic level assessment of the efficiency of a tax administration does then requires the collection of data on six essential key variables. These are:

1. total tax yield (ideally but not vitally broken down by tax);

2. GDP (A + B+C in figure 1);

3. the share of the non-observed economy included in that estimate of GDP (B in figure 1);

4. the size of the shadow economy in proportion to GDP (A in figure 1);

5. the cost of labour engaged to collect the revenues raised, and

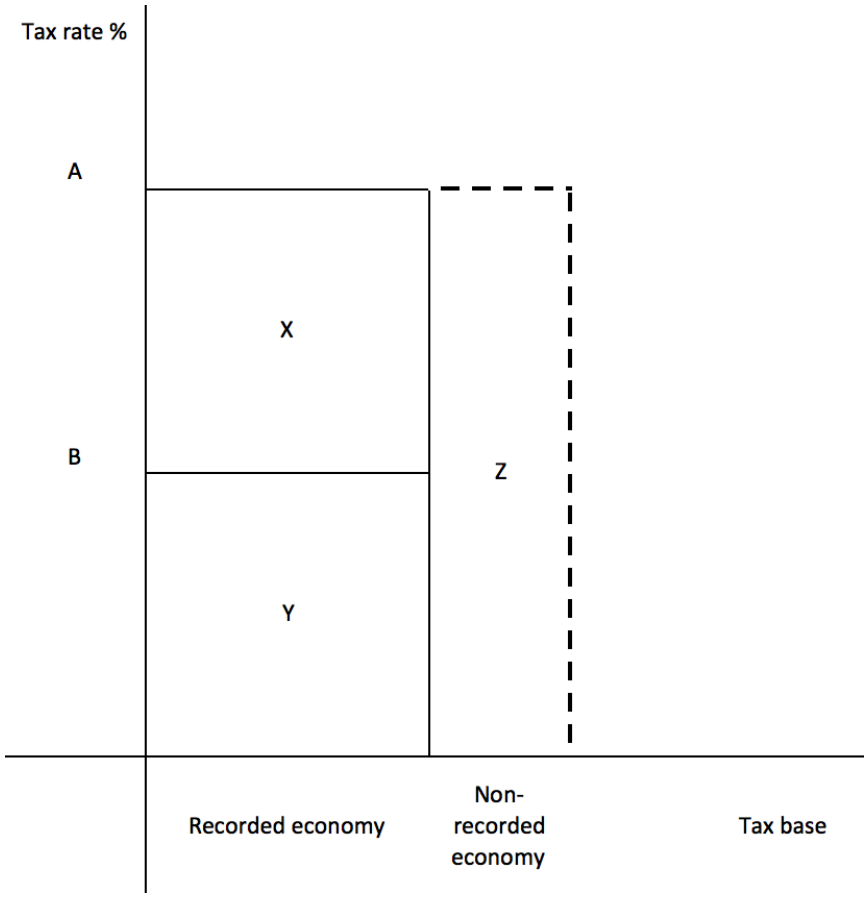
6. the overhead costs of the tax administration.

This data might, if considered to be of appropriate quality, be used for four purposes. The first is an assessment of the tax authority's ability to raise revenue as a proportion of GDP. The second is to appraise its ability to control the shadow economy, which is that non-observed activity motivated by the intention to evade regulation various forms, all of which will result in non-payment of tax (Schneider et al 2010, 5). Thirdly, it might be argued that it should be about the ability of a tax authority to deliver upon the government's revenue projections as part of its overall macroeconomic policy. And only fourthly might it be considered appropriate to appraise the cost effectiveness of the tax authority in fulfilling these other objectives. It is effectiveness against the achievement of these varied objectives that we have sought to appraise when undertaking this work.

This then leaves three further issues to consider. The first is whether nationally reported GDP can appropriately be used as the basis for the calculation, or whether it should be grossed up for the estimate of the shadow economy that is likely to be excluded from that figure for the reasons noted in this paper. The second is whether the aggregate tax rate based on reported GDP is to be used as the basis for extrapolation of the tax lost to the shadow economy or whether some other sum should be used taking into consideration the issues noted later in this paper. The third, and perhaps most important, is whether or not there is in fact any aggregate tax loss at all because a government does not collect tax for its own sake but does, instead, do so to collect a targeted sum that achieves its overall fiscal goal, which will usually be related to its planned surplus or deficit. In other words, whatever the result of the first two deliberations the question has to be asked as to whether the loss that can be calculated is meaningful at a macroeconomic level because if all illicit financial flows which are at present untaxed were identified, and brought within the tax base, the realistic possibility exists that the overall tax yield might remain unchanged.

This last point is explored using figures 4 and 5:

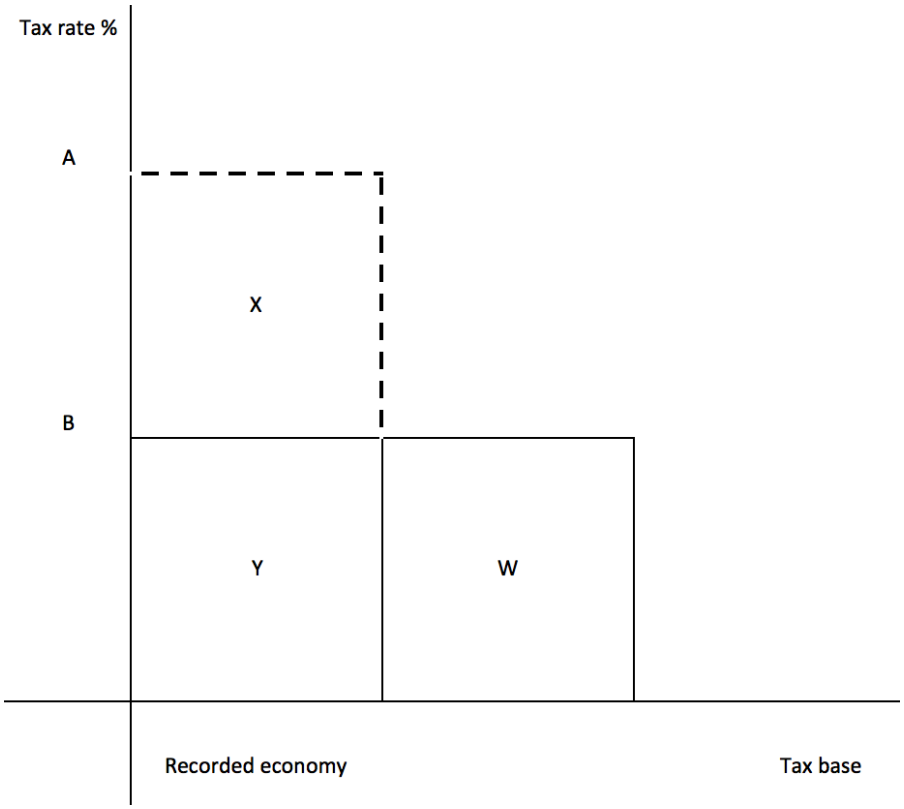
Figure 4 – tax collection when there is a shadow economy



In this stylised presentation of tax revenue collection the sum collected (X + Y) is the tax base in the recorded economy multiplied by tax rate A to produce an overall yield. The tax gap is represented by the tax base in the non-recorded economy multiplied by tax rate A, and is represented by the area Z.

In figure 5 it is assumed that there is no activity in what was previously the non-recorded economy, all of which is now transparent and so subject to tax:

Figure 5 – tax collection when there is no shadow economy



The size of the recorded economy has now expanded. However, there is no reason to assume that the overall size of the actual economy has changed. As a result there is also no reason to assume that the overall tax yield that the government might plan has changed. That is because with no change in overall economic activity there is no necessary reason for the government to spend more or less, and therefore to change its tax plans simply because more revenue is potentially available. The consequence might then be that a government in this fortunate situation would decide to not increase its total tax revenues but might instead reduced the tax rate from A to B, as figure 5 indicates, with those in what was previously the unrecorded economy now making a tax contribution of W, which happens in this stylised presentation to equal the amount uncollected noted as Z in figure 4. In other words, in this representation:

$$Z = W$$

And:

$$X + Y = Y + W$$

Meaning that:

$$X = Z$$

In other words, the tax gap is not foregone, but what actually happens is that the tax not paid by those in the illicit economy is instead made good by an excess charge on those in the recorded economy who are tax compliant. The tax gap, seen in this way, is not then an issue of lost revenue; it

is instead an indication of the inequality created by those who do not comply with the requirements of the tax code. It is stressed: this is not to belittle the issue; rather it is to suggest that the consequences of tackling the tax gap a greater the micro economic efficiency, or even macroeconomic possibility. Tackling the tax gap is also a matter of significance for those with concern about social and economic justice.

Of course, it is unlikely that the transition from the position represented in figure 4 to that in figure 5 would actually take place in any real economy: the chance that all economic activity will become observable is remote in any jurisdiction, but this does not remove the relevance of the explanation. That relevance is that if the illicit economy can be stated as a percentage of the existing GDP, assuming that stated GDP includes little or no estimate of that illicit activity, then when multiplied at the prevailing tax rate the estimated tax revenue foregone as a consequence of that part of the economy not being recorded can be estimated, and is equivalent to Z in figure 4. This then answers the first two points noted: knowing the proportion of the illicit economy included in GDP is only of significance if that proportion (B in figure 1) is itself significant. If it is not then if tax collected within the jurisdiction is appropriately stated, and recorded as a proportion of GDP, a useful estimate of the tax gap can be prepared from these sources alone.

What does also need to be stressed is what the term 'useful' means in this context. It is suggested for this purpose that useful data has the qualities of being relevant, reliable, comprehensive in terms of types of data covered, complete as to availability of data for those sources, comprehensible in isolation and comparable over time and with other not dissimilar analyses. Each of these qualities is defined in relation to the use that is to be made of the information. That begs the question as to what use might be made of tax gap data. On this issue the UK's tax authority say "The tax gap provides a useful tool for understanding the relative size and nature of non-compliance. …. [I]t provides a foundation for HMRC's strategy. Thinking about the tax gap helps the department to understand how non-compliance occurs and how HMRC can address the causes." (HMRC 2018, 3). This is one, very clear, microeconomic perspective on this issue. In contrast, the Fiscalis group of EU member states that have jointly considered tax gap appraisal said of the reasons for assessing VAT gaps that "Effective collection of taxes is a cornerstone of a fair taxation system. Taxes that remain unpaid cause revenue loss in the budget of Member States and may lead to an excessive burden on the honest taxpayers who correctly fulfil their tax obligations. Furthermore, effective collection of taxes is essential for level playing field and avoids economic distortions." (Fiscalis 2016, 11). Both purposes are equally valid. However, they require quite different information.

The need that HM Revenue & Customs specifies is best met by bottom-up data i.e. an appraisal of the effective management of data supplied in tax returns actually collected. The need noted by the Fiscalis group cannot be effectively met in that way. That is because most bottom up analyses are only prepared for particular taxes, and not the system as a whole, which is why the UK's tax authority continue to include a significant number of what they describe as 'illustrative estimates' in their annual tax gap appraisals (HMRC 2018). The data is, therefore unlikely to be comprehensive. In addition, because the data in bottom-up analysis is very largely based on tax returns received it is unlikely to be complete with regard the shadow economy, and nor is it therefore relevant or reliable for assessing macro economic issues, whilst the fact that the tax base will vary considerably between different countries also makes comparison between estimates prepared on this basis unlikely to be

useful. In contrast, data on GDP and tax revenues collected is available for most countries (subject to the points made elsewhere in this paper) meaning that estimates prepared based on such sources are likely to be useful for macroeconomic decision-making purposes with regard to tax issues. It is suggested that a top down approach to tax gap estimation is to be preferred if the data is to be used for macroeconomic management of the economy but that bottom-up analyses have a use for the appraisal of the effectiveness of tax authorities.

6. GDP Data issues

If a GDP based approach to tax gap estimation is required to provide useful data to appraise relative tax gaps and what might be done about them the quality of the data available to undertake this exercise must be assessed.

There is remarkable unanimity with regard to European Union GDP data. Using 2015 data as the basis for research, because it is the most recent year for which OECD tax authority data is available at the time of writing, the Eurostat GDP data that has been used in the analyses we have undertaken because it is almost identical, barring what must be tiny exchange differences, with that published by the IMF, World Bank and United Nations based on our currency conversions. At this level there appears to be total unanimity on the available data, albeit that this does in all likelihood simply indicate willingness to utilise EU member state nationally published information. This is, perhaps, not too surprising. Each officially subscribes to a common framework for national income reporting that was relatively recently updated (Eurostat 2013).

The more difficult question that then follows is whether this accord on published GDP data actually reflects what is happening in the jurisdiction to which it relates? This raises the question of the extent to which the published estimates of GDP (and it should be noted that all GDP figures are estimates) reflect activity in the shadow economy of the countries that publish them, and whether those estimates are themselves consistently prepared. There is surprisingly little literature on this issue, and much that there is has been published by the International Organisations that regularly publish comparative GDP data. So, for example, Eurostat devote a small mention of a few paragraphs to the issue in their guide to the accounting requirements of EU member states (Eurostat 2013, 310). In this they suggest that the:

> *Value of production activities that are not directly observed are, in principle, included within the national accounts production boundary. The following three types of activity are therefore included:*
>
> *(a) illegal activities where the parties are willing partners in an economic transaction;*
> *(b) hidden and underground activities where the transactions themselves are not against the law, but are unreported to avoid official scrutiny;*
> *(c) activities described as 'informal', typically where no records are kept.*
>
> *In principle, the remuneration of these workers is included in compensation of employees or mixed income. This adjustment is to be taken into account in the data on employment and self-employment when calculating ratios and other statistics.*

They add:

> *Illegal activities where either of the parties are not willing participants (e.g. theft) are not economic transactions and so are not included in the production boundary*

Perhaps the most important words in their commentary are 'in principle' since it is not apparent from this guide how such activities are in practice to be accounted for. In practice the United Kingdom's Official for National Statistics gives some indication of is approach to this issue when saying that from 2015 onwards it would when preparing UK national accounts:

> *replace the existing National Accounts concealed income/activity model with a new, more comprehensive model based, in part, on analysis by Her Majesty's Revenue and Customs (HMRC) of evaded corporation and income tax and update existing estimates of missing production by unincorporated businesses below the VAT and/or PAYE thresholds using updated administrative data provided by HMRC. (ONS 2015)*

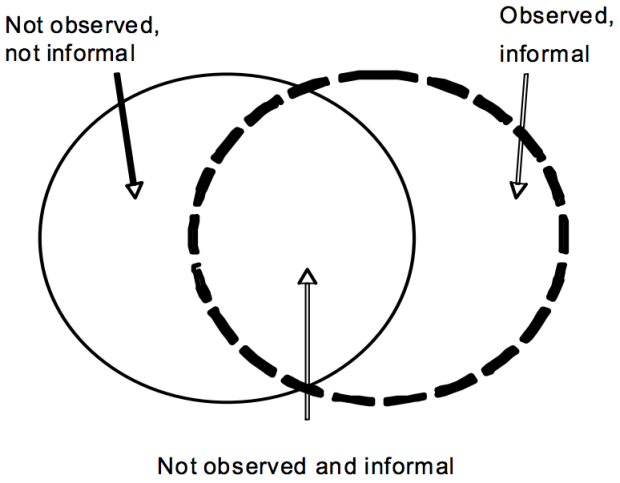
The problems with this approach are immediately apparent. Firstly, the UK is alone in the EU in undertaking annual tax gap appraisals, and most member states have done none at all (Murphy & Petersen 2018, Fiscalis 2016). Secondly, the assumption is that the HM Revenue & Customs estimate of tax evaded, based as it is on tax returns submitted to them, is adequate. This is open to doubt (Murphy 2014). Thirdly, tax data which may itself be incorrect because it does not appropriately record the activities of small and medium sized entities is used to make good the deficiencies in recording their activities in GDP data. The likelihood is that the UK GDP data is substantially under-recorded as a result. This impression is reinforced by the observation by HM Revenue & Customs in their own note on their tax gap methodology, where it is admitted that significant parts of their data are made up of 'illustrative estimates' or are based on 'developing methodologies' i.e. there is no robust estimate available at all (HMRC 2018, 16).

The OECD has noted (Blades and Lequiller, 2014) that the shadow, or non-observed economy (as they prefer to call it) is made up of two parts. One is illegal activity, such as prostitution and the trade in illicit drugs. These authors suggest that this amounts to less than 1% of GDP in most countries (Blades and Lequiller 2014, 109). They do not provide a source for this opinion. They then add that the second part of non-observed activity comprises unrecorded but otherwise legal activity, which they suggest might vary from between 2% and 15% of the GDP of OECD countries. They explicitly suggest that the gap for Spain at the time that they wrote might be 11.2%. They also note (Blades and Lequiller 2014, 123) that the adjustment in GDP for the non-observed economy is in the case of France 4%, but that this is 'just an approximation'. These authors also admit that such estimates should also include allowance for the faults in statistical methods in recording all activity. In so doing it would seem that they base their work on that of the United Nations in its work on Systems of National Accounts (United Nations 2009).

This UN report, which was co-published with the European Commission, International Monetary Fund, Organisation for Economic Cooperation and Development and World Bank, appears to be the most recent attempt by International Organisation to appraise this issue. It has a slightly different

focus from the OECD, separating non-observed activity between the formal sector and the informal sector, each of which can be observed and unobserved. It does not, as such, address illicit activity, making it clear that a focus on developing countries (which the OECD does not have) requires this difference of emphasis (United Nations 2009, 471). The result is that it suggests that the non-observed economy can be identified in this way:

Figure 6



Source: United Nations 2009, 471

The issue of significance here is that the informal, formal and non-observed sectors can overlap because of the difficulty in identifying boundaries between the two, most especially when many small enterprises will often declare a part but not all of their income (Slemrod 2007) and that the not-observed sector can therefore comprise parts of both, most especially when survey based research can identify some parts of the informal sector for inclusion in GDP estimates.

Eurostat also reference this issue in a website discussion[5]. Their discussion, like the other sources noted, is light on noted data sources, barring the UN paper (2009) and adds almost nothing to knowledge on this issue. This, however, is misleading as in practice Eurostat do, according to Andrews et al (2011, 12) record the informal sector in EU member states under seven headings within their accounting framework. These are:

1. Producers not registering to evade tax or social security obligations;
2. Producers not registering because their activities are illegal;
3. Producers not required to register e.g. because they only make goods for home consumption within the family unit;
4. Producers not surveyed for national accounting purposes either because it is not economically worthwhile to do so as the entities are small or registers of entities are out of date;
5. Producers not surveyed due to statistical errors;

[5] https://ec.europa.eu/eurostat/statistics-explained/index.php/Building_the_System_of_National_Accounts_-_non-observed_sector

6. Producers deliberately under-reporting despite being surveyed to under-declare tax liabilities;
7. Other statistical mistakes.

This approach is reflected in their definition of the non-observed economy which they define as follows (Eurostat 2018):

> *Non-observed economy (NOE) refers to all productive activities that may not be captured in the basic data sources used for compiling national accounts. The following activities are included: underground, informal (including those undertaken by households for their own final use), illegal, and other activities omitted due to deficiencies in the basic data collection program. The term 'non-observed economy' encompasses all of these activities and the related statistical estimation problems.*

The definition is interesting but because of its breadth little practical use for appraising illicit flows arising in shadow economies: activities undertaken for own consumption clearly do not contribute to this. In addition, the recognition that data deficiencies contribute to the NOE adds little to the usefulness of this definition.

More tellingly, Andrews et all (2011, 13) note that 'Although estimates of the non-observed economy provide a useful gauge of informality, these estimates are not typically available from national statistical offices, and in the event that they are available, differences in methodological approaches may hinder cross-country comparisons. Moreover, the estimates include other statistical deficiencies not related to informal activities'. Given that these authors were writing quite recently for publication by the OECD what is apparent is that just how reliable GDP data might be on this issue is exceptionally hard to assess. Recourse has then to be made to other sources to determine what that proportion should be.

7. Tax data issues

There are, as noted, issues of concern with regard to GDP data when seeking to determine whether or not it includes reasonable estimates of the illicit financial flows within EU member states, or not. Before resolving the conundrums this creates it is also appropriate to note that other data concerns do also arise when seeking to prepare macroeconomic estimates of the tax gap. In particular, there is surprising difficulty in securing what appears to be reliable data on tax yield for each EU member state, whether in total or by tax. There are also significant apparent differences in recorded data on the number of taxpayers making contribution to such yields. This is a matter of importance. If the scale of the tax lost can be assumed to be best estimated by multiplying the value of flows in the NOE, or shadow economy, by the aggregate tax rate, which itself is determined as the percentage of GDP that aggregate tax revenues for each jurisdiction represent, then ensuring that the aggregate tax take is properly stated is a matter of some significance in this calculation. We assumed when starting this work that there would be no problems arising on this issue. In practice this assumption has proved to be misplaced.

The work in which this paper is based was, at least in part, motivated by a desire to appraise the efficiency of the EU's tax authorities. The best available data on tax authority activity has been published by the OECD (2017). Included in that publication is data on tax yield by member state. When using this data we noted apparent discrepancies with some national data. This led us to investigate alternative sources of information. Two were identified. One was the annual publication of the European Commission's Taxation and Customs Union surveying the tax administrations of the EU, which includes statistical data on revenues collected by each EU member state (European Commission, 2017). This data is expressed as a proportion of GDP. We translated it for the sake of comparison into monetary totals, aided by the consistent reporting of GDP in the European Union, previously noted. The other available database its that published by the International Centre for Tax and Development at the University of Sussex and now maintained by the United Nations University (UNU-WIDER, 2017). This includes all EU member states. As with the EU data, this dataset expresses revenues collected as a percentage of GDP and this data has, again, been translated into monetary values for the sake of comparison with OECD data. It should be noted that the data within this UNU-Wider database has been collected from a variety of sources. The most common source for EU member states appears to be the OECD. The principle alternative is the IMF's Government Finance Statistics database. Data for Croatia fro 2015 was not available from UNU-Wider and that for 2014 for this country alone has been used instead. As it became apparent that these data sources were all providing different indications of total taxation revenues by state and type of tax an additional bench mark test was also made: the reported tax revenue for the UK for its tax year 2015 - 16 (admittedly ending 31 March 2016, but the only reliably published data for this country) has been compared with each other source to test their reliability (Office for Budget Responsibility 2017).

The result of comparing these various data sources was surprising. All data is expressed in millions of euros, with the exchange from UK pounds (when required) being made at European Union official exchange rates:

Table 1 Total tax revenues by EU member state as reported by differing data sources (Euro'm)

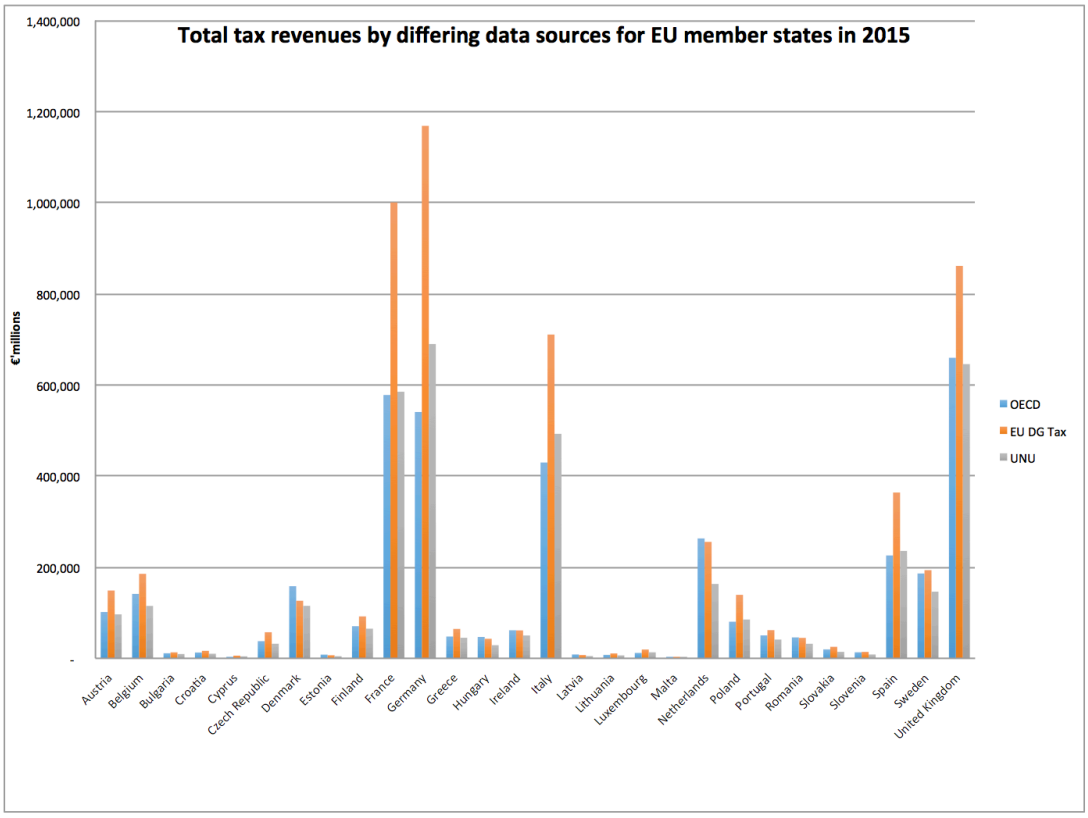
	OECD total revenue	EU Total revenue	UNU total revenue
Austria	101,655	148,821	96,620
Belgium	141,406	185,451	115,012
Bulgaria	11,142	13,178	9,517
Croatia	12,769	16,518	10,162
Cyprus	3,104	5,890	4,347
Czech Republic	37,683	57,281	31,970
Denmark	158,363	126,377	115,249
Estonia	8,196	6,857	4,556
Finland	70,471	92,016	65,087
France	577,977	1,000,575	585,175
Germany	540,666	1,168,762	689,791
Greece	47,875	64,530	45,124
Hungary	46,951	42,960	28,828
Ireland	61,616	61,317	50,211
Italy	429,765	710,628	492,733

Latvia	8,564	7,320	5,019
Lithuania	7,656	10,816	6,452
Luxembourg	11,874	19,382	13,242
Malta	2,381	3,055	2,504
Netherlands	263,149	255,613	163,339
Poland	80,372	139,338	85,132
Portugal	50,357	61,854	41,206
Romania	45,956	44,888	31,936
Slovakia	19,658	25,326	14,261
Slovenia	13,293	14,214	8,463
Spain	225,764	363,959	235,776
Sweden	186,230	193,525	146,358
United Kingdom	659,654	861,308	645,771
	3,824,547	5,701,760	3,743,843

Sources: as noted

The differences are apparent when expressed graphically:

Figure 7



Sources: as noted in the text

The comparison with UK official data was as follows:

Table 2

Variously recorded tax revenue of the United Kingdom in 2015

	OECD	EU	UNU	UK
	€'m	€'m	€'m	€'m
Total revenues	659,654	861,308	645,771	867,960
Personal income tax	224,705	236,795	235,418	232,696
Corporate income tax	57,037	65,053	63,745	62,824
VAT	120,830	176,945	198,272	179,792
Social security	148,793	161,333	199,676	157,197
Total excl. overall revenues	551,365	640,126	697,110	632,509

Sources: as noted in the text and authors' calculations

Expressed as percentage variances from the UK's officially reported revenue for the tax year in question these are as follows:

Table 3 - Reported tax revenues from the UK expressed as a percentage of UK source data on those revenues

	OECD	EU	UNU	UK
Total revenues	76.0%	99.2%	74.4%	100.0%
Personal income tax	96.6%	101.8%	101.2%	100.0%
Corporate income tax	90.8%	103.5%	101.5%	100.0%
VAT	67.2%	98.4%	110.3%	100.0%
Social security	94.7%	102.6%	127.0%	100.0%
Total excl. overall revenues	87.2%	101.2%	110.2%	100.0%

Sources as noted in the text and authors' calculations

Given that the EU tax revenue data most closely accords with that for the UK, which is verifiably accurate, it is this source that is to be relied upon in this research. This does not, however, prevent an important conclusion being drawn, even if it is tangential to the overall issue that this paper is addressing, which is that to compare the efficiency of tax authorities reliable data is required and it would appear that neither the OECD or UNU data sets meet this criteria. Any conclusions based upon them are likely to be inaccurate as a result, and researchers need to be aware of this. The

Eurostat data is also not beyond question for this reason. Better explanation of the sources for reported data appear to be required in all cases if decision-making is to be reliable.

8. Issues with data on the shadow economy

The number of countries within the EU, or anywhere else, estimating tax gaps is very limited indeed (Murphy & Petersen 2018, Fiscalis 2016). The majority of those that do so only publish data with regard to VAT (Fiscalis 2016). Only the UK undertakes an annual estimate across a range of taxes but all of the data reported is prepared on a bottom-up basis excluding VAT (HMRC 2018) and is therefore unlikely to be comparable with data from other EU member states. The only officially prepared estimates that might achieve this goal of comparability are the estimates of the VAT tax gap now prepared for all EU member states annually on behalf of the European Commission (EC DGT 2018). This estimate is based on observed national accounts data included in GDP (EC DGT 2018, 15). The methodology, in effect, estimates the amount of VAT that should be charged at prevailing rates applicable within a state on identified consumption within GDP and then compares the total resulting theoretical tax yield with the actual tax collected. The result is an estimate of the 'tax compliance gap' i.e. the sum lost because of taxpayer non compliance whether due to criminality, tax evasion, tax avoidance or as a result of tax simply not collected because the taxpayer had become insolvent before the sum due could be collected.

For the purposes of appraising the size of the shadow economy the estimate is of significance. VAT is a tax on final consumption, whether by consumers or other non-VAT registered entities. It is therefore a tax that is, at least in principle, charged on one of the key components of GDP. As is noted by those preparing the estimates, the VAT tax base is by no means comprehensive with just 55.2% of theoretically chargeable VAT tax base actually being subject to tax at the full VAT rate in 2016 (EC DGT 2018, 51). This is because some elements of consumption are exempt from VAT charge in the EU e.g. healthcare and education are almost invariably treated as such. Other parts of consumption are also taxed at lower or even zero rate: clearly there can be no effective measure of the tax gap attributable to VAT in the latter case. The authors describe the resulting uncollected tax as the ' VAT policy gap', which is the proportion of the total potential tax revenue that could have been raised if all end consumption had been charged to VAT at the prevailing standard rate of tax applying in the jurisdiction for which the calculation is being undertaken that is not payable because of the decision of its government to grant allowances, reliefs, exemptions and reduced rates of tax.

The resulting two gaps are as follows:

Table 4

EU VAT compliance gaps for 2015 and 2016 and VAT policy gap for 2016

	2015		2016		
MS	VAT Gap EUR millions	VAT Gap (%)	VAT Gap EUR millions	VAT Gap (%)	Policy Gap (%)

BE	3,329	10.77	3,079	9.68	52.47
BG	1,058	20.67	693	13.56	29.00
CZ	2,521	16.92	2,165	14.19	38.49
DK	3,054	10.70	2,466	8.51	42.92
DE	24,706	10.45	22,679	9.39	44.38
EE	127	6.33	144	6.78	34.98
IE	1,419	10.61	1,610	11.15	49.39
EL	5,358	29.37	5,916	29.22	47.55
ES	2,897	4.05	1,966	2.71	59.52
FR	19,867	11.58	20,896	11.92	52.43
HR	251	4.22	70	1.15	36.20
IT	35,753	26.13	35,988	25.90	53.78
CY	174	10.28	83	4.73	43.72
LV	389	17.17	258	11.27	41.70
LT	992	25.57	983	24.52	34.54
LU	80	2.28	29	0.85	40.50
HU	1,943	15.40	1,629	13.33	45.26
MT	24	3.42	20	2.71	42.86
NL	4,705	9.49	2,024	4.00	41.53
AT	2,282	8.00	2,149	7.30	46.15
PL	9,652	24.30	8,004	20.80	48.69
PT	2,272	12.88	1,784	10.16	51.54
RO	6,808	34.48	6,137	35.88	33.94
SI	289	8.24	290	8.04	45.91
SK	2,243	29.27	1,872	25.68	38.84
FI	1,405	6.89	1,707	7.98	49.60
SE	1,474	3.51	465	1.08	46.32
UK	22,600	11.04	22,040	11.67	53.06
Total EU-28	157,672	13.2	147,146	12.3	44.47
Median		10.7		9.9	

Source: EC DGT 2018

Trend data from the same source suggests a downward trend in the VAT compliance gap over time:

Table 5

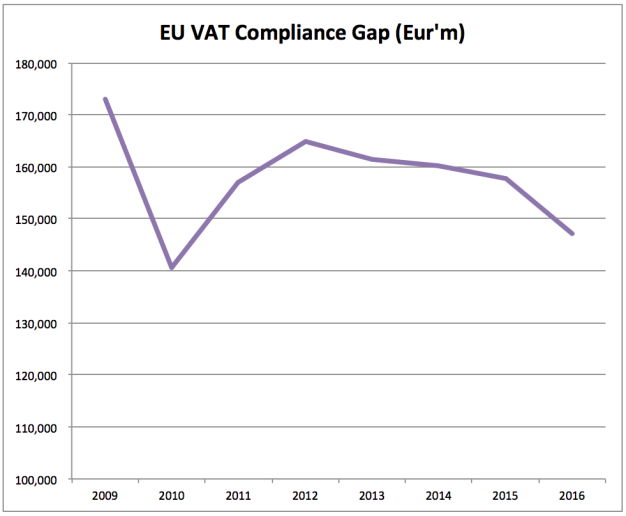
Trends in the EU VAT compliance gap, 2009 - 2016

Year	VAT Gap EUR millions	VAT Compliance Gap (%)	Median VAT Compliance Gap (%)
2009	172,954	18.17	14.30
2010	140,624	12.14	12.00
2011	157,117	14.82	13.15
2012	164,879	15.20	12.30
2013	161,442	14.75	13.81
2014	160,221	14.09	10.92
2015	157,672	13.20	10.70
2016	147,146	12.30	9.90

Source: EC DGT 2018 and earlier years summarised by authors

As is apparent, the VAT compliance gap across EU member states is falling in absolute numerical terms:

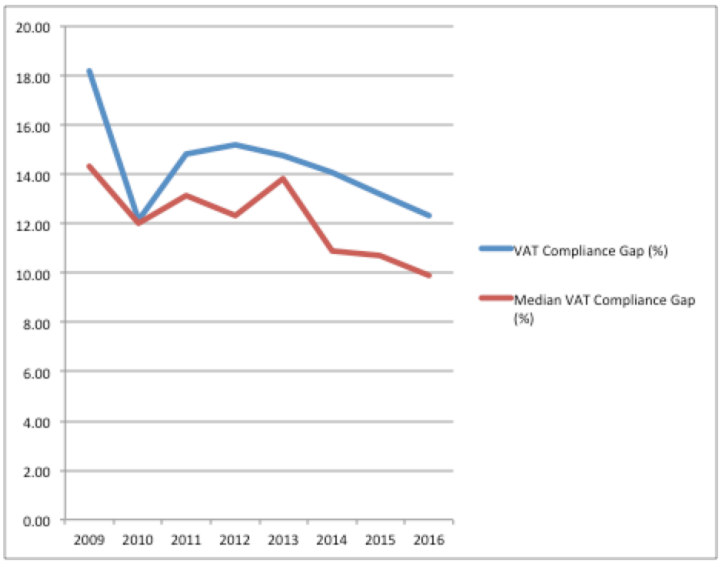
Figure 8



Source EC DGT 2018 and author's summaries of prior year reports

In percentage terms the trend is also downwards:

Figure 9 – EU aggregate and median VAT compliance gaps stated as percentages of theoretical revenue lost



Source EC DGT 2018 and author's summaries of prior year reports

The trend is data is favourable. The volatility in the estimates, both in aggregate (where the results for 2010 and 2011 appear surprising and counterintuitive, since it is likely that tax abuse will grow at a time of economic stress) and that individual country levels (where some results appear to change significantly from year-to-year) suggest that other sources of data that might indicate the value of the illicit flows on which tax losses might arise would be of benefit in assisting appraisal of the total EU Tax gap.

There are a number of bases for estimating tax gaps (Andrews et al, 2011). Perhaps the longest established is the currency demand approach developed by Gutmann (1977) and successively and developed by Tanzi (1980). As presented by Tanzi, the argument is that there is a level of cash required for the volume of transactions in the recorded economy and if there is excess cash in use then that must be because there are unrecorded transactions that must in turn be motivated by the desire to evade taxes. It was suggested by Tanzi that empirical data supported this claim. There are, however, limitations in the methodology. Ferwerda et al (forthcoming) have suggested that Tanzi's belief that high tax rates motivate tax evasion can only be evidenced in periods of economic volatility when rates change significantly. It is their suggestion that this was only true in the 1930s, but not thereafter. A possible interpretation is that this implies it is not absolute tax takes that motivate such behaviour but that significant changes in marginal rates do. This is certainly consistent with much of the debate to be found in tax practitioner journals which would suggest that it is rate differentials (for example, between income and corporation taxes; income and capital gains taxes and between social security tax rates on earned and unearned income) that motivate tax avoidance activity, meaning that this might also spillover into evasion. Whatever the cause, it seems unlikely as a result that this approach provides sufficient evidence to support tax gap estimates.

Recourse has to be made in that case to other bases of estimation, of which the most commonly used is the so-called MIMIC method, where MIMIC stands for 'multiple indicator; multiple causes'. This approach, most commonly associated with the work of Friedrich Schneider (for example, in Medina and Schneider 2018) is discussed in some detail by Schneider et al (2010), Raczkowski (2015)

and Schneider et al (2015). In effect, the method uses a matrix of indicators that might motivate those with an inclination to tax evade, which are weighted as to perceived significance and then used to explain their potential impact on GDP. It is important to note in this regard that it is not suggested that tax evasion is the sole contributory motive for this unrecorded economic activity (Schneider et al 2010). The motives might be to evade any type of regulation, but it so happens that tax will be evaded as a result. Importantly, this is also true of activity motivated by a desire to evade one tax e.g. VAT, which then necessarily means that other taxes will also be evaded as well. So, for example, if VAT is evaded then other taxes such as personal and corporate income taxes as well as social security charges can no longer be recorded as being due because the turnover that might have been recorded to permit their payment cannot be reinjected into the income statement of the entity that has suppressed one part of its activity. The consequence is that whatever the motive, once income has moved into the shadow economy all taxes due on it are lost. This has important consequences. The loss of one tax (most commonly, but not always, VAT) has spillover effects into all other taxes and as such aggregate tax rates across the economy as a whole can be used for assessing the scale of losses.

The most recent version of a MIMIC estimate that has passed substantial peer review and which relates to 2015, which is the year for which OECD tax authority data is available, is that by Medina and Schneider (2015) which was published by the IMF. The estimates in this paper are noted below. An alternative recent MIMIC estimate is provided by Raczkowski (2015). These estimates relate to the year 2014. These two MIMIC estimates and the previously noted VAT compliance gaps (EC DGT 2018) are compared as follows:

Table 6 – EU estimates of shadow economies and VAT gaps

	Medina and Schneider estimate shadow economy 2015	EU VAT gap estimate 2015	Raczkowski 2014 estimate	Average gap
	%	%	%	%
Austria	9.01	8.24	7.50	8.25
Belgium	17.80	10.76	16.40	14.99
Bulgaria	20.83	20.58	31.20	24.20
Croatia	22.96	3.92	28.40	18.43
Cyprus	32.20	7.44	25.20	21.61
Czech Republic	10.47	16.48	15.50	14.15
Denmark	14.70	10.83	13.00	12.84
Estonia	18.49	4.88	27.60	16.99
Finland	13.30	6.45	13.00	10.92
France	11.65	11.71	9.90	11.09
Germany	7.75	9.56	13.00	10.10
Greece	26.45	28.27	23.60	26.11
Hungary	20.49	13.74	22.10	18.78

Ireland	9.58	9.94	12.20	10.57
Italy	22.97	25.78	21.10	23.28
Latvia	16.62	17.97	25.50	20.03
Lithuania	18.65	26.42	28.00	24.36
Luxembourg	10.38	5.56	8.00	7.98
Malta	29.43	22.54	24.30	25.42
Netherlands	7.83	7.94	9.10	8.29
Poland	16.67	24.51	23.80	21.66
Portugal	17.82	11.46	19.00	16.09
Romania	22.94	37.18	28.40	29.51
Slovak Republic	11.18	29.39	15.00	18.52
Slovenia	20.21	5.52	23.10	16.28
Spain	22.01	3.52	18.60	14.71
Sweden	11.74	-1.42	13.90	8.07
United Kingdom	8.32	10.88	9.70	9.63
	16.87	13.93	18.79	16.53

Sources: as noted in the text and authors' calculations

It is apparent that the estimates of the shadow economy that these sources supply do vary quite considerably in some cases. If, however, the estimates are applied to national GDP data and then aggregated for the EU as a whole a surprising degree of aggregated consistency is noted, whether or not it is assumed that the shadow economy is included in full in the reported estimate of GDP (Table 9) or GDP has to be grossed up to include that sum (Table 10):

Table 9 – Possible sizes of EU shadow economies if the shadow economy is included in published GDP estimates

Median and Schneider shadow economy	Rackowski shadow economy	EU VAT gap shadow economy	Average shadow economy
€'bn	€'bn	€'bn	€'bn
31.0	25.8	28.4	28.4
73.0	67.3	44.1	61.5
9.4	14.1	9.3	11.0
10.2	12.6	1.7	8.2
5.7	4.5	1.3	3.8
17.6	26.1	27.8	23.8
40.0	35.3	29.4	34.9
3.8	5.6	1.0	3.5
27.9	27.2	13.5	22.9
255.6	217.2	256.9	243.3
235.9	395.7	291.0	307.5

46.6	41.6	49.8	46.0
22.7	24.5	15.2	20.8
25.1	32.0	26.0	27.7
379.6	348.7	426.0	384.8
4.0	6.2	4.4	4.9
7.0	10.5	9.9	9.1
5.4	4.2	2.9	4.2
2.8	2.3	2.1	2.4
53.5	62.2	54.3	56.7
71.7	102.4	105.4	93.1
32.0	34.2	20.6	28.9
36.8	45.5	59.6	47.3
8.8	11.8	23.2	14.6
7.8	9.0	2.1	6.3
237.7	200.9	38.0	158.9
52.7	62.4	-6.4	36.3
216.5	252.4	283.1	250.7
1921.1	2082.2	1821.0	1941.4

Sources: as noted in the text and authors' calculations

Table 10 – Possible size of EU shadow economies if the shadow economy is not included in published GDP estimates which have to be grossed up to allow for it as a result:

	Median and Schneider shadow economy	Rackowski shadow economy	EU VAT gap shadow economy	Average shadow economy
	€'bn	€'bn	€'bn	€'bn
Austria	34.1	27.9	30.9	31.0
Belgium	88.8	80.5	49.5	72.9
Bulgaria	11.9	20.5	11.7	14.7
Croatia	13.3	17.7	1.8	10.9
Cyprus	8.4	6.0	1.4	5.3
Czech Republic	19.7	30.9	33.2	27.9
Denmark	46.8	40.6	33.0	40.2
Estonia	4.6	7.8	1.0	4.5
Finland	32.2	31.3	14.5	26.0
France	289.3	241.1	291.0	273.8
Germany	255.7	454.8	321.7	344.1
Greece	63.4	54.5	69.5	62.5
Hungary	28.5	31.4	17.6	25.9
Ireland	27.8	36.4	28.9	31.0
Italy	492.8	442.0	574.0	502.9
Latvia	4.8	8.3	5.3	6.2

Lithuania	8.6	14.6	13.4	12.2
Luxembourg	6.0	4.5	3.1	4.5
Malta	4.0	3.1	2.8	3.3
Netherlands	58.1	68.4	58.9	61.8
Poland	86.0	134.3	139.6	120.0
Portugal	39.0	42.2	23.3	34.8
Romania	47.7	63.6	94.9	68.7
Slovak Republic	9.9	13.9	32.8	18.9
Slovenia	9.8	11.7	2.3	7.9
Spain	304.8	246.8	39.4	197.0
Sweden	59.7	72.5	-6.3	42.0
United Kingdom	236.1	279.5	317.7	277.8
	2292.1	2486.7	2207.2	2328.7

Sources: as noted in the text and authors' calculations

On the basis of this consistency an aggregate estimate of the tax gap for each EU member state can be prepared, assuming that the average shadow economy noted in Tables 9 and 10 exists, with the estimate being made at the aggregate tax rate reported by Eurostat:

Table 11 – suggested size of the EU tax gap

	EU sourced GDP data 2015	EU reported tax yield as a proportion of stated GDP 2015	Tax gap estimate based on average grossed up GDP	Tax gap estimate based on reported GDP
	€'bn	%	€'bn	€'bn
Austria	344.5	43.2%	13.4	12.3
Belgium	410.3	45.2%	33.0	27.8
Bulgaria	45.3	29.1%	4.3	3.2
Croatia	44.5	37.1%	4.0	3.0
Cyprus	17.7	33.2%	1.8	1.3
Czech Republic	168.5	34.0%	9.5	8.1
Denmark	271.8	46.5%	18.7	16.2
Estonia	20.3	33.7%	1.5	1.2
Finland	209.6	43.9%	11.4	10.0
France	2194.2	45.6%	124.9	110.9
Germany	3043.7	38.4%	132.1	118.1
Greece	176.3	36.6%	22.9	16.8
Hungary	110.7	38.8%	10.0	8.1
Ireland	262.0	23.4%	7.3	6.5
Italy	1652.6	43.0%	216.3	165.5

Latvia	24.3	30.1%	1.9	1.5
Lithuania	37.4	28.9%	3.5	2.6
Luxembourg	52.1	37.2%	1.7	1.5
Malta	9.5	32.1%	1.0	0.8
Netherlands	683.5	37.4%	23.1	21.2
Poland	430.1	32.4%	38.9	30.2
Portugal	179.8	34.4%	12.0	10.0
Romania	160.3	28.0%	19.2	13.2
Slovak Republic	78.9	32.1%	6.1	4.7
Slovenia	38.8	36.6%	2.9	2.3
Spain	1080.0	33.7%	66.4	53.5
Sweden	449.0	43.1%	18.1	15.6
United Kingdom	2602.1	33.1%	91.9	83.0
	14798.0	36.1%	897.6	749.1

Sources: as noted in the text and authors' calculations

The resulting tax gap is likely to be in a range between the figures noted. Doubt arises because, as previously noted, the extent to which an estimated part of the shadow economy is included with GDP is not known.

8. Further issues to note with the tax gap estimates

A number of additional issues need to be noted with regard to these tax gap estimates. The first is that they only relate to issues recorded within GDP. As noted in figures 1 and 2, this leaves a significant range of transactions to which the estimated rate of loss has not been applied. So, and for example, it is likely that the corporate tax base shifted wholly out of an economy, whether artificially or not, is excluded from this estimate. So too are estimated tax losses arising because of capital gains, the abuse of wealth and gift taxes, and other such taxes. However, an estimate is by default included on those deemed transactions included in GDP but which do not get reflected in taxable transactions in the real economy. These factors clearly add some uncertainty to the estimates.

Tax avoidance is not included in the estimate as such, except to the extent that it reduces overall tax yield within the economy. The same is true of bad debt, which cannot be separately identified using these methods. In other words, tiers 3, 4 and 5 of the tax gap as noted above are combined in these estimates. The method does not also reflect any loss to tax policy (tiers one and two of the tax gap as noted by Murphy and Petersen. 2018). In effect, the estimate offered is of the tax compliance gap alone.

That said an estimate for the tax policy gap can be suggested. If it is noted that of the 28 EU member states just seven have aggregate tax rates exceeding 40%, but it was assumed that this implied that tax policy would permit such rates to be charged in other EU member states and that it is government decision that means that they are not then an approximate tax policy gap estimate can be prepared. Overall tax yields by EU member state, tanked from highest to lowest are as follows:

Table 12 – EU member states overall tax yields

		Tax yield
		%
1	Denmark	46.5%
2	France	45.6%
3	Belgium	45.2%
4	Finland	43.9%
5	Austria	43.2%
6	Sweden	43.1%
7	Italy	43.0%
8	Hungary	38.8%
9	Germany	38.4%
10	Netherlands	37.4%
11	Luxembourg	37.2%
12	Croatia	37.1%
13	Slovenia	36.6%
14	Greece	36.6%
15	Portugal	34.4%
16	Czech Republic	34.0%
17	Estonia	33.7%
18	Spain	33.7%
19	Cyprus	33.2%
20	United Kingdom	33.1%
21	Poland	32.4%
22	Malta	32.1%
23	Slovak Republic	32.1%
24	Latvia	30.1%
25	Bulgaria	29.1%
26	Lithuania	28.9%
27	Romania	28.0%
28	Ireland	23.4%
		36.1%

Source: Eurostat for 2015

The average yield for the top seven states is 44.4%. Assuming other states could collect this yield then the tax policy gap might be:

Table 13: Estimated and approximate tax policy gaps for EU member states

	Tax policy gap	Tax policy gap

	%	€'bn
Austria	0.0%	0.0
Belgium	0.0%	0.0
Bulgaria	13.9%	6.9
Croatia	5.9%	3.2
Cyprus	9.8%	2.0
Czech Republic	9.0%	17.4
Denmark	0.0%	0.0
Estonia	9.3%	2.2
Finland	0.0%	0.0
France	0.0%	0.0
Germany	4.6%	181.3
Greece	6.4%	13.7
Hungary	4.2%	6.2
Ireland	19.6%	54.9
Italy	0.0%	0.0
Latvia	12.9%	3.5
Lithuania	14.1%	5.8
Luxembourg	5.8%	3.7
Malta	10.9%	1.2
Netherlands	5.6%	47.5
Poland	10.6%	51.4
Portugal	8.6%	17.9
Romania	15.0%	26.2
Slovak Republic	10.9%	9.7
Slovenia	6.4%	3.0
Spain	9.3%	115.1
Sweden	0.0%	0.0
United Kingdom	9.9%	292.9
		865.7

Sources: As noted in the text and authors' calculations

The estimate is, of course, no more than that but it does indicate the scope that many states have with regard to potential change of taxation policy. It should be noted that overall the sum is of the same broad scale as the estimated tax compliance gap.

9. Tax authority efficiency

Having noted the considerable data problems that we faced when undertaking this work, and the resulting estimates of one aspect of the tax gap that was estimated as a consequence of addressing those data issues, it appropriate to return to the core theme of this paper, which is an appraisal of the efficiency, or otherwise, of EU tax administrations.

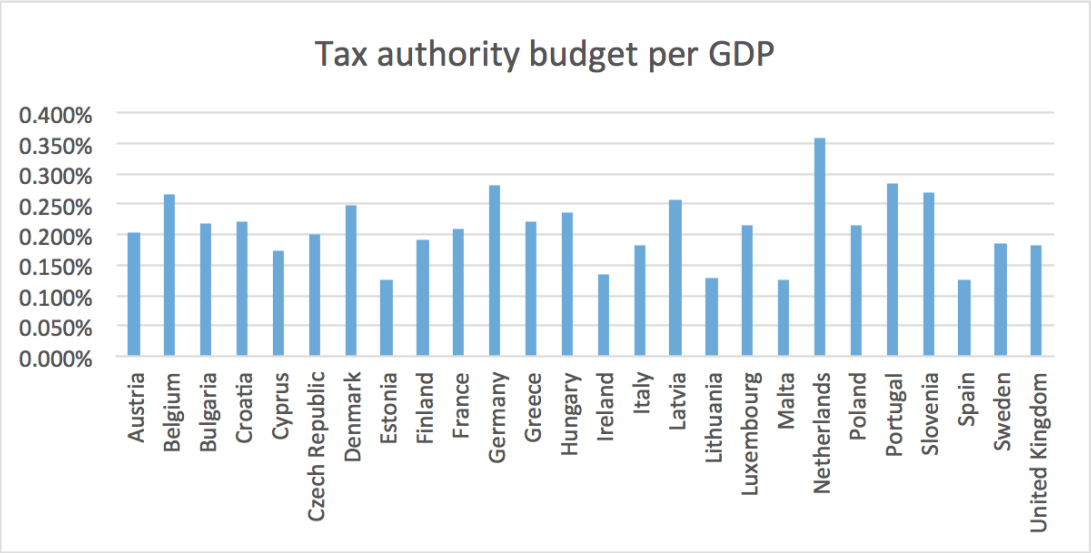
For the purposes of the data that follows the year 2015 is being considered. Data on tax authority resources comes from the OECD (2017) and data on taxes paid from Eurostat (2018) unless otherwise noted. GDP data is also from Eurostat. A survey of EU tax administrations undertaken by the Tax Justice Network in the summer of 2018 to extend the OECD research into areas where it was felt that additional data might be of use apparently yielded replies from just six jurisdictions. The prospects of securing any useful information to add to that secured by the OECD is, then considered to be remote. No other publicly, available survey data on either staff employed or the costs of tax administrations has been identified.

Tax gap estimates are based on an average of the two estimates previously estimated in this paper to allow for the fact that most GDP estimates include a partial estimate of the shadow economy, but do not reflect the scale of the loss estimated for the reasons previously noted. Where other data is used the source is noted.

It should be noted that despite the extensive coverage of OECD data in some areas the failure to indicate the allocation of resources and staffing to specific taxes means that the attempted assessment of the efficiency of tax authorities can only effectively be undertaken at the level of all taxes because the relative efficiency of any tax authority at collecting any particular tax can only be guessed at without any data to indication the allocation of resources to activity within the authority itself. This, in itself, would suggest that the OECD, or the EU, should be seeking data on the allocation of tax authority resources to enable this appraisal of resources to take place when undertaking future surveys.

This said, a number of assessments can be undertaken. Tax authority spending as a proportion of GDP does vary quite considerably amongst states:

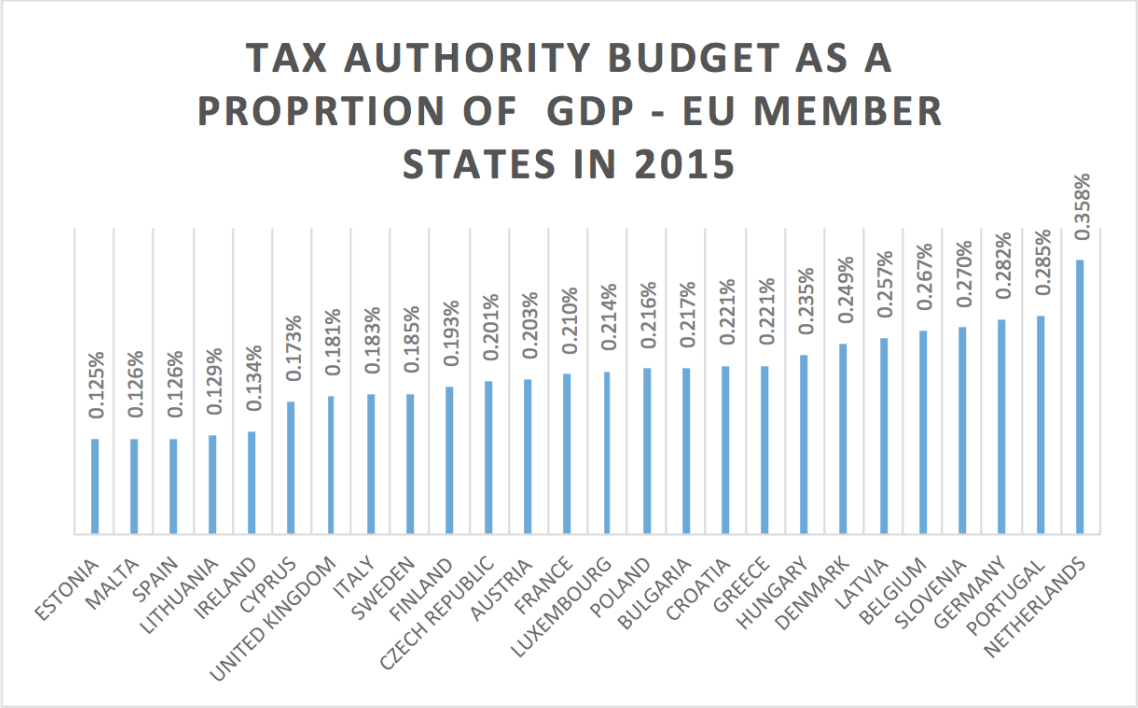
Figure 10



Source: OECD 2017 and author calculations

Ranked, this data is as follows:

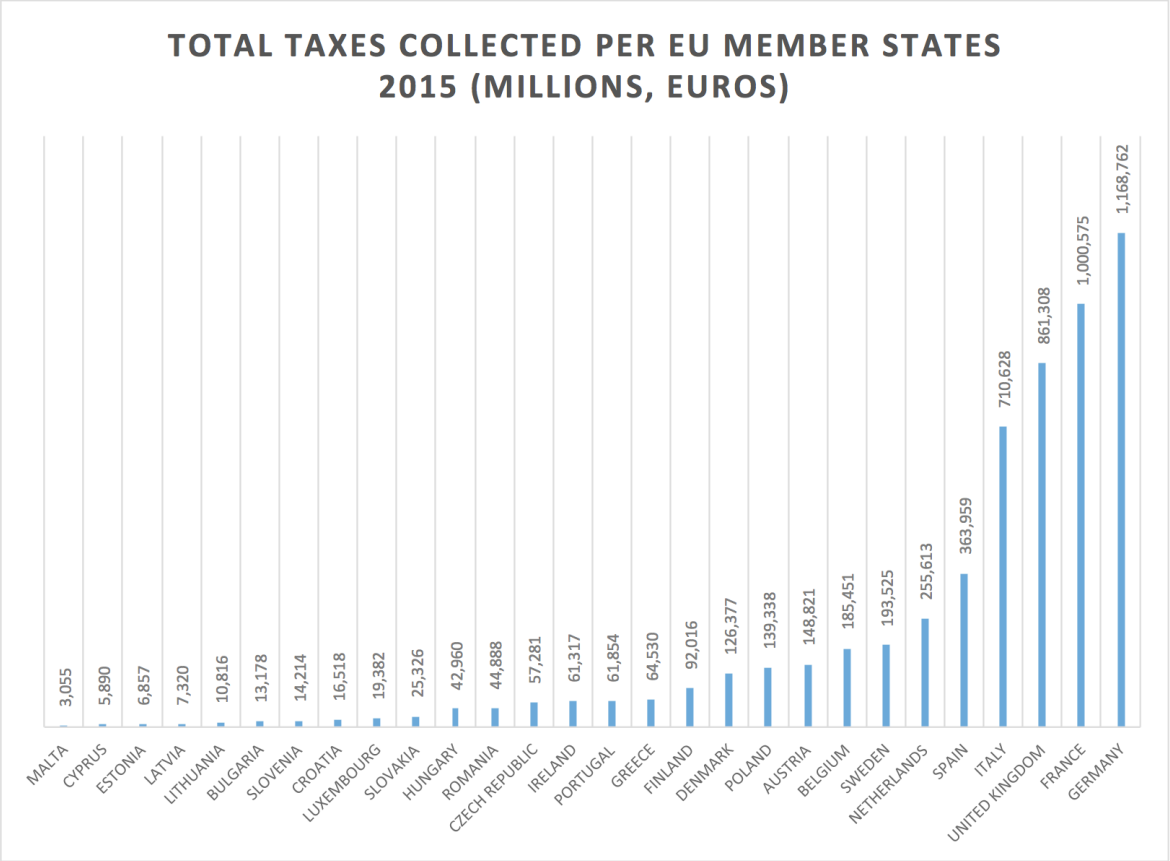
Figure 11



Source: OECD 2017 and author calculations

The scale of these administrations, as indicated by tax collected, does vary considerably:

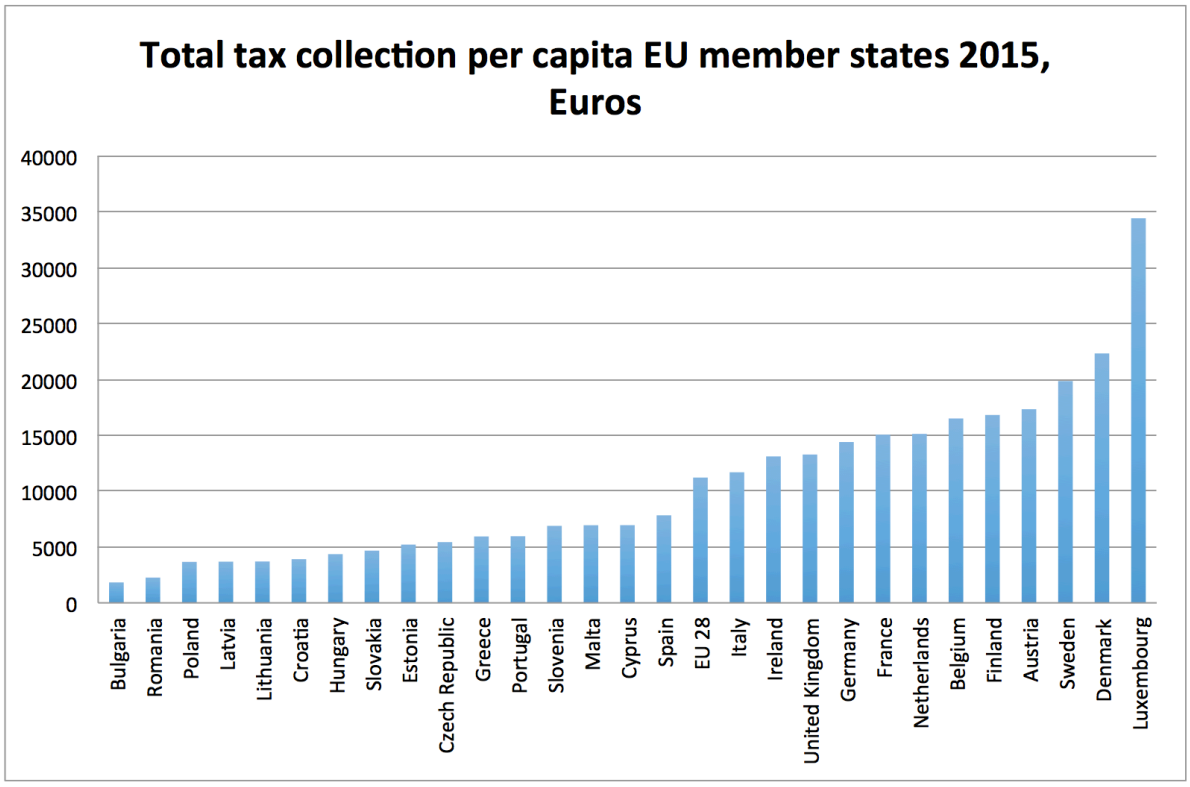
Figure 12



Source: OECD 2017 and author calculations

Stated per capita, there is also considerable variation:

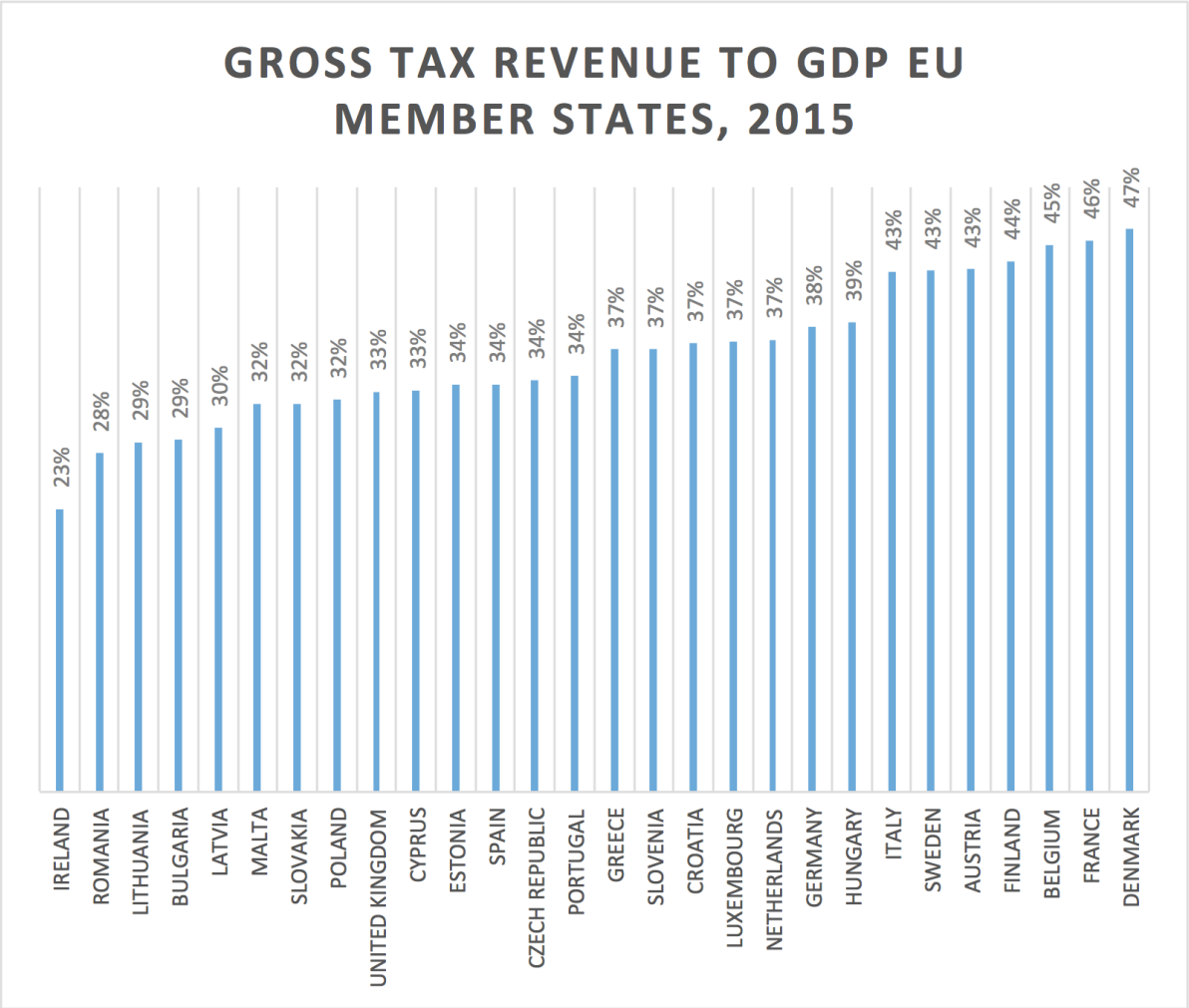
Figure 13



Source: OECD 2017 and author calculations

The unusual revenues of Luxembourg are notable. It is apparent that there are anomalies in the ratio of yield to GDP as a result of what might be described as tax haven activity in other countries as well, as the ratio of total tax collection to GDP implies:

Figure 14



Source: OECD 2017 and author calculations

It has been widely reported that Irish GDP reporting has been distorted by the flow of corporate profits through the country and this appears to be reflected in this data when tax collection per capita appears consistent with its nearest neighbour, the UK.

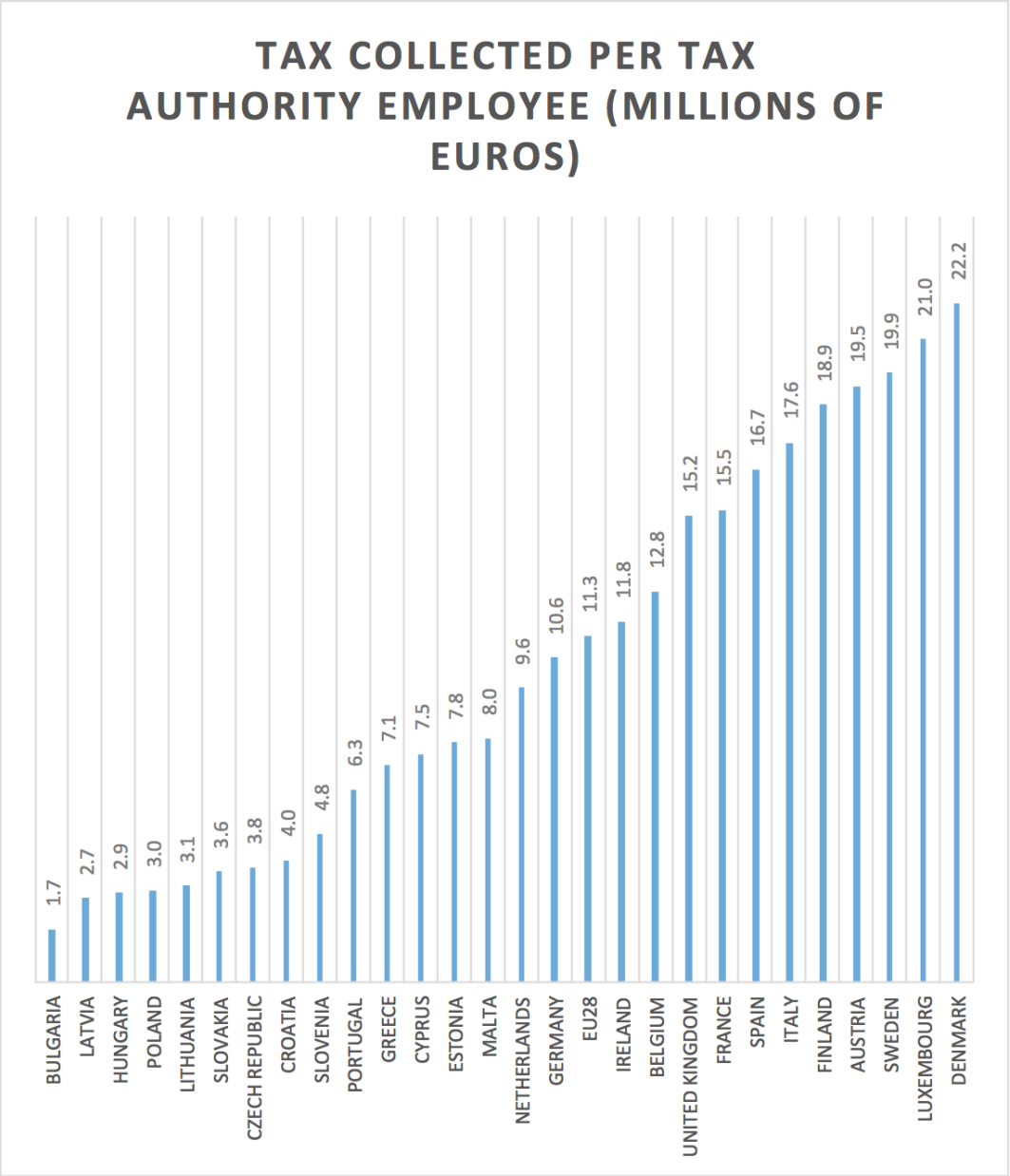
Turning to efficiency measures, tax collected per euro spent is as follows:

Figure 15

Source: OECD 2017 and author calculations

It is apparent that the range of efficiency, based on this criterion, is wide. This is true if other efficiency criteria are used. For example, tax collected per employee for those countries reporting this data is as follows:

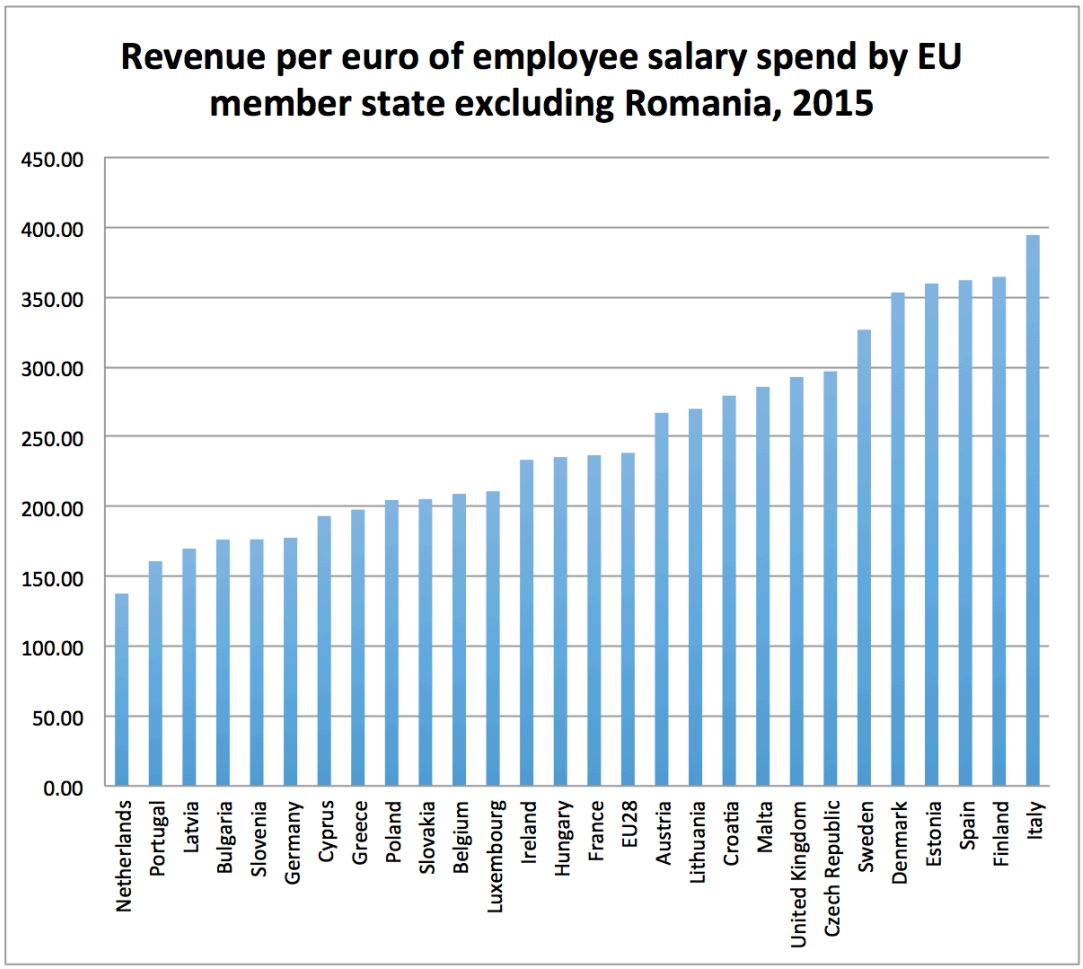
Figure 16



Source: OECD 2017 and author calculations

The apparent efficiency ratio varies by a factor of 12.95: Denmark's employees appearing to be that much more efficient than those of Bulgaria. The perspective on this issue of employee productivity changes if yield per euro spent on salaries is considered instead:

Figure 17

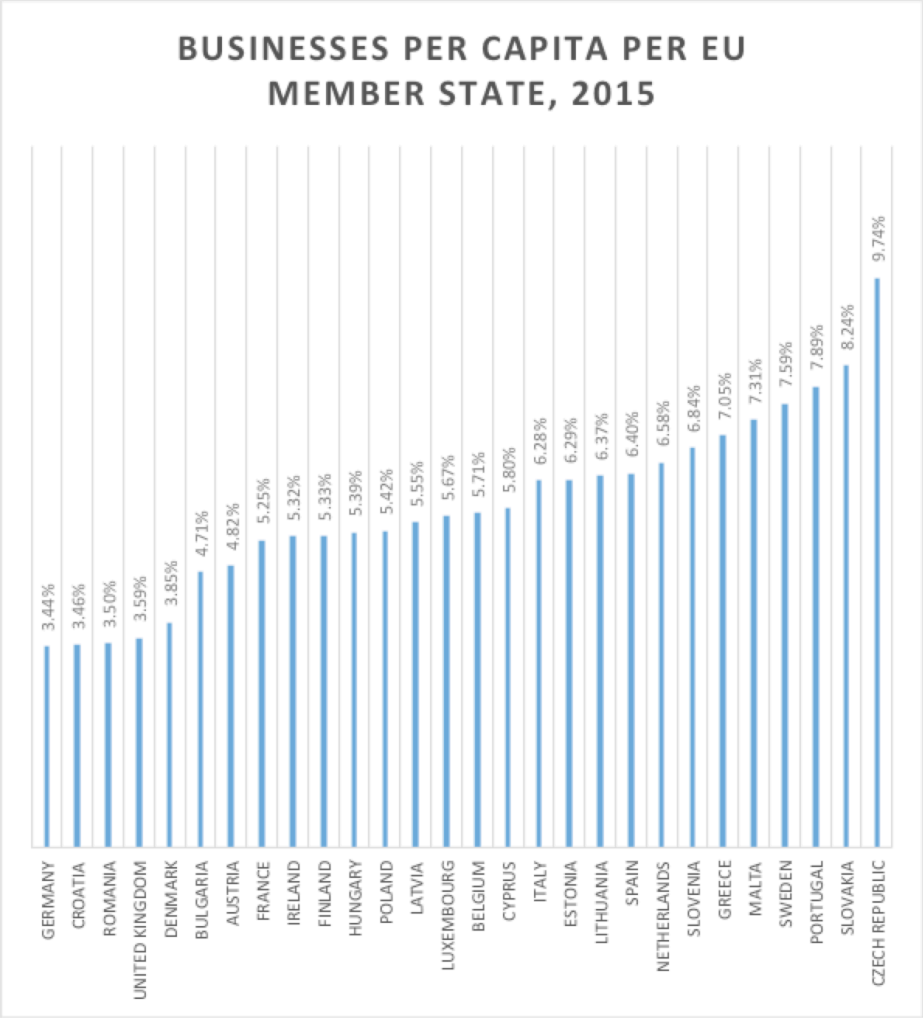


Source: OECD 2017 and author calculations

The efficiency ratio now appears to be dramatically different: the difference is that Italy appears to be 2.86 times more efficient than the Netherlands, assuming all other matters are equal.

Clearly they are not. For example, business intensity varies per state. The number of incorporated business per capita in EU member states varies widely (based on Eurostat data, which it should be noted does not necessarily tie up with local source data or the reported number of such entities that are taxable, at least in the case of the United Kingdom:

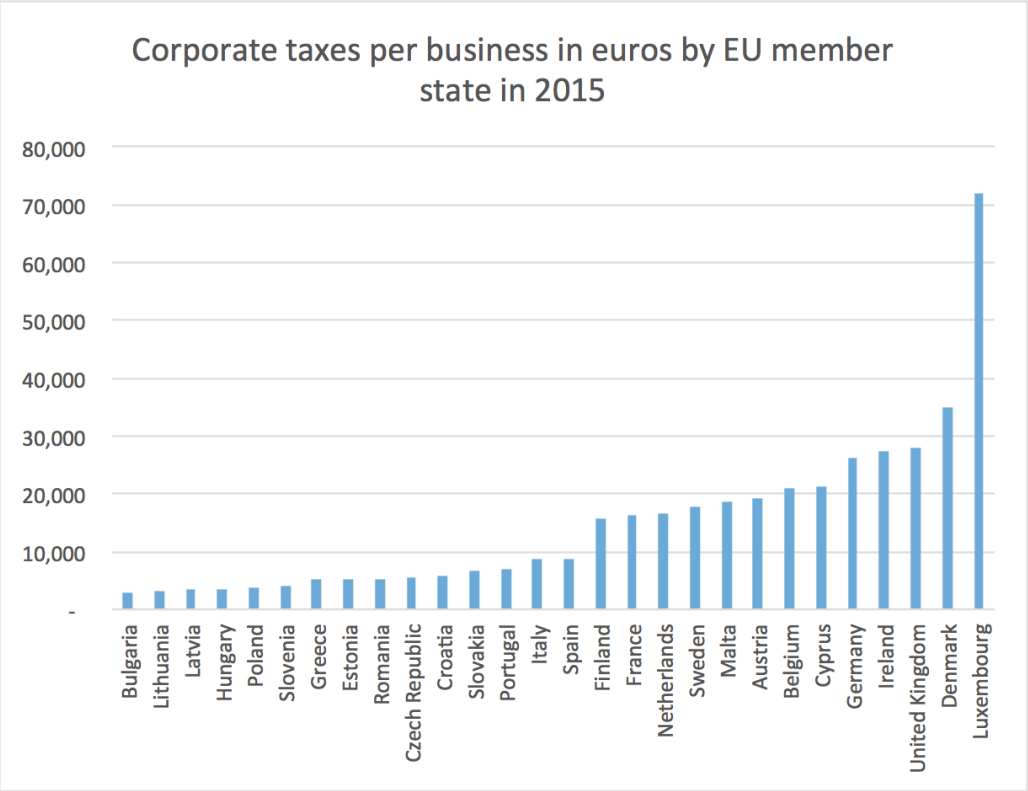
Figure 18



Source: OECD 2017, Eurostat and author calculations

Corporation tax yield per incorporated business reveals a different picture:

Figure 19



Source: OECD 2017, Eurostat and author calculations

It is apparent that the explanation for these variances is not at all down to tax authority efficiency alone: the issue in question also relates to spillovers from tax policy (Baker and Murphy 2017) and the state of the economy being addressed.

The hypothesis that does seem important to test is, then, one where the available data might, despite all the deficiencies noted in all its forms, indicate the existence of relationship s requiring further investigation. These are the relationships between yield, spending, staffing and tax gaps. For the purposes of the analyses that follow an average tax gap has been used, as noted in the following table, which assumes that some of GDP reflects shadow economy estimates and some does not. It is stressed that this is approximate, but since all the data used in these estimates appears to be of that nature there is nothing exceptional about that fact.

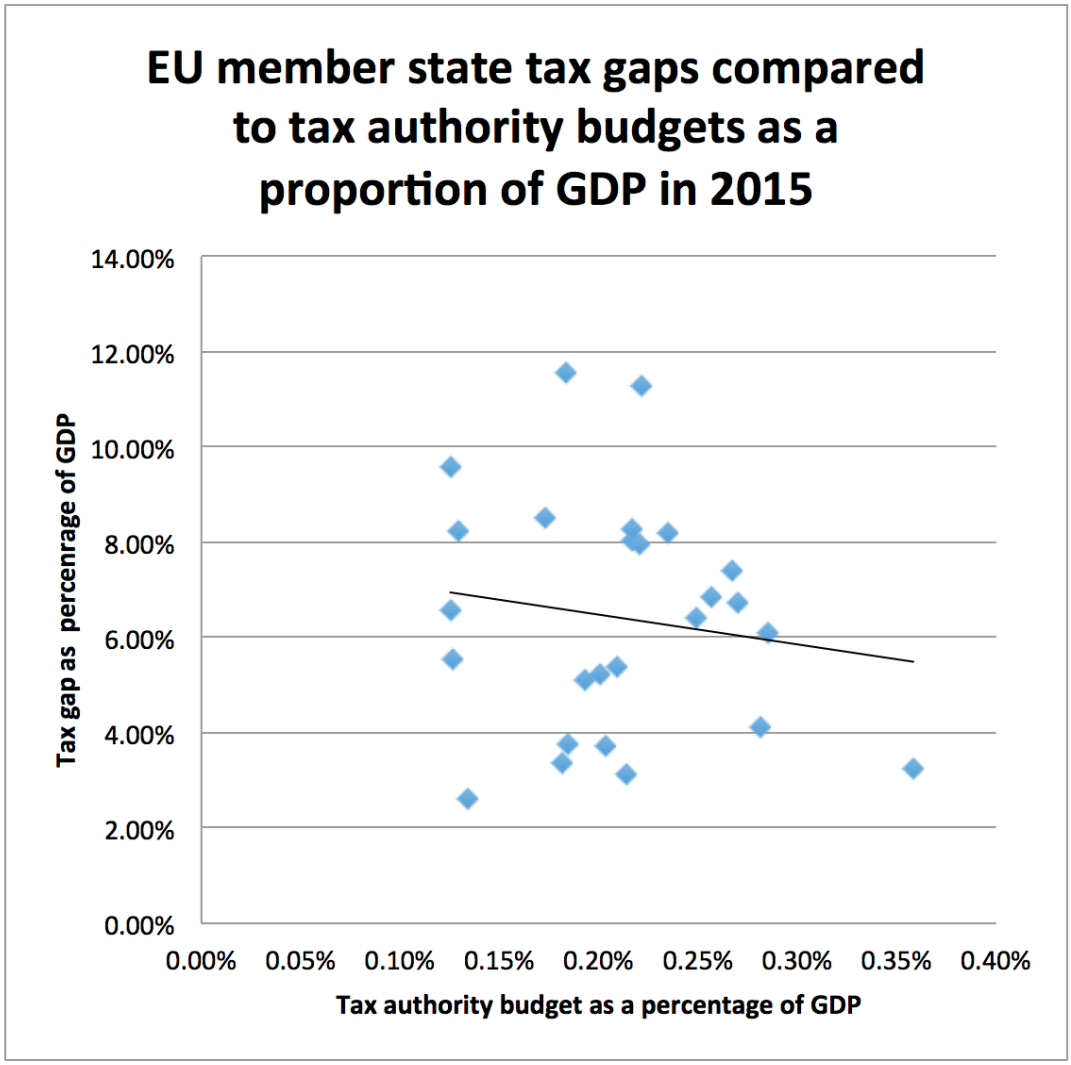
Table 14 – average EU tax gap by member state

	Tax gap estimate based on average grossed up GDP	Tax gap estimate based on reported GDP	Average tax gap estimate	Average tax gap % of GDP
	€'bn	€'bn	€'bn	
Austria	13.4	12.3	12.8	3.7%
Belgium	33.0	27.8	30.4	7.4%
Bulgaria	4.3	3.2	3.7	8.3%
Croatia	4.0	3.0	3.5	8.0%
Cyprus	1.8	1.3	1.5	8.5%
Czech Republic	9.5	8.1	8.8	5.2%
Denmark	18.7	16.2	17.5	6.4%
Estonia	1.5	1.2	1.3	6.6%
Finland	11.4	10.0	10.7	5.1%
France	124.9	110.9	117.9	5.4%
Germany	132.1	118.1	125.1	4.1%
Greece	22.9	16.8	19.9	11.3%
Hungary	10.0	8.1	9.1	8.2%
Ireland	7.3	6.5	6.9	2.6%
Italy	216.3	165.5	190.9	11.5%
Latvia	1.9	1.5	1.7	6.8%
Lithuania	3.5	2.6	3.1	8.2%
Luxembourg	1.7	1.5	1.6	3.1%
Malta	1.0	0.8	0.9	9.6%
Netherlands	23.1	21.2	22.2	3.2%
Poland	38.9	30.2	34.5	8.0%
Portugal	12.0	10.0	11.0	6.1%
Romania	19.2	13.2	16.2	10.1%
Slovak Republic	6.1	4.7	5.4	6.8%
Slovenia	2.9	2.3	2.6	6.7%
Spain	66.4	53.5	60.0	5.6%
Sweden	18.1	15.6	16.9	3.8%
United Kingdom	91.9	83.0	87.5	3.4%
	897.6	749.1	823.4	5.6%

Sources: As noted in text and author estimates.

Based on this data the following can be plotted:

Figure 20



Source: as noted in text and author calculations

Note that a trend line has been added. However, if the outlier of the Netherlands, which spends 0.36% of its GDP on its tax authority, is removed from the data the trend line is completely flat. There appear to be no meaningful relationships in this data. The spend that is made on a tax authority does not appear to have direct relationship with the tax gap that a country suffers. The same conclusion is reached across the range of data investigated.

10. Conclusions

What might be concluded from this review?

Overall, the conclusion is that the basic hypothesis with which the work began, and which it sought to test, that increasing in the spend on a domestic tax authority should increase the tax yield by reducing the tax gap is not proven by the available data. No obvious statistical link exists.

That said, what is apparent is that the data required to really appraise the effectiveness of tax administrations in Europe is not readily available. This is not just at the level of the individual tax authorities, where the OECD has made progress (albeit incompletely) with regard to collecting necessary data. It is also true at the level of recording tax actually collected by different jurisdictions, where there appears to be considerable confusion in the available data. An enhanced effort to collect information on tax collected, by tax, is required. In addition, the OECD's work needs to question the expenditure incurred by tax authorities with a focus upon determining the use of available resources by tax. Unless this is done the cost of collecting each tax cannot be appraised but this would appear to be an essential prerequisite of an effective review of the tax administrations of the European Union, which also appears central to the well being of all the state involved.

In addition, available GDP data appears to not be good enough for the purpose of this appraisal. This is because it is apparent that insufficient official effort is being put into estimating the size of shadow economies, and far too little discussion on this issue is taking place. As such the extent to which the shadow economy is really reflected in GDP is largely unknown. Given the significance of this sector, and the importance of GDP for the comparative appraisal of economies, this leaves what is happening in this critical part of the economy beyond appraisal and so effective management. There are few economies that can afford this neglect, which does, therefore, requires further explanation.

Despite this, and perhaps rather surprisingly, there does appear to be a convergence within the available data on the potential size of the shadow economy in EU member states and this has, in turn, permitted the estimation of tax gaps for EU member states. Whilst it would appear that the trend in these tax gaps is mildly downward, and this is welcome, such is their remaining scale that this issue deserves greater attention than it is receiving. It is also apparent that existing methodologies can only capture some parts of the tax gaps that currently exist: better methodologies are required to capture data on tax avoidance and tax bad debt as well as those parts of the tax gap that inevitably arise outside those areas included in the measurement of GDP. Tax gap appraisal will remain incomplete until this is done.

Lastly, and perhaps most importantly, what is clear is that there is no simple relationship that exists between tax authorities spending, tax yield and the tax gap. The issue is much more complex than that. What is apparent as a result is that if there is to be effective management of the tax gap what is required is a different management approach to the appraisal of risk within tax systems and tax authorities. It is suggested that a spillover approach of the type proposed by Baker and Murphy (2017 and forthcoming) is what is actually required to address this issue.

11. Bibliography

Advani, Arun, William Elming, and Jonathan Shaw. 2015. "How Long-Lasting Are the Effects of Audits?" 011–15. TARC. https://tarc.exeter.ac.uk/media/universityofexeter/businessschool/documents/centres/tarc/publications/discussionpapers/How_long_lasting_are_the_effects_of_audits_v3.pdf.

Allingham, Michael G., and Agnar Sandmo. 1972. "Income Tax Evasion: A Theoretical Analysis." Journal of Public Economics 1 (3): 323–38.

Alm, James. 2012. “Measuring, Explaining, and Controlling Tax Evasion: Lessons from Theory, Experiments, and Field Studies.” International Tax and Public Finance; New York 19 (1): 54–77.

Alm, James, and Denvil Duncan. 2014. “Estimating Tax Agency Efficiency.” Public Budgeting & Finance 34 (3): 92–110.

Andrews, D., Caldera Sanchex, C. and Johannson, A. 2011. Towards a better understanding of the informal economy. Paris: OECD working paper ECO/WKP(2011)42. http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ECO/WKP%282011%2942&docLanguage=En

Baker, A and Murphy, R. 2017. “:Tax spillover: a new framework”. London: The UK parliament All Party Parliamentary Group on Inclusive Growth. https://www.inclusivegrowth.co.uk/wp-content/uploads/2017/03/Tax-Spillover_v4.pdf

Blades, D., and Lequiller, F. 2014. Understanding National Accounts, Second Edition. Paris: Organisation for Economic Cooperation and Development https://read.oecd-ilibrary.org/economics/understanding-national-accounts_9789264214637-en#page3

Boll, Karen, and Lynne Oats. 2014. “Measuring Outcomes.” 007–14. TARC. http://openarchive.cbs.dk/bitstream/handle/10398/8995/TARC_Measuring_Outcomes_Discussion_Paper.pdf?sequence=1.

Daunton, Martin. 1998. “Trusting Leviathan: British Fiscal Administration from the Napoleonic Wars to the Second World War.” In Trust and Governance, edited by Karen S. Cook and Russell Hardin, 102–34. Russell Sage Foundation. http://www.jstor.org/stable/10.7758/9781610440783.9.

EC DGT. 2017. “VAT Gap Factsheet.” European Commission Director General of Taxation. https://ec.europa.eu/taxation_customs/sites/taxation/files/vat_gap_factsheet_2017.pdf.

EC DGT. 2018. Study and Reports on the VAT Gap in the EU-28 Member States: 2018 Final Report. Brussels: TAXUD/2015/CC/131

European Commission. n.d. “Taxation Trends in the European Uniuon 2017.” Country Chapters. Accessed June 25, 2018. https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/taxation-trends-eu-union/country-chapters_en.

Eurostat. 2013. European System of Accounts ESA 2010. Luxembourg: Publications Office of the European Union.

———. 2018. The non-observed economy. Brussels: https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Non-observed_economy_%28NOE%29

Falkinger, Josef. 1995. “Tax Evasion, Consumption of Public Goods and Fairness.” Journal of Economic Psychology 16 (1): 63–72.

Ferwerda, J., Deleanu, I. and Unger, B. Forthcoming. Overestimating the Underground Economy when Tax Rates are Stable.

Fonseca, Miguel A, and Shaun B Grimshaw. 2015. “Does Using Behavioural Prompts in Pre-Populated Tax Forms Affect Compliance? Results from an Artefactual Field Experiment with Real Taxpayers.” 015–15. TARC.

https://tarc.exeter.ac.uk/media/universityofexeter/businessschool/documents/centres/tarc/publications/discussionpapers/Fonseca_&_Grimshaw_Sept15.pdf.

Frey, Bruno S. 1997. “A Constitution for Knaves Crowds out Civic Virtues.” The Economic Journal 107 (443): 1043–53.

Fuest, Clemens, and Nadine Riedel. 2010. “Tax Evasion and Tax Avoidance in Developing Countries: The Role of International Profit Shifting.” 1012. Working Papers. Oxford University Centre for Business Taxation. https://ideas.repec.org/p/btx/wpaper/1012.html.

Gemmell, Norman, and John Hasseldine. 2014. “Taxpayers’ Behavioural Responses and Measures of Tax Compliance ‘Gaps’: A Critique and a New Measure.” Fiscal Studies 35 (3): 275–96.

Gutmann, P. 1977. The subterranean economy. Financial Analysts Journal, 33(6), 26-27.

Hasseldine, John. 2007. “Study Into: ‘Best Practice’ in Tax Administration.” National Audit Office. https://www.nao.org.uk/wp-content/uploads/2008/07/n0708930_international_review.pdf.

———. 2010. “The Administration of Tax Systems.” Working Paper 10–21. Andrew Young School of Policy Studies. https://doi.org/10.4337/9780857933898.

HMRC, 2018, Measuring tax gaps 2018 edition. London: HM Revenue & Customs https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/715742/HMRC-measuring-tax-gaps-2018.pdf

Jackson, B., and V. Milliron. 1986. “Tax Compliance Research: Findings, Problems, and Prospects.” Journal of Accounting Literature, no. 5: 125–65.

Khlif, Hichem, and Imen Achek. 2015. “The Determinants of Tax Evasion: A Literature Review.” International Journal of Law and Management; Patrington 57 (5): 486–97.

Lubell, Mark, and John T. Scholz. 2001. “Cooperation, Reciprocity, and the Collective-Action Heuristic.” American Journal of Political Science 45 (1): 160–78.

Media, L. and Schneider, F., 2018. Shadow Economies Around the World: What Did We Learn Over the Last 20 Years? Washington, DC: International Monetary Fund Working Paper WP/18/17

Mirrlees, James A., ed. 2010. Dimensions of Tax Design: The Mirrlees Review. Oxford ; New York: Oxford University Press.

Murphy, R. 2014. Tax Evasion in 2014. London: Public & Commercial Services Union http://www.taxresearch.org.uk/Documents/PCSTaxGap2014Full.pdf

Murphy, R. 2015. The Joy of Tax. London: Random House.

Murphy, R. and Petersen, H. 2018. Minding the tax gap at the heart of macroeconomic policy. London: Coffers.eu working paper

OECD. 2017. Tax Administration 2017. https://www.oecd-ilibrary.org/content/publication/tax_admin-2017-en.

Office for Budget Responsibility. 2017. Economic and Fiscal Outlook. Accessed June 25, 2018. http://obr.uk/efo/economic-fiscal-outlook-march-2017/.

ONS. 2015. Methodological Improvements to National Accounts for Blue Book 2015: Exhaustiveness. London: Office for National Statistics.

Onu, Diana, and Lynne Oats. 2014. “Social Norms and Tax Compliance.” 006–14. TARC. https://tarc.exeter.ac.uk/media/universityofexeter/businessschool/documents/centres/tarc/publications/discussionpapers/Social_norms_and_tax_compliance_May_14.pdf.

Osborne, Stephen, ed. 2010. The New Public Governance? Emerging Perspectives on the Theory and Practice of Public Governance. London ; New York: Routledge.

Raczkowski, K. 2015. Measuring the tax gap in the European economy. Journal of Economics and Management Vol. 21 (3): 343.

Sandmo, Agnar. 2005. “The Theory of Tax Evasion: A Retrospective View.” National Tax Journal; Washington 58 (4): 643–63.

Sawyer, Adrian. 2001. “A Taxonomy of the Tax Compliance Literature: Further Findings, Problems and Prospects - Tables.” Australian Tax Forum 16 (June): 285.

Schneider, Friedrich, and Dominik H. Enste. 2003. “The Shadow Economy.” Cambridge Core. February 2003. https://doi.org/10.1017/CBO9780511493591.

———. 2013. “The Shadow Economy 2nd Edition.” Cambridge Core. February 2013. https://doi.org/10.1017/CBO9781139542289.

Schneider, F., Buehn, A. and Mentengro, C. 2010. Shadow Economies All over the World New Estimates for 162 Countries from 1999 to 2007. World Bank Working Paper 5356. Washington DC: The World Bank Group

Schneider, F., Raczkowski, K. and Mróz, B. 2015 Shadow economy and tax evasion in the EU. Journal of Money Laundering Control, Vol. 18 Issue: 1, pp.34-51

Slemrod, Joel. 2007. “Cheating Ourselves: The Economics of Tax Evasion.” The Journal of Economic Perspectives 21 (1): 25–48.

———. 2016. “Tax Compliance and Enforcement: New Research and Its Policy Implications.” SSRN Scholarly Paper ID 2726077. Rochester, NY: Social Science Research Network. https://papers.ssrn.com/abstract=2726077.

Slemrod, Joel, Marsha Blumenthal, and Charles Christian. 2001. “Taxpayer Response to an Increased Probability of Audit: Evidence from a Controlled Experiment in Minnesota.” Journal of Public Economics 79 (3): 455–83.

Tanzi, V. 1980. Underground economy and tax evasion in the United States: estimates and implication. Banca Nazionale del Lavoro Quarterly Review 32, 427 - 53.

———. 2017. “Corruption, Cmplexity and Tax Evasion.” EJournal of Tax Research; Sydney 15 (2): 144–60.

Torgler, Benno. 2003. “Tax Morale, Rule-Governed Behaviour and Trust.” Constitutional Political Economy 14 (2): 119–40.

———. 2004. “Moral Suasion: An Alternative Tax Policy Strategy? Evidence from a Controlled Field Experiment in Switzerland.” Economics of Governance 5 (3): 235–53.

United Nations. 2009. Systems of National Accounts. New York: https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf

“UNU-WIDER : Government Revenue Dataset.” 2016. UNU-WIDER. January 14, 2016. https://www.wider.unu.edu/project/government-revenue-dataset.