The Revenue Administration—Gap Analysis Program: Model and Methodology for Value-Added Tax Gap Estimation

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TECHNICAL NOTES AND MANUALS

The Revenue Administration—Gap Analysis Program: Model and Methodology for Value-Added Tax Gap Estimation[1]

This technical note and manual (TNM) addresses the following issues:

- How do countries measure noncompliance and other revenue foregone in value-added tax (VAT)?
- What is the VAT gap under the IMF Revenue Administration—Gap Analysis Program?
- How is the Value-Added Tax gap measured by the IMF Revenue Administration—Gap Analysis Program?
- How can the VAT gap be used to improve compliance?

CONTENTS

I. HOW DO COUNTRIES MEASURE NONCOMPLIANCE AND OTHER REVENUE IN VALUE-ADDED TAX?

Several countries follow good practice in publishing estimates of the fiscal impact of VAT reliefs that are allowed in law.[2] A common example of such a relief is the exemption from VAT of social welfare services provided by public bodies and not-for-profit organizations. Such impacts are known as "tax expenditures." Generally, these estimates are derived from independent data, for example from household expenditure surveys or from relieved supplies declared by taxpayers.[3]

It is generally less easy to measure revenue not collected due to noncompliance, but an increasing number of countries are doing so.[4] By their very nature, noncompliant behaviors are unlikely to be declared by taxpayers and may well be deliberately concealed; consequently, they are not easy to quantify through direct observation or survey. Even still, the fiscal impacts of noncompliance are of critical interest, not just to tax administrations, but also to finance ministries and other stakeholders, and a growing number of countries now regularly produce and publish estimated revenue losses due to noncompliance.

Three main approaches are used to estimate VAT noncompliance:

- **Top-down approach:** A top-down approach aims to provide a comprehensive assessment of all tax losses by measuring the gap as the difference between estimated potential revenue and actual revenues. The estimates for potential revenue are typically produced using statistical data. This approach does not identify the compliance behaviors creating the losses.

- **Bottom-up approach:** Bottom-up techniques, such as random sampling of taxpayers for audit, or compliance risk analysis and intervention results can instead be used to estimate the impact of specific behaviors. As well, these can provide valuable insights into compliance behaviors and risks, and they can be used to test and interpret top-down estimates. However, such techniques cover only specifically identified sources of the tax/duty gap—not necessarily the whole tax/duty gap—and are costlier to execute than a top-down approach.

- **Econometric techniques:** Analytical tools such as frontier analysis and time series analysis are sometimes used to provide estimates of efficiency or revenue losses. The results are quite sensitive to the selection of determinants and assumptions used in the model. As well, the results can be difficult to interpret from a compliance or tax administration perspective. Their use is, therefore, not recommended for studies whose primary purpose is to estimate the tax gap itself, though they can still be useful for more general studies of tax efficiency and the like.

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[2] This list includes, but is not limited to: Australia, Canada, Italy, France, Germany, Japan, Netherlands, Spain, Sweden, the United Kingdom, and the United States. Amongst the G20 countries, 17 provide public estimates of tax expenditures.

[3] For a more complete discussion on this topic see, for example, Villela, 2010.

[4] Amongst the previously listed countries, which produce public tax expenditure estimates, the United Kingdom and the United States have an established history of regularly produced public tax gap estimate reports. Italy and Australia have, also, recently started to produce regular reports. Some other countries have produced reports, but not on a regular annual release schedule; this would include Sweden, France and most of South and Central America. Some countries, such as Germany and Mexico, commission studies on a regular basis from third parties. The European Community has, also, regularly commissioned estimates of the VAT gap for its member nations (see Reckon and CASE), but has yet to produce estimates for the other major tax types.

This technical note focuses on the top-down approach used in Revenue Administration–Gap Analysis Program (RA-GAP) Model and Methodology to estimating VAT gaps. The IMF RA-GAP approach has several distinctive advantages in respect to top-down approaches used in most countries, in particular:

- the RA-GAP model and methodology provides administrations with details on the nature of the tax gap, not just its size, by breaking the VAT gap down by sectors of activity in the economy, and by basic administrative functions (collections versus assessment);

- the RA-GAP model for estimating potential revenue more closely follows the manner in which a typical credit-invoice VAT works in practice, which allows for a more precise modelling of the policy structure of a countries VAT; and

- the RA-GAP methodology is an accruals-based methodology, which allows for better matching the statistical measures for economic activity with revenue collections, and allows for tracking an administration's efforts to close the gap over time.

II. WHAT IS THE "VALUE-ADDED TAX GAP" UNDER THE IMF REVENUE ADMINISTRATION—GAP ANALYSIS PROGRAM?

While a modern tax system is predicated on voluntary compliance, there are often few tools available to measure and monitor tax compliance. Tax gap analysis provides tax administrators and policy makers, and their stakeholders, with a measure of the amount of tax revenues lost through noncompliance, avoidance, and the impact of policy choices.

For any tax, the gap, as defined in the IMF RA-GAP, is the difference between potential revenue of the underlying economic tax base and actual revenue. Under this broad definition, the tax gap can be decomposed into two main components: the impact of noncompliance (*compliance gap*), and the impact of policy choices (*policy gap*). This relationship is illustrated in Figure 1.[5]

Defining the gap in this fashion allows for a comparison of the relative sizes of the compliance gap and policy gap, which provides perspective on the relative amount these two factors are contributing to the tax gap. This, in turn, allows tax administrators and policy makers to assess potential avenues of actions for improving revenue performance by addressing either component of the gap.

As mentioned, the general approach of the RA-GAP methodology is to estimate the size of the compliance gap on a top-down basis by comparing potential VAT collections to actual VAT collections. The former is estimated from economic statistics covering the whole VAT tax base. The latter is estimated from VAT tax returns and related records. The critical

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[5] For another perspective on the definition of tax gap and how it can be measured, see European Commission Directorate General Taxation and Customs Union, 2016.

advantages of this approach are that (a) it should cover all compliance losses, whether or not they have been separately identified; and that (b) the results can be compared to the costs of tax expenditures and reliefs as barriers to revenue mobilization.

Figure 1. Illustration of the Components of the Tax Gap
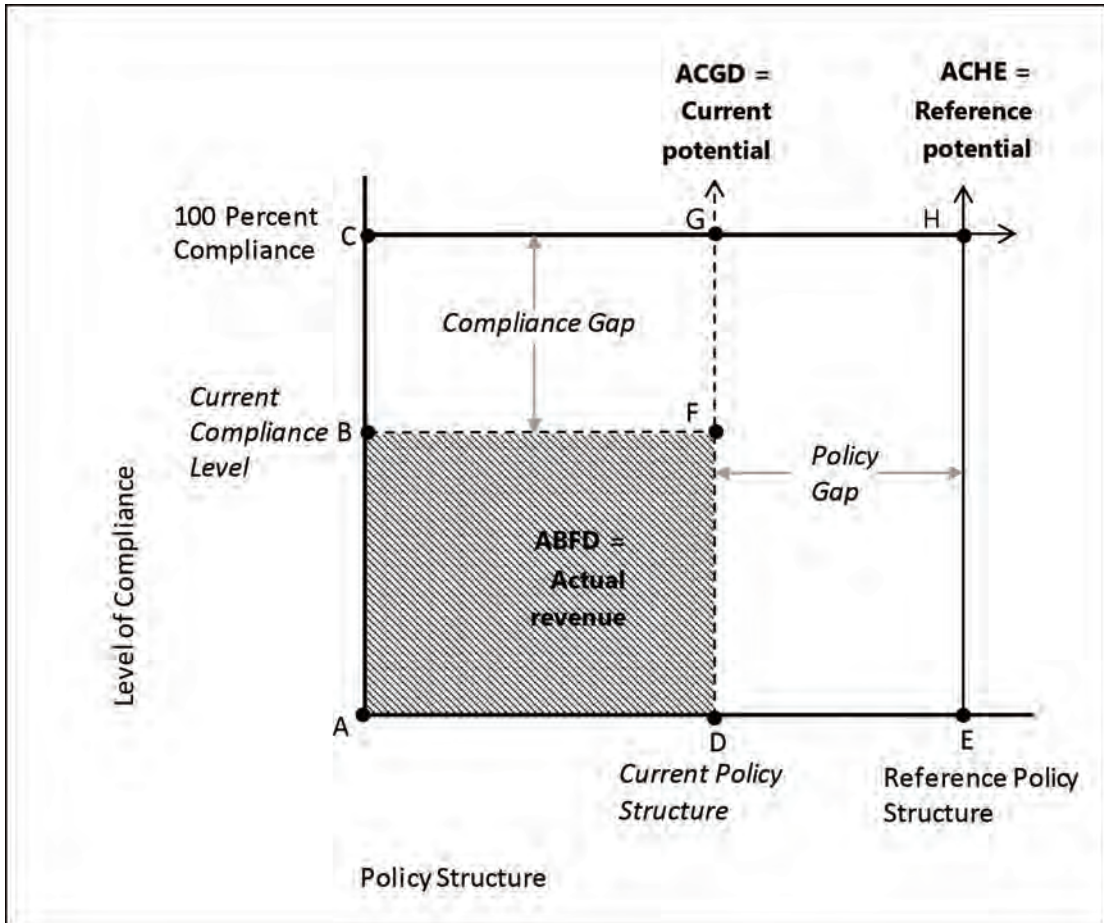
The RA-GAP methodology uses statistical data to estimate a reference potential revenue value, tax administration data to determine the actual revenue value, and then evaluates the difference between the two. This process can be summarized as:

Step 1: Estimate *reference potential revenue*, RPR, (Box *ACHE* in Figure 1).

Step 2: Determine *actual revenue*, AR, (Box *ABFD*).

Step 3: The *tax gap* = RPR-AR.

A key component in estimating the potential revenue is to establish a reference policy framework. For a VAT, the reference policy structure employed by RA-GAP is the current standard rate applied to all final consumption.[6]

The *compliance gap* is estimated using the same general procedure, except the potential revenue against which actual revenue is compared is constructed using the current statutory framework instead of a reference framework. The process is similar to that of the overall gap.

Step 1: Estimate the potential revenue under the current policy settings, CPR, (Box *ACGD*).

Step 2: Determine actual revenue, AR, (Box *ABFD*).

Step 3: The compliance gap = CPR-AR.[7]

With the compliance gap determined, the *policy gap* is the difference between the estimated *reference potential revenue* (RPR) and current potential revenue (CPR). Alternatively, it can be expressed as the difference between the tax gap and the compliance gap.[8] It should be noted that, as with current revenues, there is a difference between the potential revenue existing within the policy gap and the revenue yield that would be achieved against that potential; i.e., there would be compliance losses realized in closing the policy gap. While this could be indicated by extending the Line *BF* out to Line *EH*, this could be misleading, as the compliance rate associated with the removal of any tax expenditure item may not be the same as the current average compliance rate.

III. HOW IS THE VALUE-ADDED TAX GAP MEASURED BY THE IMF REVENUE ADMINISTRATION—GAP ANALYSIS PROGRAM?

The following section breaks the discussion of the details of the RA-GAP VAT gap estimation methodology into three components:

1. the method for estimating potential revenue;

2. the method for measuring actual revenue; and

3. the methods used for reporting the derived gap figures.

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[6] The VAT gap yielded from this calculation is then analogous to the VAT C-efficiency measure. C-efficiency is the ratio of actual VAT to the standard VAT rate applied to final consumption, which is basically the ratio of AR to RPR, rather than the difference. See Keen (2013) for a more in depth discussion of the relationship between the tax gap, its decomposition into compliance and policy gaps, and its relation to C-efficiency.

[7] The VAT gap yielded from this calculation is then analogous to the VAT C-efficiency measure. C-efficiency is the ratio of actual VAT to the standard VAT rate applied to final consumption, which is basically the ratio of AR to RPR, rather than the difference. See Keen (2013) for a more in depth discussion of the relationship between the tax gap, its decomposition into compliance and policy gaps, and its relation to C-efficiency.

[8] The different values for potential revenue that results from these two measures, RPR and CPR, are solely a function of the policy structure used in the estimation; basically RPR is calculated by applying the standard rate to all supplies, while CPR uses the current applicable tax rate schedule.

A. Potential VAT Revenue

The RA-GAP preferred methodology for estimating potential revenue for a VAT is to apply the VAT policy framework to a model of the value-added for each sector of the economy. This process for estimating the tax follows the same process individual taxpayers use to determine their individual liabilities. The full VAT liability for an individual taxpayer is determined by the amount they pay to customs on their imports, plus the VAT they must charge on their output sold domestically (exports being zero-rated), less the VAT they have been charged on their inputs. This potential VAT revenue model works with national accounts statistical data, principally supply-use or input-output tables, to estimate the tax applicable on imports by a sector, adds the tax applicable to the domestic output of a sector, and subtracts any credits for tax applicable to the intermediate demand and gross fixed capital formation (inputs) of the sector.

1. The potential revenue model

The potential revenue model described here applies to both estimates for potential revenue: RPR and CPR. The same model would, also, be used for the potential revenue estimate associated with any other counterfactual policy structure.[9] The difference in the nature of the potential revenue values depends entirely on the policy structure used as an input into the model.

The value-added model for potential revenue, as discussed above, can be expressed as:

$$PV = \sum_s (PVm^s + PVo^s - PVi^s) \tag{1}$$

where s denotes a particular sector and,

PV = the total potential VAT revenue;

PVm^s = the potential VAT on to the imports of sector s;

PVo^s = the potential VAT on the output of sector s; and

PVi^s = the potential VAT creditable on the inputs of sector s.

As is evident in the above equation, by not summing over the sectors s, this model can provide a breakdown of the potential VAT by sector.

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[9] This allows employing the model for purposes of determining the potential revenue impact of alternate policy structures, or estimating the cost of specific or sets of tax expenditures.

Turning to the various components of potential revenue in equation (1), the potential VAT on imports of a sector, PVm^s, is determined by:

$$PVm^s = \sum_c (M_c^s \times \tau_c) \tag{2}$$

where,

M_c^s = imports by sector s of commodity *c*, from the national accounts statistics, and

τ_c = the VAT rate that applies to commodity c (zero if zero-rated or exempt).

The vector of VAT rates, τ_c, is the first of three "policy variables" in the model. For estimating current potential revenue, the values for are obtained from the current tax rate schedule.[10] For the reference potential revenue estimate, the standard rate in effect for the period is assigned to the full vector τ_c.

The potential VAT on the output of a sector is determined by:

$$PVo^s = \sum_c (O_c^s - X_c^s) \times \tau_c \times r^s \tag{3}$$

where,

O_c^s = output by sector s of commodity *c*, from the national accounts statistics;

X_c^s = exports by sector s of commodity *c*, from the national accounts statistics; and

r^s = the proportion of value-added in sector *s* that is produced by entities registered for VAT.

Exports are subtracted from total output to determine taxable domestic output, which follows the method of calculation for the domestic VAT liability for individual taxpayers in almost all VAT jurisdictions.[11] This amount is then reduced by r^s, the second policy variable in the model, which reflects the impact of the presence of VAT thresholds. Potential VAT on output is only due on the output of those entities which can be, or are required to be, registered for VAT. While τ for the current potential collections for a given commodity can be directly extracted from the statutory tax rate schedule, the value of r for a given sector typically needs to be estimated. Estimates for the values for r^s can be constructed using other sources, such as business survey data, or other tax declaration data (e.g., corporate income tax).

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[10] With the exception of the rate applied to the retail and wholesale trade sectors. The explanation for the need for a special rate for these sectors, and the method for determining it, is described below.

[11] This is the general case for jurisdictions which use a standard destination based VAT, and so zero-rate exports. The EU had, until recently, been using an origin based VAT system for services; in such circumstances, the exports of those services would not be subtracted from domestic production, and their imports not taxed. Methodologically, this can be accomplished by simply multiplying imports and exports by a binary vector (a vector of ones or zeros) to indicate which supplies should be treated under the destination principle (assigned a value of one) and those under the origin principle (assigned a value of zero).

Finally, the potential VAT credits for inputs of sector s, PVi^s, is determined by:

$$PVi^s = \sum_c (N_c^s + I_c^s) \times \tau_c \times r^s \times (1 - e^s) \times \eta_c^s \qquad (4)$$

where,

N_c^s = intermediate consumption by sector s of commodity c, from the national accounts statistics;

I_c^s = gross fixed capital formation by sector s of commodity c, from the national accounts statistics;

e^s = the proportion of output for a sector which is exempt output; and

η_c^s = the proportion of input tax credits for commodity c by sector s allowed to be claimed.

In the national accounts statistics, purchases are typically separated into two broad categories: consumption and capital formation. So in calculating the VAT paid on inputs by a sector, two sources of data must be used: data on the consumption by industries (intermediate consumption) and the gross fixed capital formation by industries (investment).

The policy variable r^s is applied to this term, as well. Input credits only accrue to registered entities in a sector, so applying r^s to the total VAT paid on inputs results in only that proportion paid by registered entities being treated as creditable.[12]

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[12] There is an assumption here that the same value of r^s applies across the four variables *O, X, I,* and *N.* It can be shown mathematically that this assumption is actually only of consequence if there are any significant difference between the level of r^s for *O* and *X.* If the level of r^s is close to one, as would generally be expected, the results will not be very sensitive to this assumption. As such, while it might be more technically correct to come up with separate values for *O* and *X,* this would likely greatly increase the time and effort required to construct the model with no discernible difference in the final results.

Box 1. An Alternate Method for Estimating Potential Value-Added Tax

Another model structure for estimating the potential collections for a VAT, and the more common methodology, is to base the model on final consumption and other demand-side data.[13] The design principle behind such a model is to construct a revenue model that tries to best capture the target tax base. This method uses demand-side data to determine the VAT paid by consumers, and then adds an estimate of the amount of final VAT borne by exempt businesses using statistics on intermediate demand. In theory, both methods should yield the same results, as they are both theoretically identical definitions of the potential tax base. This equivalence comes from the basic national accounts identity:

$$Y = C + I + X - M$$

where C is final consumption by households, G is consumption by government, Y is value-added and is the difference between O and N, as defined above, and I, X, and M are defined as above. This can be transformed to isolate final consumption:

$$C = M + O - X - N - I$$

So, we can see here that a demand-based approach, focusing on final consumption to estimating the base would be represented by the left-hand side of the equation, is equivalent to the value-added-based approach, as represented on the right hand-side. Indeed, this is the principle upon which the credit-invoice VAT method, employed by almost all countries which levy VAT, is based.

While the above described methodology should, in theory, provide the same overall value for the tax gap as using the RA-GAP value-added-based approach, RA-GAP allows for disaggregating the estimate by sector. By using the value-added-based methodology, the potential collections estimated are determined with respect to the sector of collection. In turn, the taxpayer registry data can be used to determine the sector of activity for disaggregating the actual collections on a sectoral basis. Thus, gap estimates can be produced on a sector-by-sector basis. This key feature of the value-added-based approach makes it the preferred approach for RA-GAP.

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[13] For examples of such models, and further discussion on their design and specification, see Reckon LLP (2009), CASE (2013), CASE (2014).

Input VAT credits are, also, only allowed in the production of taxable output, and so the amount of credits is also limited by e^s, the proportion of output for a sector which is taxable. The value for e^s is endogenously determined in the model by comparing the value of exempt output in a sector to the total output of the sector:

$$e^s = \sum_c (O_c^s \times \omega_c) \Big/ \sum_c (O_c^s) \tag{5}$$

where ω_c distinguishes whether commodity c is exempt ($\omega_c = 1$) or taxable ($\omega_c = 0$).[14]

Finally, some VAT structures restrict input tax credits for certain supplies, such as entertainment expenses. The variable η_c^s is the proportion of a purchase for which input credits are denied, and is the third policy variable in the model used to cover these circumstances. The values for this variable for the current potential collection estimate are determined from the statutes. For example, if there were a general disallowance of input tax credits for restaurant meals, the value of η_c^s for all sectors would be zero (0). For the full potential collections, all values in η_c^s are one (1).

Potential revenue is calculated by substituting equations (2) through (4) into equation (1). As each of these component equations provide separate values for each sector s, so too can the derived total potential VAT be broken down by sector of activity. This is what allows the RA-GAP methodology to break the VAT gap down by sector.

2. Accounting for differences between statistical treatments and tax treatments

The model specified above presupposes that the definitions for the data on economic activity, as provided by the statistical data, matches the definitions used for tax purposes. There are, however, some key areas where the definitions differ, and these must be accounted for in assembling the inputs for the model.

Adjustments for Variables X and M

Adjustments to the statistical data for exports and imports, as supplied by the supply-use tables (or input-output table), are necessary, as the definition for imports and exports as employed in standard national accounts methodology differs from the definition under a typical VAT. Specifically, in the national accounts data, exports include the domestic consumption by nonresidents and imports includes the value of consumption abroad by

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[14] This assumes that the proportion of inputs to output used in producing the taxable supplies and non-taxable supplies is identical. While this is most likely not the case for any individual taxpayer, many jurisdictions use just such an apportionment rule to determine the allowable amount of input tax credits for businesses making split supplies (taxable and exempt supplies). In such cases, this model treatment would approximate the statutory requirement.

residents.[15] Under a typical destination-based VAT system, however, domestic consumption by nonresidents is taxable (although some countries might provide refunds for some or all of this VAT), and consumption abroad by residents is not taxable.[16] In calculating reference potential revenue, it is necessary to adjust final consumption to include domestic consumption by nonresidents, and exclude consumption abroad by residents. Supply-and-use tables should specifically include data on the value for these special categories of imports and exports, which can then be used in adjusting the tables.[17]

Another necessary adjustment for exports and imports arises because in the national accounts data exports and imports are associated with the sector of production and consumption, respectively, while the tax treatment is dependent on who the agent of the transaction is. So, for example, in the national accounts data all exports of bicycles will be associated with the bicycle manufacturing sector, while in reality all bicycle exports could be occurring through a trading company that purchases and exports bicycles. Similarly, imports of machinery and equipment used by bicycle manufacturers will appear as imports of machinery and equipment by the bicycle manufacturing sector, while in reality those imports could again be passing through a machinery wholesale company. Customs data can typically be employed to reallocate imports to the agent of import, rather than the final destination. Business survey data on the volume of exports, where available, can be employed to reallocate the exports. These reallocations are necessary in order to get the distribution of the tax gap across sectors correct, but they do not affect the overall level of the gap (i.e., the overall volume of production subject to zero-rating is not being changed; all that changes is the distribution of that zero-rated output).

Determining a weighted average statutory rate for the trade margins

For the retail and wholesale services sectors, a weighted average statutory VAT rate needs to be calculated. In the National Accounts Statistics, the output of the retail and wholesale services sectors are recorded as trade margins, while gross sales and inputs related to the transactions are not recorded. The rate applied to these margins should account for the fact that different VAT rates may apply across the range of commodities sold by the retail and wholesale sector (e.g., the standard rate on automobiles but a zero rate on pharmaceuticals).

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[15] The national accounts are compiled based on residency, and transactions between residents and non-residents are recorded as imports and exports, regardless of whether such transactions cross national borders or not.

[16] For jurisdictions that have rebate programs for VAT expenses incurred by non-residents, the estimate for potential VAT should be adjusted by the known expenditures for the rebate program, and not by adjusting the estimate to assume all such consumption is not subject to VAT.

[17] In cases where this specific data is not available, data on debit and credit for travel service on Balance of Payments can be another source of information. Otherwise, an approximation can be made by removing values for the import or export of services which are typically consumed at the place of supply—such as hotel and restaurant supplies, and local transportation supplies.

Using a breakdown of the margins by commodity type in a supply table of the national accounts, we can calculate a weighted average rate:

$$\tau_T = \sum_{c'} (\tau_{c'} \times K_{c'}) / \sum_{c'} (K_{c'})$$

where,

   τ_T = the weighted average VAT rate for the margins of the retail and wholesale sectors;

   $\tau_{c'}$ = the VAT rate for commodity c', where c' includes all commodities except for services of the retail and wholesale sectors; and

   $K_{c'}$ = is the value of the retail and wholesale margins associated with commodity c'.

3. Accommodating complexities in the policy structure

While the three policy variables, r^s, τ_c and η_c^s, can be used to model most policy structures, there are some specific policies which need additional adjustments. These policies generally fall under one of the two following categories:

   a. **Business to business treatments:** This would include policies that exempt supplies between certain taxpayers or class of taxpayers, for example, an exemption for supplies to VAT registrants by micro businesses (e.g., businesses under the threshold), or an exemption for a business based on their type of activity (e.g., where financial service providers are exempted as a class, rather than specific financial services). This would, also, include policies that provide for different rates for a supply depending on who the purchasers are, for example, zero-rating otherwise taxable fuels when supplied to international airlines.

   b. **Purchaser specific rates (business to consumers):** A tax policy that has different rates for a supply depending on who the purchasers are, for example, reduced rates on food for elderly purchasers or for diplomats.

Business-to-business treatments

Business to business treatments that involve exemptions will affect the overall level of the tax gap, while treatments that apply special rates will largely only affect the distribution of the gap across the sectors and not the overall level, as any change in the output tax of the supplying business would be offset by a matching change in the input tax credits of the purchasing business.[18] For example, if supply of fuel from a wholesaler to an airline is zero-rated but all other fuel sales are taxable, and if the model does not capture this nuance, the amount of VAT expected from the wholesaler would be overestimated (as the model would expect them to have collected VAT on sales to the airline), while there would be an offsetting under-estimation of the VAT for the VAT expected from the air transport sector (as the

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[18] The specific case of exemption for otherwise taxable supplies, which are the result of a registration threshold, or some other generalized exemption for supplies made by a certain subset of a sector, is already accommodated for through the inclusion of the policy parameter r^s.

model would expect the airlines to have creditable VAT attributable to all their consumption of fuel). These cases can typically be accommodated by modifying how tax rates are incorporated into the model, extending the specification from varying strictly by commodity, τ_c, to allowing for variations in the tax rate depending on the sector of activity of the supplier, $\tau_{c,s}$ or tax rates which vary by commodity, sector of the supplier, and sector of the purchaser, $\tau_{c,ss,sp}$.[19]

Business-to-consumer treatments

There are two methods for reflecting the impacts of special treatments applicable to business-to-consumer transactions: one is to expand the model by creating a special goods and services (for example, food for elderly people), reflecting the specific tax rates and actual transaction flows, and the other is to separately estimate the revenue impacts of special treatments and adjust the results from the model. For both methods, estimating the impact of any special treatments dependent on the nature of the consumer, i.e., income group, age, etc., needs household consumption survey data, or existing tax expenditure estimates for these transactions.

B. Actual value-added tax revenue

Like potential revenue, actual revenue can be expressed as the sum of three components: VAT on imports, VAT due on outputs, and VAT creditable for inputs in the period:

$$AV^s = \sum_{t \in s} (Vm^t + Vo^t - Vi^t)$$

where

AV^s = actual VAT for sector s;

Vm^t = VAT on imports for taxpayer t active in sector s;

Vo^t = VAT on output of taxpayer t; and

Vi^t = creditable VAT on inputs of taxpayer t.

Sector information for a taxpayer is typically available from the taxpayer registry, and so breaking down actual VAT by sector is typically fairly straightforward.

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[19] In practice, as these special treatments are not too common, it is easier to specify a general tax rate structure in the estimation model which varies only by commodity and then have a separate set of overriding tax rates which only apply for the specific types of transactions.

Alternatively, actual VAT can be re-expressed as the VAT on imports plus the domestically declared net VAT for taxpayers in a debit position, Vd^t, plus the domestically declared net VAT for taxpayers in a credit position, Vc^t:

$$AV^s = \sum_{t \in s} (Vm^t + Vd^t - Vc^t)$$

where

$Vd^t = (Vo^t - Vi^t)$ where $Vo^t > Vi^t$; and

$Vc^t = (Vi^t - Vo^t)$ where $Vi^t > Vo^t$.

The advantage of this simple rearrangement of the components of actual VAT is that different measures for actual VAT can be created by varying the data sources for the last two terms.[20] The table below summarizes four measures for actual VAT derived from varying the method of measurement and the data sources for measurement for the different components in the equation.

TABLE 1. THE VARIOUS MEASURES FOR ACTUAL VALUE-ADDED TAX				
Reference Period	Data Source for Vd^t	Data Source for Vc^t	Resulting Actual VAT Measure	Measure Used For...
Date of Transaction	Transactions	Transactions	Net Revenue	General operational performance indicator
Tax Period	Transactions	Transactions	Accrued Net Revenue	General operational performance indicator
	Assessments	Assessments	Assessments	General operational performance indicator, and tax gap measurement
	Transactions	Transactions	Accrued Collections	Tax gap measurement

1. Actual value-added tax: net revenue

This measure uses the date of the transaction of payments and refunds regardless of tax period (i.e., compiling all transactions made in June, regardless of what tax period the payment is being made for). It provides information about net cash collections or newly available cash for the government during the period. From an operational perspective, this is of course an important measure for the government in general.

Issues

- This measure will lag behind potential VAT revenues to the extent of normal lags in the collection of revenue, which will lead to fluctuations between potential VAT revenues and actual collections, which are due to collection operations and not due to compliance.

- Differences between potential VAT also arise due to lags in the payment of refunds.

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[20] For Vm^t, the VAT on imports, there is typically little difference between the VAT assessed and the VAT paid; customs operations typically require payment of all amounts due before release. This is not universally the case, and some countries do have programs allowing some taxpayers to "clear now, pay later", but typically such programs are (or should be) restricted to taxpayers in good standing. For purposes of simplicity of this discussion, we can ignore these exceptions.

- Significant differences can also arise in the case of administrations which employ a single taxpayer account for all taxpayer transactions. Under a single taxpayer account system, a taxpayer might use credits accrued under a VAT to offset debits accrued through income (or other) taxes. If these intra-tax transactions are not properly recorded it could result in over-reporting of net VAT (as not all credits are accounted for) and under-reporting of other taxes (as the VAT credits crowd out payments).[21]

These issues mean that estimating compliance gaps by using net revenue will not necessarily represent changes in taxpayers' compliance, as it will also reflect lags in collection and timing of refund payments. Furthermore, in many jurisdictions refunds are restricted to certain groups of taxpayers, such as taxpayers engaged mainly in making exports, and all other taxpayers with excess credit are required to carry that excess credit forward and apply it against debits in subsequent tax periods. In such a system then, even if there were 100 percent compliance, the value for the actual VAT and the potential VAT would differ, with the actual VAT being sometimes greater and sometimes lesser than the potential VAT, depending on the level of the stock of this un-refunded excess credit. Therefore, net revenue is not an appropriate measure for actual VAT to use in gauging a revenue administration's efforts to close the compliance gap.

2. Actual value-added tax: accrued net revenue

This measure uses the same data as net revenue, but the transacted amounts are reallocated to the tax periods in which tax liabilities or credits arose. In the long run, this measure will have roughly the same average value as net revenue.

Issues
- As with the net revenue measure differences with potential VAT may arise when countries employ excess credit carry-forward mechanisms, or using single taxpayer accounts.

Accrued net revenue is better associated with economic activities in each tax period, and it becomes more meaningful to compare with potential VAT revenues. However, for countries using excess credit carry-forward mechanisms, as with net revenue, changes in the stock of un-refunded excess credit will affect the difference from potential VAT, and so will result in a distorted measurement of the compliance gap.

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[21] Some countries allow excess VAT credit balances to be used to offset other tax liabilities, without operating single taxpayer accounts as such. Under such arrangements, the use of the VAT credit is recorded as a debit in the taxpayer's VAT account and a corresponding credit against outstanding liabilities in the other tax account, and so this issue does not arise. This procedure ensures the net revenue totals of both taxes is reported correctly. A similar mechanism can be used in a single taxpayer account system, but it is not inherently required as is the case where separate accounts per tax type are maintained.

3. Actual value-added tax: assessments

Actual VAT can also be measured using the assessment data compiled using the self-assessment data supplied by the taxpayer on their tax declarations for tax periods, and any additional assessments levied by the revenue authority. This would be a measure of the amount of actual VAT due.

Issues

- Not all assessed VAT liabilities are actually paid by taxpayers. Therefore, overall assessed amount would be smaller than available cash for the government in the long run, so the compliance gap estimated using this measure would end up understating the overall compliance gap.[22]

- As this measure relies in part on assessments made by the revenue authority, relying on this measure for assessing compliance would create an incentive for the revenue authority to create inflated assessments.

While this measure thus has issues in terms of measurement of the compliance gap, it is still useful to compare against potential VAT. As discussed below, potential VAT minus actual VAT assessments is referred to as the "assessment gap," and regarded as one of the two components which make up the compliance gap.

4. Actual value-added tax: accrued collections

This final measure for actual VAT is a hybrid of accrued net revenue and assessments—basically using payments data for debits (V_d^t), and assessments for credits (V_c^t). While the RA-GAP framework applies the label "accrued" to this measure, it is not meant to strictly follow the accrual basis accounting for measuring debits and credits. This measure is designed to achieve the best measure for underlying taxpayers' compliance. Over the long run, as with accrued net revenues, if the creation of excess credits to be carried forward balances out with the use of those excess credits, this measure will average out to the same value as net revenue.

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[22] If VAT credit is over-declared and actual reimbursed refund is smaller than declared credit, some of underestimation of compliance gaps would be offset.

Because this measure is a hybrid of accrued net revenue and assessments, it is necessary to consider an adjustment for the amount of offsetting between excess credit and tax liabilities in different periods for countries that allow or require some or all taxpayers to carry-forward excess. This offset amount should be regarded as additional VAT payments, because the use of excess credit to offset a tax liability is in essence equivalent to a cash payment by the taxpayer. This requires only a slight modification to the actual VAT equation:

$$AVac^s = \sum_{t \in s} (Vm^t + Vdp^t + Vdc^t + Vc^t)$$

where

$AVac^s$ = net accrued VAT collection for sector s;

Vm^t = VAT on imports for taxpayer t;

Vdp^t = actual VAT payments received from taxpayer t for the period;

Vdc^t = excess credits of taxpayer t used to reduce a positive VAT liability for the period; and

Vc = domestic net VAT credits (excess credits) for taxpayers in a credit position.

Often tax administrations are not explicitly tracking the values of Vdc^t, and so these must be derived from the assessment record data. The data which is usually recorded and tracked is the total amount of excess credit a taxpayer has brought forward from a previous period. This value, ECF^t (Excess-credit, carried forward for taxpayer t), can be used to determine Vdc^t using the following algorithm:

If $ECF^t > Vd$ then $Vdc^t = Vd$, otherwise $Vdc^t = ECF^t$.

In other words, if the excess credit carried forward exceeds the amount of positive VAT due, then the amount of excess credit used is equal to the amount of positive VAT due, otherwise if the excess credit available is less than the amount of tax due, the amount of excess credit used is the full amount available.

5. Which version to use?

With four different ways to determine actual VAT, the natural question is: which one is the "right" one? The answer is that this depends on the purpose for which the measure is to be used. In general, the usage can be broken down as indicated in Table 1: with the first two measures being used for operational purposes, and the second two for gap estimation purposes. Details on how these two measures are used in measuring the gap are provided below.

C. Measuring and reporting the gap

1. The gap in nominal and relative terms

As has been discussed above, the overall VAT gap is determined by subtracting actual VAT from potential VAT. We can now be more specific that the determination involves subtracting actual VAT, determined on the accrued collections basis, from potential VAT, estimated using the reference policy framework. The compliance gap would be the difference between the actual VAT, *determined on the accrued collections basis*, and potential VAT, *estimated using the current policy framework*. The policy gap is the difference between potential VAT, estimated using the reference policy framework, and potential VAT, *estimated using the current policy framework*.

The gap values yielded by these simple differences will be nominal values, but tax gaps are typically expressed in relative terms. While the nominal values are useful for assessing the current fiscal impact of any of the gaps, they are not useful in analyzing how the gaps are trending; growth in nominal values can always be due to simple inflation. As such, RA-GAP does not generally report the nominal values, but uses relative values.

It is conventional to present tax gap measures in terms relative to the relevant potential revenue; this is achieved by simply dividing the gap value from the relevant base measure. This means that the VAT gap and its two components would be expressed as::

$$\text{VAT gap} = \frac{\text{Potential VAT, current policy framework} - \text{Actual VAT, accrued collections}}{\text{Potential VAT, reference policy framework}}$$

$$\text{Compliance gap} = \frac{\text{Potential VAT, current policy framework} - \text{Actual VAT, accrued collections}}{\text{Potential VAT, current policy framework}}$$

$$\text{Policy gap} = \frac{\text{Potential VAT, reference policy framework} - \text{Potential VAT, current policy framework}}{\text{Potential VAT, reference policy framework}}$$

Another way of presenting the values is to express them as a share of gross domestic product (GDP). This allows for both trend analyses while still making the fiscal impact evident. It also makes for an easier comparison of the relative size of the various gaps when comparing them against each other—a 30 percent policy gap, measured as above, and a 30 percent compliance gap would not have equal nominal values.[23] The trend analysis, however, can be affected by changes in the relative size of relevant tax base to GDP. For example, if there is an increase in the relative size of final consumption to GDP, then even if the policy gap stayed constant, expressed as a percent of GDP, it would appear to increase.

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[23] The denominator for the two measures is different. As the denominator of the policy gap, potential VAT estimated using the reference policy framework, is by nature larger than the denominator for the compliance gap, potential VAT estimated using the current policy framework, a 30 percent policy gap will be nominally larger than a 30 percent compliance gap.

RA-GAP presents the gap values both as expressions relative to their relative tax base and relative to GDP. This allows for making a nuanced assessment of the trends while allowing for comparisons across the various measures.

2. How accurate is this measure of the gap?

As these tax gap measures are highly dependent on national accounts statistics, the accuracy of these measures will largely depend on the accuracy of the national accounts statistics used, as well as on the modelling assumptions that have to be made. Typically, national accounts statistics are not published with margins of error and, though any assumptions used are, also, subject to error margins, it is not generally possible to quantify them. For both these reasons, it is rarely appropriate to publish margins of errors for tax gap estimates. Moreover, indications of accuracy of the national accounts statistics are generally constructed based on an analysis of the degree of revisions made between the preliminary and final published values.[24] Such an approach would suggest the margin of error could be quite large, as estimates for GDP can change by several percentage points between revisions and could vary substantially from country to country.

Because of this uncertainty in the exact level of the margin of error, and the fact that it is plausible that the margin of error could represent a sizeable portion of the estimated gap, analysis of the gap should focus more on trends than levels. While it cannot be assumed that the margin of error in the national accounts statistics are small, as compared to any estimated value for the tax gap, it can more safely be assumed that the biases creating the errors in the national accounts are systemic in nature; i.e., there is a regular tendency to either over-estimate or under-estimate. If the biases in the statistics are systemic in nature, changes and trends in the estimated gap would be more accurate or indicative than the level. The rule of thumb employed by RA-GAP in looking at year-over-year changes in the gap measures, is that changes are significant once they exceed a half percentage point of GDP.[25]

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[24] For example, on the accuracy of their estimates, Statistics Canada states on their website: "No direct measures of the margin of error in the estimates can be calculated. The quality of the estimates can be inferred from analysis of revisions and from a subjective assessment of the data sources and methodology used in the preparation of the estimates…" *http://www23. statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=1901.*

[25] For a further discussion on the errors tax gap estimates are subject to see Her Majesty's Revenue and Customs (2015).

IV. HOW CAN THE VALUE-ADDED TAX GAP BE USED TO IMPROVE COMPLIANCE?

As underscored above, the VAT gap can be broken down into a compliance gap and a policy gap. While these measures are of use in evaluating revenue performance, further insight into compliance issues and revenue performance can be gained through further decomposing these gap measures and tracking their changes over time.

A. Breaking Down the Tax Gap to Support Taxpayer Compliance Management
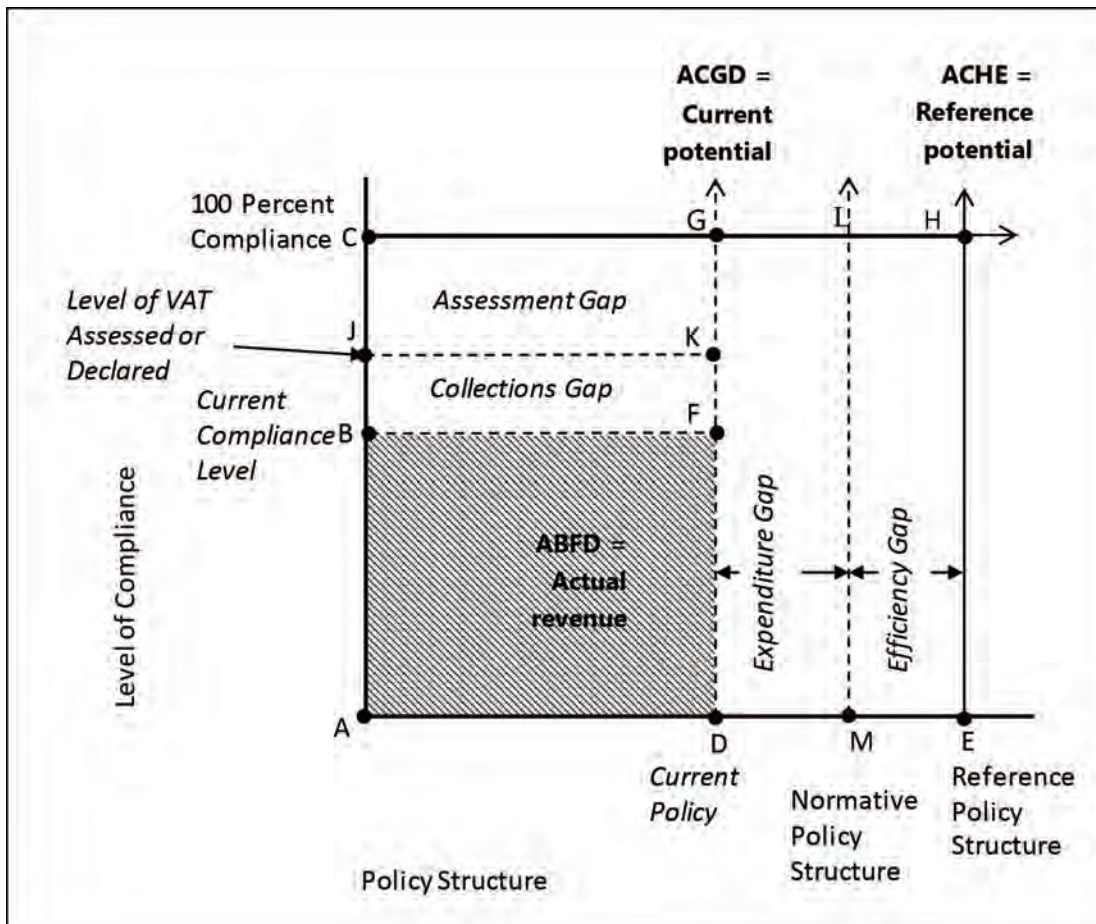
1. Breaking down the compliance gap operationally

In RA-GAP, the compliance gap is divided into two main components: the collections gap and the assessment gap.

- The *collections gap* measures the difference between what taxpayers have declared as being due, or have had assessed as being due, and the amount of VAT collected.

- The *assessment gap* measures the difference between the total amounts declared as assessed as being due versus the total potential amount of VAT which should have been declared or assessed (CPR).

Figure 2 illustrates graphical views of these gaps. The assessment gap, as mentioned above, is estimated using actual VAT determined on the assessment basis (Box *AJKD* in Figure 2), which is subtracted from the potential VAT estimated using the current policy framework (leaving Box *JCGK*). The collections gap can then be determined either by subtracting actual VAT determined on the accrued collections basis from actual VAT determined on the assessment basis, or by subtracting the assessment gap from the compliance gap (leaving Box *BJKF*). These two measures are useful in looking at which different operational functions, collection and enforcement operations or audit and assessment operations, might need to be strengthened to close the compliance gap.

Figure 2. Breakdown of the Components of the Tax Gap

2. Breaking down the compliance gap by sector

When using the RA-GAP methodology, the compliance gap can be broken down by sector. This can be very useful in determining where to focus resources to investigate compliance risks and close the compliance gap. Note, however, that the gap value per sector is not sufficient in itself for such purposes, and should be used in conjunction with other business intelligence about the composition and demographics of the sector. On one hand, the value of noncompliance in sector X might comprise a large portion of the compliance gap, but this could be spread thinly across a very large number of taxpayers. Sector Y, on the other hand, might have a relatively small compliance gap, but it could be concentrated in a very few taxpayers and so the return on investing resources in closing the compliance gap in sector Y might be higher than that for sector X. Alternatively, operational intelligence may indicate that the compliance gap in a particular sector is due to organized criminal fraud, which should be more of a priority for compliance action. Other indicators that can be brought to bear include the compliance gap per taxpayer in the sector and changes in output to input ratios across

taxpayer segments in a sector (grouped by size of total output; reductions in this ratio is a sign of potential general compliance issues, and outliers in the segment can be indicative of specific taxpayers with compliance issues). Other, more analytical, approaches can be used, for example an analysis of time series of revenues per sector can identify unexpected changes or other anomalies that should be investigated further for potential compliance risks.

3. Breaking down the policy gap…

While not directly linked to administrative performance, breaking down the policy gap into the policy choices and 'nontaxable' consumption can help simplify the VAT policy framework and, consequently, facilitate taxpayer compliance management (whether by making compliance easier or reducing opportunities for noncompliance). The overall policy gap is estimated using two distinct values for potential VAT estimated using two distinct policy frameworks. The policy gap can be subdivided into any number of subcomponents by incrementally adding elements into the potential tax base. These elements are included in the reference policy framework, but exempted (or taxed at a reduced rate) in the current policy framework. While each of these alternate policy frameworks could be of interest (mainly for the purposes of constructing tax expenditure estimates), the RA-GAP methodology focusses on one specific alternate policy framework: the "normative policy framework" (Line *LM* in Figure 2). This policy framework excludes the following items from the tax base, which are included in the reference policy framework:

i. Nonmarket public goods. This includes such items as public education and public healthcare. The value of these items are included in final consumption in the national accounts statistics, but are not typically subject to VAT.

ii. Imputed rents for residential housing stock. Again, this is an item included in final consumption in national accounts, but could not be easily captured by a VAT.

iii. Margin-based financial services. While there are methods for assessing VAT on such services, almost all VATs include an exemption for this item due to the complexity involved in trying to capture them.

Using this normative policy framework, the policy gap is split into two components; RA-GAP refers to these two components as the "expenditure gap" and the "efficiency gap." The expenditure gap is measured by subtracting potential VAT estimated using the current policy framework from the potential VAT estimated using the normative policy framework. The efficiency gap can then be measured by either subtracting the potential VAT estimated using the normative policy framework from the potential VAT estimated the using reference policy framework, or by subtracting the expenditure gap from the policy gap.

One of the main purposes of measuring the policy gap is to identify the extent to which revenue is being foregone due to policy choices. However, the standard method for measuring the policy gap, using final consumption statistics as a proxy for the potential tax base, includes tax base components, which are either not likely taxable under a VAT or would not yield any net fiscal gains. This breakdown of the policy gap is, therefore, intended to provide a better indication of the fiscal impact of the policy choices made in the design of the current policy framework by isolating those components of the gap which are included to achieve specific policy objectives (the expenditure gap) versus those which are there for pragmatic reasons (the efficiency gap).[26]

B. Tracking Changes in the Gap to support Taxpayer Compliance Improvements

As the measure for actual VAT is an accruals-based measure, it will change over time—this is the nature of accruals. This means that the value of the gap will vary depending on when it is measured. This is appropriate; revenue administrations continue to endeavor to address compliance issues, and so the compliance gap will close as those efforts take effect.

There are two general measures that RA-GAP uses in order to provide standardized, static measures of the gap which can be used comparatively over time and across jurisdictions:

1. the initial gap; and

2. the gap as of (a specified date of measurement).

The methods for measuring these two indicators, specifically the data considerations, are provided below.

1. The initial gap

The initial gap is measured at the original filing/payment deadline. In measuring actual VAT, both on the assessment basis and on the adjusted collections basis, the transactions and assessment data is filtered to select only payments and returns received by their respective deadlines. This measure of the gap will not change over time and provides an indicator of voluntary compliance—a basis for comparison as to how the gap evolves over time as the administration collects on arrears, receives late filed declarations, and makes additional assessments.

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[26] There are other ways in which the policy gap can be broken down. The policy gap can be broken down by rate differentiation (deviations from the standard rate, which can result in both positive or negative contributions to the policy gap) versus exemptions. See Keen (2013) for more discussion on this. The policy gap can also be broken down along thematic lines, e.g., agricultural related measures, industrial related measures, etc., or by individual tax expenditure items. Breaking the policy gap down along thematic lines, or by individual measures, is slightly more complicated as some tax expenditures will have overlapping effects (e.g., the VAT threshold would overlap with agricultural and industrial measures).

2 .The gap as of...

Any gap estimate made subsequent to the initial gap should always have an indication of the timeframe of measurement, e.g., "the gap as of May 1, 2015 was 30 percent." The timeframe indicated would be the period when the new transaction and assessment data is extracted. Ideally, gap measurements would be performed on a regular basis, such as the anniversary of the filing/payment deadline. Comparing changes to the gap over time, in particular if the measurement is performed on some regular basis, will provide insight into the performance of the administration in closing the compliance gap over time.

V. FINAL REMARKS

This note has provided a detailed description of the model and methodology used in IMF RA-GAP to produce VAT gap estimates and how this methodology differs from, and provides advantages over, the methodology that countries have traditionally employed. By using a model for potential VAT designed to employ statistics on value-added by sector (rather than the more traditional approach of employing statistics on final consumption), the RA-GAP approach can better replicate the policy structure of a VAT (as the value-added approach mirrors the credit-invoice approach of a typical VAT) and allows for a break-down of the gap by sector. From both a measurement and risk assessment perspective, this sectoral breakdown allows for a better, more nuanced, understanding of the overall compliance gap.[27]

As well, the RA-GAP approach, by using an accruals-based measure for actual VAT collections, also allows for more precision in the matching of the economic activity as captured by the statistical data and the taxpayer activity identified by the tax administration. In addition, the accruals measure allows for a more dynamic measurement of how the gap changes over time and a better understanding of the distinction between the collection and assessment gap.

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[27] Though it should be remembered that RA-GAP's value-added approach should produce the same overall estimate of the compliance gap as the demand-based approach, which has indeed been observed to be the case in those countries where both approaches have been employed.

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