



Working Paper

The use of tax gap data by EU tax authorities

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Executive Summary

Tax gap methodologies have been used to estimate the scale of unpaid tax by a number of European Union and other governments during the course of the current century, but the technique remains in use exceptionally rather than as a standard. This paper explores current tax gap methodologies and the use made of them by European Union tax authorities. Suggestion is made that certain conceptual and design faults in the current methods of tax gap modelling limit the usefulness of tax gap data. Building upon a recent IMF proposal, the paper proposes that tax gap methodologies are better put to use as effective tools of macroprudential management of an economy, and that as a result much greater significance should be given to a range of tax gap measures, the nature of which in this context is suggested.

Key words: Tax, tax gap, tax avoidance, tax evasion, tax compliance, macroprudential risk management.

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1. Abstract

Tax gap methodologies have been used to estimate the scale of unpaid tax by a number of European Union and other governments during the course of the current century, but the technique remains in use exceptionally rather than as a standard. This paper explores current tax gap methodologies and the use made of them by European Union tax authorities. Suggestion is made that certain conceptual and design faults in the current methods of tax gap modelling limit the usefulness of tax gap data. Building upon a recent IMF proposal, the paper proposes that tax gap methodologies are better put to use as effective tools of macroprudential management of an economy, and that as a result much greater significance should be given to a range of tax gap measures, the nature of which in this context is suggested.

Key words: Tax, tax gap, tax avoidance, tax evasion, tax compliance, macroprudential risk management.

2. Introduction

This paper reviews the current use of tax gap methodology by European Union ('EU') tax authorities. It summarises a work in progress for two reasons: firstly because research on this issue as part of the Combating Financial Fraud and Empowering Regulators (COFFERS) Horizon 2020 project is as yet incomplete; and secondly because that use of tax gap methodology by tax and other regulatory authorities is itself developing¹.

As the paper notes, results to date suggest that tax gap estimation as a technique for managing risk both within a tax authority and a macroeconomy has not yet been fully embraced within the EU. Despite this data from a variety of sources suggests that fourteen tax authorities in the European Union might prepare tax gap estimates. As a result the paper is in six further parts.

The first of these reviews what the tax gap is, why it is calculated and what the current state of academic and other understanding on this issue is. In the second further part data on which European Union member states might be estimating tax gaps is surveyed. In the third part a review of current methodologies in use is presented. The fourth additional suggests how those tax gap methodologies might be developed. Part five then suggests that tax gaps might be prepared in five specific tiers to allow better understanding of the usefulness of the data that they present. The last part briefly summarizes the paper's main conclusions.

¹ For example, the UK's HM Revenue & Customs announced their latest approach to the tax gap in late October 2017. See <https://www.gov.uk/government/statistics/announcements/measuring-tax-gaps-october-2017?cachebust=1506003271> accessed 25 October 2017

In the process it is suggested that tax gap thinking needs, firstly, to be embedded into macroeconomic management, with the explicit link between tax gaps and the level of borrowing required to fund government spending in an economy being recognised. This then requires, secondly, that the risks inherent in international and other tax policy be better appraised in the next stage of tax gap analysis, whilst the tax compliance gap needs to be appraised in two parts. The first of these (which is the third tier of tax gap) refers to gaps where a loss of revenue in one tax is likely to result in a loss of revenue in another tax. This is much more likely when taxes are evaded. Tax avoidance, which is likely to be predominant in the fourth suggested tier of tax gap, is, in contrast, likely to result in a loss that is discrete and attributable to a single tax. The fifth tier of the suggested process looks at how a tax system is designed and highlights systemic system failures within it that create the risks which those who arbitrage the tax system for gain seek to exploit.

3. The tax gap

There is surprisingly consistent opinion across most academic literature and amongst many national and regional tax authorities as to how the tax gap might be defined. Yet there are also subtle differences that are important. The UK's HM Revenue & Customs defines the tax gap as "the difference between the amount of tax that should, in theory, be collected by HMRC, against what is actually collected." (HMRC, 2016, 3). Mazur and Plumely (2007) define the tax gap as the difference between the amount of tax that should be imposed by the tax code of a country and the amount that is actually reported and paid on timely filed returns.

The US's Internal Revenue Service ('IRS') defines the tax gap as "the difference between the tax that taxpayers should pay and what they actually pay on timely basis" (IRS 2016).² The language is similar to the one adopted by the HMRC with a slight but important difference. The IRS introduces the notion of 'timely payment' as a factor in the consideration of the tax gap³. The International Monetary Fund's ('IMF') shares a core aspects of the definitions above, but adds an important element to understanding:

² http://www.irs.gov/pub/irs-utl/tax_gap_facts-figures.pdf

³ HMRC do not consider late payment of tax to be a part of the tax gap (HMRC, 2017a, 67), only taking into account tax not paid at all. The IRS approach puts a stronger emphasis upon timely payment. The HMRC approach reduces the quantum of the reported tax gap but does not attribute significance to the fact that tax paid late requires government borrowing as a substitute mechanism for funding government activity in its place, and appears inadequate as a measure as a result.

A commonly used definition of the tax gap is the difference between current and potential collections. Under this definition, the term “tax gap” tends to describe the difference between the actual tax collections and the tax collections a revenue administration should collect given the current policy framework (potential collections). (IMF 2013,11)

In doing so the IMF suggest that there are two aspects to the tax gap requiring consideration. One is the effect of taxpayer-noncompliance on tax revenue, a notion that is captured in the definitions above. The other aspect is the impact that policy choices made by legislators and regulators might have had in reducing available tax revenues. These two different aspects of tax gap are labelled by the IMF as a) the ‘compliance gap’ caused by non-payment that results from noncompliance with tax rules, and b) the ‘policy gap’, which referred to tax laws granting exemptions, tax liability deferrals or preferential tax rates (IMF 2013,11).

The European Commission Director General of Taxation (ECDGT) who commissions the annual study of the EU’s VAT gap (EC, 2017) explicitly embraces the IMF's concept of the 'tax policy gap', noting that:

[T]he Policy Gap captures the effects of applying multiple rates and exemptions on the theoretical revenue that could be levied in a given VAT system. In other words, the Policy Gap is an indicator of the additional VAT revenue that a Member State could theoretically, i.e. in case of perfect tax compliance, generate if it applied a uniform VAT rate on all goods and services (EC, 2016a, 51).

As is noted below, the ECDGT provides estimates of the policy gap with regard to value added tax (‘VAT’) for twenty-seven of the twenty-eight EU member states. The ECDGT also extend their work to the compliance gap for that tax in the same range of states.

European National tax authorities, as a rule, are not seeking to measure tax policy gaps. This may well be because many (as noted below) have yet to estimate the tax compliance gap. Others may be discouraged from doing so by academic opinion on the worth of measuring tax gaps, believing that, as Gemmell and Hasseldine (2012: 17) have noted, “There are few, if any, reliable methods of measuring direct tax gaps as conventionally defined.” This opinion, however, is not universally shared. It could be that national tax authorities desist from commenting on internal political issues alluded to by the notion of the ‘policy gap’ – although we notice that to the best of our knowledge the literature has not addressed this factor as a possibility.

After offering another definition of the tax gap, which the OECD describe in about the most succinct way possible as “The tax gap is the difference between tax due and tax collected” (OECD, 2017, 182) the OECD do note that this leaves many issues unresolved, including those arising from tax policy gaps referred to by the IMF, noted previously, and tax debt, as raised by the IRS, also noted above, before suggesting that “the main consideration is that any chosen approach contains information that is useful for understanding the relative size and nature of non-compliance over time.” (OECD, 2017, 182).

In the process the OECD do appear to reject the IMF approach to assessment of tax policy gaps, also embraced by the ECDGT. The OECD'S approach implies that tax gap measures are not of macroeconomic concern and are instead of purely administrative concern within tax authorities. In saying so they also note the concerns of those preparing tax gap estimates:

While the tax gap has intuitive attraction for both the public and political representatives, it is a difficult concept to define precisely. Estimation is also difficult as much of the tax gap is either deliberately concealed from view and/or data may be difficult to find. The measurement and publishing of tax gaps should therefore be navigated and communicated carefully. Limitations of tax gap estimates mean they are not a good basis for explicit performance targets (OECD, 2017, 181).

We conclude therefore that the discrepancy with regards to the policy gap notwithstanding, there is a great deal of uniformity of opinion as to the methods of estimating tax gaps.

There seems to be agreement as well on two possible methods of estimation of the tax gap, one employing a bottom-up approach, while the other is 'top-down'. The IMF noted of the UK's HMRC's work on this issue in 2013:

The HMRC [tax gap] program follows a pattern of employing "bottom-up" based estimates for the direct tax gaps, and "top-down" estimates for the indirect tax gaps. Both approaches are applied consistently with good international practices (IMF 2013, 9).

The OECD reflects the same view in 2017, suggesting:

The use of tax gap measurements is becoming more common, especially for VAT, as jurisdictions increasingly see the benefits of having high level estimates of non-compliance within the tax system. Top-down methodologies that use national accounts data represent a relatively low-cost means of producing such estimates. These approaches are often associated, though, with a fairly high degree of uncertainty and therefore are of limited operational use. Bottom-up methodologies that include information from random audits, on the other hand, can provide a more accurate picture of lost revenue across segments and tax types. (OECD 2017, 62)

The terms "bottom-up" and "top-down" need explanation. A top down approach uses macroeconomic data to estimate the tax owing. So, for example, gross domestic product can be analysed into its component elements. Then taking VAT as an example, the likely VAT due on each part of the theoretical tax base can be estimated suggesting a total theoretical VAT yield. This is described as the VAT Total Tax Liability ('VTTL') (EC, 2017, 8) which is then compared with the actual yield to suggest a compliance tax gap.

In contrast a "bottom-up" approach uses an audit sample of submitted tax returns to estimate errors found within them and then extrapolates this error rate across the whole population of submitted returns. The method does however leave this approach very vulnerable to estimates of tax not declared at all on tax returns not submitted by persons whose identity may not even be known. For this reason HMRC say, somewhat enigmatically, in their note on "bottom up methodologies":

Different methods and data sources are used, depending on best available, to estimate how much tax is lost within each area. HMRC uses internal data and operational knowledge to identify areas of potential tax loss (HMRC, 2017a, 13).

The IMF notes that that there is room for improvement which would enhance HM Revenue & Customs' analysis of tax gap, including the construction of bottom-up estimates for the VAT gap in order to compare results from top-down estimates (IMF 2013, 35). Further, the IMF warn that any tax gap estimates, and especially those based on bottom-up methods, should not be used as the sole basis for inference about taxpayer compliance behaviour (IMF 2013, 44). The IMF endorses the two

methodologies, but suggests they should be used simultaneously and reconciled when possible, and not be considered in isolation.

The European Union has come to broadly similar conclusions when estimating the VAT gap across its twenty-eight member states and, like the IMF, places as much emphasis on policy gaps as it does compliance gaps (EC, 2016a).

There is a much broader range of opinions in the academic literature on this issue. Some such literature fits firmly into the framework used by tax and regulatory authorities and seeks to improve the methodologies used by them; for example, Hamilton (2015) suggests there is a need for improving sample selection used in the bottom up methods of tax gap estimation. Others are critical of specific methods of official tax gap estimation (Slemrod and Johns, 2010), whilst still using them as a basis for analysis as they accept they are the only ones available at present (Slemrod, 2007). Others argue that all current and conventional tax gap estimates are unreliable as they omit behavioural responses: Gemmel and Hasseldine (2012, 20), for example, express their lack of faith into current methodologies:

From what we know about the sources of data used to produce tax gap estimates, the quality of the methods adopted, the potential for error within methods and non-comparability across them, we posit that in many cases the margins of error associated with individual estimates are just too big for these methods to form a reliable guide to year-to-year changes in tax compliance or ‘tax gaps’ (Gemmel and Hasseldine 2012, 14).

However, these comments have to be interpreted in the context of these authors’ belief that tax gap data is a short-term management tool rather than information to be used as a strategic indicator of the need for reform within the tax system or macroeconomy. As the OECD (2017, 181) have noted, few tax authorities have as yet finessed their use of tax gap data sufficiently to serve as a year on year management tool (although HM Revenue & Customs have been undertaking such surveys annually since 2010) but this need not diminish their strategic importance.

The strategic significance of the data is reflected in another body of literature which uses the concept of the shadow economy as the basis for the assessment of tax gaps (Christie & Holzner 2006, Murphy, 2012, Williams & Nadin 2012). This work is apparently replicated only by the Finnish government amongst regulatory agencies and tax authorities (FTA, 2016). The Finnish tax authority's use of data in this way is sufficiently unusual to mean that neither the OECD nor the EC consider the country in the list of those countries preparing tax gap estimates (see part 3, below). This might be because doing so leads to difference of opinion on the potential behavioural response of those who would be targeted if effort was made to limit the size of the shadow economy, meaning that the loss arising is itself hard to predict (Schneider, 2013).

Civil society activists (for example Henry, 2012, Murphy, 2011 and Cobham and Jansky, 2015) have also been involved in estimating tax gaps, although most have focussed on international and not national dimensions of this issue. The first such estimate was prepared in 2006 (Murphy, 2006). Many of these tax gap calculations have focussed upon what Murphy defined as the ‘expectation gap’, which he suggested (Murphy, 2006, 9) was:

The difference between the headline or declared tax rate for companies, and the rate of tax they actually pay. This gap is a measure of the difference between the contribution society expects business to make by way of tax paid, and what is actually paid.

The choice was deliberate: constrained by data available in the public domain, this measure made estimation by civil society possible when data on the actual tax base declared by the companies subject to scrutiny was not accessible. The technique was used by Murphy (2008) to compare the declared effective tax rates of a sample of multinational corporations with the tax that would have been due at headline rates, in the process creating what was, in effect, a policy gap measure of the tax gap in UK corporation tax.

Due to lack of access to official data, many NGOs have tended to rely on estimates of the shadow economy to develop estimates of national tax gaps (Murphy, 2014); the European Union (Murphy, 2012); the world as a whole (Murphy, 2011), or tax havens (Henry, 2012; Zucman, 2015). These estimates have given rise to controversy and disagreement: Zucman, has, for example, disagreed with Henry's methodology (2012,40) whilst HM Revenue & Customs have taken issue with Murphy (Goodall, 2012).

These civil society surveys do share in common with the estimates prepared by tax authorities a focus on tax lost as an issue in its own right. The broader academic literature on the issue makes it clear that a wider dimension exists, partly as a result of the high rate of non-compliance that are repeatedly found. Kleven et al. (2011) find that almost 45% of those self-employed in Denmark routinely avoid taxes, broadly replicating the findings of Advani (2017, 2) who suggests that based on HMRC audit data that 36% of self-assessment taxpayers who were randomly audited included errors in their tax returns that resulted in an average underpayment of £2,320, a sum equivalent to 32% of the average initial tax amount that they declared. Advani found that the rate of non-compliance did not vary greatly with income, but it is likely that a random audit programme would not reveal the behaviour of the wealthiest. The likelihood that the ratio of aggregate misreported income to true income is generally higher the higher the income is found repeatedly in reported studies (Bishop, Formby, and Lambert 2000; Johns and Slemrod 2010; Zucman et al. 2017). While there are suggestions that this is partially the case because high incomes are often received in a form more prone to misreporting (Johns and Slemrod 2010), previous cases have raised the notion that this trend may be more than just a coincidence, that in fact financial institutions, for example in Switzerland, could specifically cater to the needs of higher earners (Zucman et al. 2017).

Zucman (2013) estimates that roughly 10% of the global GDP is held in tax havens. The United States' Treasury statistics on international capital also show that around 10% of all US companies' listed equities are managed offshore in the 21st century, compared to less than 1% in the 1940s (Zucman 2014). While much of this activity is perfectly legal, many instances are not: two reports by the United States Senate in 2008 and in 2014 found that before 2009, between 85 – 95% of accounts owned by U.S. entities in Switzerland at Credit Suisse or UBS were left undeclared (Zucman et al. 2017). It is likely that domestically based tax gap estimates do not appropriately assess these losses. Roussille (2015) found similar results for European accounts in Switzerland: between 90% and then 80% remained undeclared before 2010 and before 2013 respectively.

Many of the above cited studies focus upon the impact of tax non-compliance on levels of inequality. Zucman et al. (2017) argue that inequality should no longer simply be measured by tax data because of the lack of reliability of such tax data, even when there are apparently high levels of tax compliance within a country. Zucman et. al. are making the case that previous studies based on tax data may significantly underestimate the actual levels of wealth concentration, the rise in the concentration of wealth since the 1970s, and as a result the levels of inequality.

The implication of the work of Zucman and others is that tax gap data has a much greater purpose than simply assisting assessment of the efficiency of tax authorities or otherwise. Tax gap data could assist policymakers and economists when considering the distribution (and so redistribution) of tax burden and the impact that this might have on inequality and so overall economic performance.

The IMF (2017) have embraced this a argument, suggesting that:

Advanced economies with relatively low levels of progressivity in their personal income tax (PIT) may therefore have scope for raising the top marginal tax rates without hampering economic growth. Different types of wealth taxes can also be considered.

If such recommendations are acted upon a consequence may be that work on tax gaps may have greater policy significance in the future.

4. Who prepares tax gap data?

The most comprehensive survey undertaken to date of tax gap methodologies was prepared by the OECD. The OECD report states:

Almost one half of the 55 surveyed administrations report producing periodic tax gap estimates for one or more of the main tax types, with the production of estimates of VAT the most prevalent. The majority of administrations that produce assessments do so for all three major tax types [personal income tax, corporation tax and VAT], with around half of those making their estimates publicly available (OECD, 2017, 62).

Twenty-three tax administrations out of the fifty five surveyed (which fifty-five includes all EU member states) (OECD, 2017, 21) undertake tax gap estimates of some sort. Of these fourteen publish data, and of the fourteen eight cover all major taxes, including personal income tax, corporate income tax and VAT. The OECD data does not clarify how many EU countries meet this criterion.

Earlier OECD reports have been more forthcoming: in 2015 the OECD reported that countries that have undertaken tax gap research are Australia, Chile, Denmark, Estonia, the EU, Finland, South Korea, Latvia, Lithuania, Mexico, Slovak Republic, Slovenia, Sweden, the UK and the USA. None of these are EU member states, not counting work by the EU itself (2015, 132). A year later the European Commission suggested that more of its member states have been involved in this activity (EC, 2016b, 42). In their opinion the following states were preparing tax gap estimates:

Table 1

Member state	Taxes covered
Czech Republic	VAT
Estonia	VAT, income tax and social security
Finland	VAT
Germany	VAT and corporation tax
Italy	VAT, income tax and corporation tax
Latvia	VAT, income tax and social security
Poland	VAT
Portugal	VAT
Slovakia	VAT
Slovenia	VAT
UK	VAT, income tax, corporation tax, social security

It is notable that Denmark, Lithuania and Sweden are in the OECD list but not the European Commission's: Denmark are known to be working on this issue whilst Sweden has published a report on its work (Skatterverket, 2014). It is our estimation that currently fourteen EU member states are working on the tax gap estimates in some way, albeit most of these are only working on VAT tax gap estimates. The European Union also prepares a VAT gap annually for all member states excluding Cyprus (2017). As yet the survey work undertaken at City, University of London, has not found any data to contradict these suggestions.

5. The tax gap methodologies used

The clearest explanation of methodologies used to estimate tax gaps at present available are provided by the IMF (2013), HMRC (2017b) and the European Commission (2017). The Finnish Tax Authority (FTA, 2016) provides a contrasting approach.

HMRC and the EC adopt a broadly similar approach to VAT gap estimation. As the EC notes (2017, 55):

The “top-down” method that is utilised for VAT Gap estimation relies on national accounts figures. These figures are used to estimate the VAT liability generated by different sub-aggregates of the total economy. The VTTL is estimated as the sum of the liability from six main components: household, government, and NPISH final consumption; intermediate consumption; GFCF; and other, largely country-specific, adjustments.

In the “top-down” approach, VTTL is estimated using the following formula:

$$\begin{aligned}
 VTTL = & \sum_{i=1}^N (rate_i \times Value_i) \\
 & + \sum_{i=1}^N (rate_i \times propex_i \times IC Value_i) \\
 & + \sum_{i=1}^N (rate_i \times propex_i \times GFCF Value_i) + net\ adjustments
 \end{aligned}$$

Where:

Rate is the weighted average tax rate i.e. the effective rate,

Value is the final consumption value,

IC Value is the value of intermediate consumption,

Propex is the percentage of output in a given sector that is exempt from VAT,

GFCF Value is the value of gross fixed capital formation, and

index i denotes sectors of the economy.

To summarise, VTTL is a product of the VAT rates and the propexes multiplied by the theoretical values of consumption and investment (plus country specific net adjustments).

HMRC explain their estimation of the VAT gap in non-mathematical terms, but to much the same effect (HMRC 2017b, 8). As the IMF said of this method (IMF 2013, 8):

The HMRC program follows a pattern of employing “bottom-up” based estimates for the direct tax gaps, and “top-down” estimates for the indirect tax gaps. Both approaches are applied consistently with good international practices—in fact, HMRC has been leading the application of some of these methodologies.

The biggest weakness that the IMF has identified in HMRC’s methodology is the lack of good data on the amount of VAT charged to businesses making VAT exempt supplies so that adequate differentiation between VAT charged on intermediate and end consumption might be made (IMF 2013, 9). It is not clear what progress HMRC have since made in addressing this issue.

VAT gap analysis of this sort is dependent upon the existence of statistics of sufficient quality on the size of the tax base, derived from sources other than taxpayer records (IMF 2017, 33). The IMF appears to be satisfied with the quality of statistics available in the UK but the fact that there have been concerns on this issue within the EU is apparent from the fact that the EC’s VAT gap estimates for 2017 are the first to report data for Cyprus, it having been excluded until then because of a lack of reliable national statistics (EC, 2017, 8).

Only five countries in the EU are undertaking work at present on the topic of direct taxes, of which the UK has by far the greatest scope and longest experience. The vast majority of central government collected taxation is now covered by the UK’s tax gap reporting, including wealth taxation. (HMRC, 2017a, 16). That said, estimates for tax avoidance and evasion within personal income tax, national insurance contributions and capital gains tax are described by HMRC as being based on ‘developing methodologies’ (HMRC, 2017a, 16). In addition, HMRC’s estimates for the tax gaps for stamp duty reserve tax, inheritance tax, petroleum revenue tax, environmental taxes and insurance premium tax

are described as ‘illustrative indicators for gaps with no direct measure’ (HMRC, 2017a, 16). If the IMF thinks that HMRC stands at the forefront of tax gap methodology their present lack of appropriate methodologies to estimate tax avoidance and evasion in key taxes does suggest that there is some progress still to make.

Murphy (2014a, 6) suggests that if HMRC broadened the way in which it estimated direct tax gaps, the resulting estimates would be considerably larger than currently reported. Murphy points in particular the non-reporting of the income of UK limited liability companies (2014b). HMRC’s ‘bottom up’ direct tax gap estimates should be verified, therefore, as mentioned above, by commensurate ‘top down’ estimates of direct taxation gaps. The IMF made this a focus of their report to HMRC on their work on tax gaps, suggesting that top down approaches should be used to verify the bottom up-estimates (2013, 46), noting in saying so that (2013, 14):

In general, it would be preferable to use top-down methods for all tax types, as they generally use independently derived statistics on the size of the tax base, and so are more likely to provide an estimate of potential tax revenues including from activities unknown to the tax authorities. However, given that effective tax rate of direct tax varies substantially across the population of potential taxpayers—depending on wide-ranging factors for which independent data often does not exist—a top-down estimate for direct taxes has proved to be difficult, which is why bottom-up estimates are the most prevalent methodology employed.

They add (2013, 46):

It is acknowledged that there are some serious modelling challenges and significant data issues to be addressed in trying to develop a top-down model for direct taxes, as the HMRC has documented. However, there are also some serious modelling and data issues inherent in any bottom-up estimate as well, so having the results from a top-down model to serve as a point of comparison, rather than as the primary means of estimation, could improve the overall analysis of the size and trends in the direct tax gaps.

Unless, and until this is done it is likely that the ‘bottom-up’ approaches to direct tax gap estimation that the OECD has noted are commonplace will underestimate tax gaps because the sample base on which they are calculated is, invariably, smaller than the total tax base subject to risk of tax loss.

6. Potential developments in tax gap methodologies

It should be apparent by now that the tax gap is as much at the core of macroprudential economic risk as is banking regulation and monetary policy in all its forms. If, as has also been noted, top down tax gap estimates are to be preferred to bottom up estimates then two immediate conclusions follow. The first is that current VAT gap estimates (which are by far the most common available in the European Union) are likely to be more reliable than the limited number of bottom up direct tax estimates available. Secondly, there is a need for better bases for top down estimation of tax gaps.

The IMF (2013, 46) suggest that it may be possible to base top down tax estimates in national income accounting, saying:

Very broadly speaking, VAT is tax on value added (Y), which comprises labor income (W; wage and salaries, etc.) and gross capital income (R; corporate profit, etc.). Therefore, [it follows that the] VAT base less wage ($Y - W = R$) could be used as a proxy of corporate income tax. More precisely:

$$Y = C + I + (X - M) = W + R, \text{ and therefore}$$

$$R = C - W + I + (X - M)$$

where: I = Investment, X = Export, and M = Import.

As they note, an adjustment is required to allow for the fact that investment expenditure is not directly allowable for corporation tax purposes, with a statutory depreciation allowance (which they designate D) being substituted in its place in almost all countries. In addition, whilst exports (X) are outside the scope of VAT and imports (M) are chargeable for VAT the reverse is true in corporation tax. Allowing for this the IMF suggest that the *net corporate tax base (NR)* is:

$$NR = C - W + (I - D) + (X - M)$$

We believe this approach to the tax gap from the IMF is appropriate but that some issues still need to be addressed. The IMF proxy for corporate profits is, as they note “more precisely an estimate of cash flow [available] to all businesses, corporate and unincorporated”. This, however, creates difficulties because corporate and unincorporated profits are assessed to different taxes in many countries (corporate and personal income taxes) and the defined measure of profit would appear to also include interest, some of which might be retained in corporations and part of which will flow to individuals. In addition, not all of those recipients will necessarily be in the country of residence of the person making payment.

We will propose modifications to the IMF’s methodology in a forthcoming paper. We note for the time being that there are ranges of tax gaps (including policy gaps), and that these need to be appropriately categorised by type; their uses need to be considered; suitable and broader based methodologies for their preparation are required and that the reasons for considering the tax gap need to be reappraised as a result.

The last of these issues may be the most important. The suggestion by many commentators, including the OECD, that tax gap appraisal is a mechanism for appraisal of the efficiency of tax authorities is only part of the story. The IMF analysis suggests that tax gap analysis might be more appropriately considered as a tool of macroeconomic management. In particular, if macroprudential regulation are designed to mitigate systemic risk within a financial system, then a proper understanding and use of the tax gap should form a part of this framework given the intimate relationship between money, tax and the stated goals of most macroeconomic agents who wish to deliver growth in GDP whilst constraining both inflation and government deficits.

The point is relatively easy to demonstrate. If, as the IMF (2013) note:

$$Y = C + I + G + (X - P)$$

And if it is also true, as I widely held, that

$$Y = C + S + T$$

Where Y is national income (gross domestic product), C is end consumption, G is government spending excluding transfers, I is investment, X is exports, P is imports (Note the differing terminology used here from that offered by the IMF, above), S is net savings and T tax paid, then it follow that:

$$G + I + (X - P) = S + T$$

And at the level of Gross National Income

$$G + I = S + T$$

To rearrange,

$$G = (S - I) + T$$

If in this context $(S - I)$ is seen as a residual financial measure, being an estimate of the change net borrowing within the economy that the government as lender of last resort must meet or absorb, which might be expressed as ΔB , then:

$$G = \Delta B + T$$

However that formulation is incomplete because unconventional monetary policy in the form of quantitative easing has made clear that government is not dependent upon just tax and borrowing to finance its activities but can also, in effect, create new money for this purpose⁴. If money is M then the introduction of this variable means that G should be properly defined as:

$$G = \Delta J + \Delta M + T$$

However, T in this equation is tax actually collected but the IMF argue that there are at least two gaps i.e.

$$T = T_t - T_p - T_c$$

Where T_t is the total potential tax due on the tax base, T_p is the tax foregone as a result of policy and T_c is the tax compliance gap, itself comprising T_e , which is the part of the tax compliance gap

⁴ The Bank of England says on its website that ‘Quantitative easing (QE) is an unconventional form of monetary policy where a Central Bank creates new money electronically to buy financial assets, like government bonds.’ <http://www.bankofengland.co.uk/monetarypolicy/Pages/qe/default.aspx> accessed 29 October 2017

resulting from tax evasion; T_a , which is the part resulting from tax avoidance and T_d , which is the part of the tax compliance gap resulting from non-payment of tax debts.

Substituting this understanding in the equation for G:

$$G = \Delta J + \Delta M + (T_t - T_p - (T_e + T_a + T_d))$$

7. A proposed five-tier approach to measuring the tax gap

In light of the above, we suggest that there are five potential levels, or tiers, at which the tax gap might be explored, which will be considered in more depth in this section.

The first tier looks at the formula just developed and at the various tax bases defined in national income accounting (C, or consumption; W, or wages; R, or interest; and so on) or which might be added to such accounting (such as E, to express the value of mineral extraction; F, to indicate the value of financial flows and V which might indicate net work as well as L, a measure of land value). It then estimates the total potential tax base, T_t , based on estimates of these variables as indication of the taxable capacity of the economy before explicitly making clear the policy decisions taken to tax or not those available bases, including the decision to permit so-called tax expenditures that represent incentives implicit in the tax system by exempting certain bases from charge or encouraging some behaviours (such as savings, S) by tax favoured incentive, in the process developing an estimate of tax forgone as a consequence, or T_p .

The second tier of tax gap effectively takes the difference between gross domestic product and gross national income into account. The issue is of some considerable concern, the whole OECD Base Erosion and Profits Shifting project, initiated by the G20 in 2012 and which initially reported in 2015 (OECD, 2015) [OECD, 2015, *OECD/G20 Base Erosion and Profit Shifting Project Explanatory Statement, 2015 Final Reports*. Paris: OECD <http://www.oecd.org/ctp/beps-explanatory-statement-2015.pdf>] that has driven the international tax agenda since 2012 being based on the belief that part of the tax base that should be recorded in one jurisdiction is in fact recorded in another. The issue is not as simple as relocation though. This tier of the tax gap has to embrace all aspects of tax behaviour that seeks to record income correctly attributable to one party as if it is the income of another for the purpose of securing a tax advantage (which can simply be defined as an overall reduction in the tax liability accruing to the party instigating the misconduct giving rise to the misstatement when all factors are taken into consideration, including the effluxion of time).

The third tier of risk is one that takes into consideration the consequence of tax spillovers. As Baker and Murphy (2017) have argued, the limited approach to tax spillover promoted by the IMF (2014) insufficiently explores the use of this methodology in appraising tax gaps. Their argument is that spillover methodology might be extended in two ways, one of which represents tier three risk. In this form of spillover they suggest that a tax loss arising in one tax might indicate a loss in another tax. So, to use accounting logic, if the reporting of turnover is suppressed to evade declaration of a value added tax liability then it follows that, firstly, the suppressed income cannot be reintroduced into other tax declarations (such as those for corporation tax or personal income tax) without the VAT under-declaration being apparent, meaning, secondly, that under-declarations of other taxes must follow. The most likely other such liabilities are personal income tax and social security contributions due on funds implicitly illicitly passed from a trading entity to its owner as a result of

the suppression of trading income for the purposes of increasing the owner's net income, declared or otherwise, but it is also possible that corporation tax liabilities might be suppressed as well. The understanding has significant methodological consequences: it suggests that knowing a VAT gap might permit other tax gaps to be estimated. The method can be applied to other aspects of tax evasion as well as those relating to VAT, but has limited application for tax avoidance, where such spillovers are unlikely.

Tax avoidance is as a result the focus of tier four risk. At this level of the tax gap a transaction is deliberately undertaken in a fashion that the taxpayer knows may not be tax compliant (implying that the taxpayer is taking a calculated risk that the form in which the declaration takes place might be wrong but that the balance of probabilities suggests to them that this is a risk worth taking because the prospect of penalty in the form of additional liability is limited, even if the error might become apparent in a manner described by Quentin (2015)). [Quentin, D. 2014. *Risk-mining the public exchequer*. London, self published, http://www.davidquentin.co.uk/Risk-Mining_The_Public_Exchequer.pdf]. Much so-called tax avoidance is of this nature. For the purpose of this analysis the significance is that the risk of a tax gap is inherent within a particular transaction. The chance of spillover effect is, therefore, limited and risk can be considered to be contained even if the particular risk is identified. Most tax gap analysis, given that it is usually presented as tax specific (as noted previously of the individual EU member states undertaking estimation exercises) even when it is likely that the analysis in question should be appraised as a tier three risk.

Finally, Baker and Murphy's spill-over methodology suggests a fifth tier of risk. This is the risk of spill-over within both national and international tax systems arising from poor systemic tax design, whether that be because of the creation of arbitrage risk within tax legislation and between that legislation and that regulating accounting, company or contract law; or risk resulting from the arbitrage of the tax system because tax rate differentials within and between states encourage that abuse. Their suggestion is that this risk is measurable.

This five tier approach is different from that adopted by those EU countries addressing tax gap issues at present. The difference is essentially one of scope and ambition. HMRC typifies current thinking on this issue when it says that 'Thinking about the tax gap helps the department to understand how non-compliance occurs and how the causes can be addressed.' (2017a, 3). This paper suggests that the tax gap can assist that process but is something substantially more significant and should be at the core of the whole process of macroprudential regulation used by a state to assess the systemic risks that it faces both within and beyond its jurisdiction.

8. Conclusion

This paper has reviewed tax gap methodologies as they are suggested by literature and as they are used by the EC or EU national governments. To this end, a definition of the 'tax gap' is discussed and existing data on tax gap measurements in EU member states is reviewed. Key findings and recommendations of this paper include: that the measure of establishing a tax gap appears to remain an exception, rather than the norm; that tax gap methodology is diverse and developing rather than standardized; that above discussed flaws in the design of tax gap surveys limit the resulting data's use for macroeconomic policy-making and other purposes; that an approach in which tax gaps might

be prepared in five specific tiers might be advisable. Consequently this paper suggests that more attention be paid to a range of tax gap measures, both to improve ability to measure the tax gap accurately and to turn such measurements into more useful policy tools of macroeconomic management.

The study of the tax gap, like some other aspects of taxation, has not received the attention it deserves in political economy. This review of tax gap methodologies suggests a reason for that neglect: as is apparent from much of the noted comment on the issue, the tax gap is not considered to be of macroprudential significance, but is instead suggested to be a matter of management appraisal. This paper argues that this limitation in the use of tax gap analysis is inappropriate and that the tax gap deserves to be appraised within macroprudential frameworks where its management is a key tool in the delivery of stable economic policy.

9. Planned next stages of development of the paper

The next planned developments for this work are to:

1. Undertake a pilot study based upon the national income and tax data of the Isle of Man determine whether it is technically feasible to prepare ‘top-down’ tax gap measures for income tax, national insurance, corporation tax and VAT that provide estimates of tax foregone as a result of policy, tax pens and forecast within plausible ranges of tax evaded, tax avoided and tax unpaid.
2. To submit the resulting information and an updated version of this working paper to an academic journal.

It is then proposed to undertake further work to:

3. To replicate the pilot study undertaken for the Isle of Man, if successful, the United Kingdom. This study will use UK GDP data; UK household income and expenditure survey data; data from the UK’s tax authority (HM Revenue & Customs) on tax yields as well as income sources giving rise to that revenue and the income distributions of those making payment; and data from HMRC on:
 - a. The cost of tax reliefs;
 - b. The cost of varying tax rates;
 - c. The UK tax gap.

It is anticipated that this analysis of the UK tax gap will be presented as a separate journal paper in its own right.

4. In the event that it proves possible to undertake analysis of the planned type on the UK tax gap, and to draw useful results from the work undertaken, additional analysis may then be undertaken on the tax gaps a selection of further EU member states. It is, very tentatively, suggested that these countries might be as follows, with reasons give for their potential selection being noted:

Country	Potential reason for selection
Denmark	Representative Nordic state with good tax data

	without significant of taxation to regions that it likely to make tax gap reconciliation on a 'top-down' basis harder to achieve.
Italy or Spain	Southern EU members states of significant size
Ireland	EU member state that has attracted considerable attention for its tax policies.
Luxembourg	Small member state that has attracted attention for its tax policies.
Romania	Eastern European member state believed to have the largest shadow economy in Europe.

10. Appendix

The questions asked of the European Union members state's tax administrations were as follows:

Section A1

Tax gap questionnaire – jurisdictions not estimating tax gaps at present

1. Might you advise which of the following best reflect(s) your reasons for not estimating tax gaps?
Please tick as many as might be appropriate:
 - Not considered to be an issue of priority;
 - No mandate to address this issue;
 - Insufficient resources are available to undertake the work;
 - EU data is considered sufficient for our purposes;
 - It would not change the allocation of resources in the country's tax authority;
 - It is not believed that such research will improve tax recovery;
 - There is no confidence that current tax gap methodologies will provide useful information for tax management;
 - We have not prepared such estimates to date but expect to do so in the future;
 - Other (please explain).

2. If it is your intention to prepare tax gap estimates in the future although you have not done so to date:
 - When are you planning to do so?

 - For which taxes are you planning to prepare estimates?

- What will motivate that research when it takes place? Please indicate any of the following that might be appropriate:
 - There is growing political interest in the issue;
 - EU data does not meet our needs;
 - To assist better allocation of resources used to tackle tax abuse;
 - We have now identified the research methods we would want to use to estimate tax gaps;
 - A budget to undertake this task has now been allocated;
 - Other (please explain).

- 3. If it is your intention to prepare tax gap estimates in the future might you indicate what broad approach you would propose to use for each tax for which an estimate is planned?

- 4. If you are not planning to prepare tax gap estimates might you suggest what other data you now use to indicate the efficiency of your tax authority in collecting the tax estimated to be due within your country? For example, do you use shadow economy data, data on the number of tax returns supplied, overall trends in yield or other information? Your answer to this section is of great interest to us.

Section A2

Tax gap questionnaire – jurisdictions estimating tax gaps at present

1. Can you confirm you are researching the tax gap in your jurisdiction?

2. Which taxes are the subject of your research? Please indicate all those that might apply:
 - Income tax
 - Corporation tax
 - Value added tax
 - Excise duties
 - Social security contributions / payroll taxes
 - Capital gains taxes
 - Wealth taxes
 - Others (please indicate).

3. Why were these taxes chosen?

4. Do you intend to extend the work to other taxes omitted at present? If so, which?

5. How many iterations of this research have there been and how frequently have they been undertaken?

6. Has the research been published? If so might you suggest where we might obtain a copy?
7. What is the motivation for the research?
8. How has the research been used in practice?
9. Has the research been considered successful? Why, or why not?
10. Will the research be repeated? Please explain the reason.
11. If the research is to be repeated will it be extended to other taxes?
12. What methodology was chosen for the research undertaken? Would this be changed in the light of experience?
13. Do you expect estimation of the tax policy gap to influence the future direction of tax policy making in your jurisdiction?
14. Are the results found consistent with other studies e.g. those on European VAT gaps? If not, have the results been reconciled, and how?
15. If different methodologies have been chosen for different taxes how are the results reconciled?
16. The results are, presumably, compared with national GDP. What part of your country's GDP is believed to be within the grey or shadow economy? Does this estimate differ from the tax gap estimate you have established? If so, how is this reconciled?
17. Have you prepared any other tax gap estimates or undertaken any other work that might suggest the scale of the tax gap in your jurisdiction e.g. estimating the size of the shadow economy?

If you have might you answer the following questions:

- a. What was this alternative work?
- b. Why was this approach preferred to tax gap estimation?
- c. Might you share the findings with us?
- d. What use will be made of these findings?
- e. Will this research now inform tax gap estimates? Might you elaborate your reasons?

Section B

Tax gap questionnaire – background data

1. Might you supply the following background information for your tax administration or alternatively advise where we might find it?
 - Which taxes do you administer?
 - What is the total revenue for each tax you administer for each of the last four years?
 - How many people did your administration employ in each of the last four years?
 - If you have a gender and age breakdown of your employees might you share it with us?
 - In how many offices are your staff located? If you can advise a total by year this would be appreciated.
2. Might you please supply the published accounts for your tax administration for the last four years?

3. If your administration does not publish accounts might you instead advise what the total budget for your tax administration was for each of the last four years and provide a breakdown by major budget heading, if possible?
4. If you administration publishes statistics on the taxes it administers (e.g., revenue raised, number of taxpayers, etc.,) might you either supply a copy or advise where these might be found in the Internet?
5. How many taxpayers were there for each of the direct taxes that you administer in each of the last four years?

Might you also advise, if possible:

- How many of these taxpayers were asked for a tax return for each tax in each year?
 - How many of those persons asked for a tax return actually supplied one?
 - How many penalties were issued for non-submission of tax returns in each year and what proportion of those penalties were paid?
 - How many enquiries of taxpayers were initiated by the tax administration in each of the last four years, broken down by tax, and how much additional tax was actually collected as a result?
 - How many prosecutions for direct tax related offences were there in each of the last four years and what was the percentage success rate in prosecutions undertaken?
6. How many persons were registered to collect indirect taxes in each of the last four years, by tax, if possible?
Might you also please assist with the following information?
 - How many penalties were issued for non-compliance with indirect taxation requirements were there in each of the last four years and what was the value of penalties imposed as a result?

- How many enquiries of taxpayers were initiated by the tax administration, broken down by indirect tax, in each of the last four years, and how much additional tax was actually collected as a result?
- How many prosecutions for indirect tax related offences were there in each of the last four years and what was the percentage success rate in prosecutions undertaken?

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This request for information has been made as part of the Coffers (Combating Financial Fraud and Empowering Regulators) Horizon 2020 project on which further details, including with regard to funding, can be found at www.coffers.eu. This request for information was subject to ethical clearance by City, University of London.



COFFERS
Combating Fiscal Fraud and Empowering Regulators



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