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A Basic Framework for Evaluating Value Added Tax Expenditures

Eric Hutton

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1300 New York Ave. NW, Washington, D.C., U.S.A.

Contact: Luiz Villela (LUIZVI@iadb.org)

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1 Introduction

1.1 What is a Tax Expenditure

The label “tax expenditure” provides a strong indication as to what the term is intended to apply to—any use of the tax system designed to provide a financial benefit. As such, a tax expenditure can be rather generally considered to be any special provision in the tax system which allows for a reduction in the amount of tax which would otherwise be due. The key term in that definition is “special provision;” any reduction resulting from a “normal provision” would, then, not be considered a tax expenditure. The starting place for any evaluation of tax expenditures is to then determine which the normal provisions are and which the special provisions are for the tax system.

One approach to identify the provisions which constitute a tax expenditure is to begin by defining the “normal” structure for the tax in question and then review the tax system for any provision which fails to fall within this structure. For example, deeming the normal structure for an income tax system to be a single rate comprehensive tax system would imply that any treatment other than full taxation at the standard rate, including any sort of general personal deduction, would be considered a tax expenditure.

Another approach to defining tax expenditures would be too consider only those measures which result in a reduction in tax only for a specific type of taxpayer or type of activity as being “special provisions” within the tax system. Under this approach a broadly available measure such as a basic personal exemption from income tax would not constitute a tax expenditure, whereas a deduction from income for tuition expenditures would.

A further criterion generally applied in evaluating what constitutes a tax expenditure is whether the measure is the result of a specific fiscal policy decision. Restrictions on the tax system resulting from international treaties and agreements, for example, are generally deemed to not constitute tax expenditure items. This criterion would also, however, deem measures introduced for pragmatic purposes, such as the provision of a VAT threshold to reduce tax administration costs, to be excluded from consideration as tax expenditures. Typically, the exercise involved in identifying the tax expenditures in a given tax system involves a thorough line-by-line review of the tax code, with each of the above criteria being brought to bear.

1.2 Types of Tax Expenditures

There are three basic ways which a tax expenditure can be generated, that is in which a particular treatment might differ from the deemed normative tax treatment: reductions in the tax rate, reductions to the tax base, and reductions in the tax due. Exemptions, deductions, and allowances are all examples of ways in which the tax base might be reduced. Reduced rates of tax would of course include any rate treatment lower than the deemed normative statutory rate, while some forms of nonrefundable credits might also qualify under this heading, in cases where the credit is specifically designed to yield a targeted lower effective tax rate. Refundable tax credits would fall under the category of reductions to the tax due.

1.3 "Negative" Tax Expenditures

A common question which arises in designing a tax expenditure modeling framework is the issue of possible "negative" tax expenditures. The concept here is that, given that a special reduced rate of taxation might be considered a tax expenditure, does a special higher tax rates constitute a negative tax expenditure?

As one of the principal goals behind a tax expenditure budget is to improve the transparency of the fiscal policy framework, a negative tax expenditure could be a useful instrument for reporting on the implications of tax treatments which result in higher than "normal" taxation. In cases where the specific revenue impact of the special treatment is known and measurable, it would generally be more appropriate to report such revenues under the regular tax revenue reporting budget. However, in circumstances where it might be difficult to identify separately the revenue generated from a particular tax measure, for example a special lower capital cost allowance rate, a negative tax expenditure might be an appropriate means of reporting the impact of the measure.

1.4 Tax Expenditures versus the Tax Gap

Another concept used in estimating the performance of a tax system is the "tax gap." The traditional definition of the tax gap is that it is the difference between actual collections and the maximum potential tax from the current tax base. This difference would then be comprised of a number of factors such as intended reductions in collections through provided credits, deductions or allowances, intentional reductions tax expenditures, as well as unintended losses through tax evasion and avoidance. The tax gap, then, is a broader concept than tax expenditures, which needs to be kept in mind when designing estimation methodologies for tax expenditures.
For direct taxes the procedure most commonly used for estimating tax expenditures, microsimulation based on tax return data, implicitly excludes the tax gap; losses due to noncompliance and evasion are not captured as, by definition, these relate to factors unreported on a tax return.

For indirect taxes, however, the estimation methodology more typically relies on statistics regarding the potential tax base, and so the estimation methodology needs to explicitly carve out the losses due to noncompliance. This certainly can add to the complexity of the methodology for the estimation procedure for indirect taxes, as the estimation exercise must also generate estimates on noncompliance rates. For example, applying the standard tax rate to data on the total value-added for a zero-rated sector would not only be measuring the revenue lost by not taxing the value-added of that sector, but it would also be measuring the loses due to noncompliance, as the revenue estimate implicitly assumes all taxpayers would be fully compliant.

2 Identifying VAT Expenditures

2.1 Defining the Normative Structure

The normal tax rate structure a VAT is typically defined based on the foundation of a broad-based destination principle VAT. As such, the normative structure would consist of two tax rates: a rate of zero for exports and a single positive rate for all other supplies. Almost any deviation from this structure could then be considered to be a tax expenditure. These deviations are largely

limited to cases of either a reduction in the rate of tax or reduction in the base; typically there are no provisions to reduce the tax due under a VAT.

2.2 Reduced Rate of Tax

Typically for any reduced rate of taxation under the VAT, including zero-rating, a straightforward schedule is provided identifying the applicable supplies, making identification of any tax expenditures fairly straightforward. Some degree of contention can arise, however, in determining whether the reduced rate is being provided as part of the general normative structure of the tax, that is that the reduced rate is being provided due to the supply being an export. In many countries international transportation, including personal travel, and supplies related to the provisions of international transportation, are zero-rated on such a basis, and are often excluded from tax expenditure estimates.

A similar argument is also sometimes put forward in regards to any reduced rates for tourism related supplies, the argument being that a portion of any such supply made to a foreign tourist is partially enjoyed extra-territorially, and is thus partially an export of services (indeed that is how it is treated in the National Accounts) and so should be partially zero-rated. A counter-argument to both cases, which would argue for including both personal international transportation and reduced taxation for tourism related supplies, is that the zero-rating of exports is designed to eliminate any double taxation; in both cases the supply is not being taxed in any other territory and so the zero-rating (or partial zero-rating) is unnecessary.

Some jurisdictions allow certain taxpayers deductions from gross output for certain supplies – tips included in the bill for hotel accommodation supplies for example. For the intents and purposes of tax expenditure estimates, such a supply can be considered the equivalent of a zero-rated supply (even in cases where the taxpayer may still be charging tax on their full output, and thus are implicitly being allowed to pocket some of the tax collected).

2.3 Reductions to the Tax Base

Under a VAT, reductions to the tax base are largely the result of exemption. Exemptions generally apply to particular supplies (e.g., an exemption for categories of basic food like rice or

wheat) or to particular suppliers (e.g., businesses predominantly engaged in providing financial services). Typically all such exemptions are contained within a given schedule to the VAT Act, and are thus easily identifiable. While for the most part any exemption in the schedule of exemptions should be considered an expenditure, typically there are a few exceptions to this rule. In particular, exemptions that are provided as a result of an international negotiation or treaty (e.g., exemptions for diplomatic bodies or aid missions) are typically excluded from the list of tax expenditures.

In most VATs, the tax base is also reduced through the establishment of a general threshold, for which any business with total supplies being below the threshold is deemed exempt (although provisions allowing the business to apply to register and be taxable are common). Whether or not the threshold constitutes an exemption is debatable; this is due to the fact that the basic policy intention behind the establishment of the threshold is that the cost of collection for businesses below the threshold would exceed any net revenue generation. While in general tax expenditure estimators do not explicitly net out collection costs, it could be argued that the collection costs for taxpayers over threshold, as a whole, are marginal, and would thus be below the margin of error. However, given that the threshold can certainly be used as a policy instrument to effect fiscal policy goals other than simply reducing administration costs, fully excluding the threshold from the list of tax expenditures could be misleading. For example, if the threshold were to be doubled from one year to the next, without commiserate inflationary pressures that could be argued resulted in a doubling of the collection costs, such a policy could easily be construed to be a deliberate tax expenditure. On the other hand, if the threshold had not been adjusted in 10 years, it could be that the doubling was in fact necessary to account for the cumulative impacts on administrative costs over that period.

There are a few possible ways to deal with items that have components that could be argued to be part of the normative system and components that could construe a tax expenditure. In the Canadian tax expenditure estimates, such items are dealt with by providing estimates, but by listing those items under a separate “memorandum items” category. For example, for the basic threshold applied under the personal income tax system, only the cost associated with any increase in threshold in excess of inflation indexation is included in the estimates, under the memorandum item heading. The estimate for the VAT threshold, on the other hand, is listed as a full expenditure item.

3 A Simple Modeling Framework

The approach followed herein is not to construct a single all-purpose model for the estimation of tax expenditures under a VAT, but to use a set of models designed according to the nature of the path a given supply takes in reaching the final consumer. The advantage of this approach is that it can reduce any unnecessary complication from the modeling approach for particular simple supply pathways, which limits the influence of modeling assumptions on the resulting estimates, thereby reducing the margin of error.

The other design philosophy behind the approach described herein is to make the best use of the best data, or, to put it another way, to rely as little as possible on the least reliable data. In order to estimate VAT expenditures, what is typically needed is information on the transactions involved in the supply or agent related to any given tax expenditure; this information is typically obtained from the following sources of data:

1) Customs Entries,
2) VAT Returns,
3) National Accounts Statistics, and
4) Input-Output or Supply-Use statistical tables.

The ordering of these data sources above is generally in line with the reliability ranking of each of these data sources, for tax expenditure estimates purposes. Customs entries, for example, are generally a very reliable source of information for tax expenditures, as they provide highly detailed accounts of exactly what goods have been imported by which particular agents in the economy. VAT returns, while providing information directly from VAT taxpayers, are typically fairly simple in structure, and can thus only provide highly aggregated data needing further interpretation. National Accounts statistics are generally available, providing highly aggregated data on the value-added by various sectors of the economy, and so due to their being so highly aggregated, as a source for attempting to make any sort of detailed estimates, the margin of error associated with the estimation exercise can exceed the estimate produced. Input-output or supply and use table, while more disaggregated that national accounts statistics, with more detailed information on the flow of supplies in an economy, generally have a high relative margin of error.

Based on these general assumptions about the ranking of the quality of the data sources, the methodology designed below attempts to make as much use as possible of the more reliable data sources—such as customs entries and VAT returns—over the less reliable data sources—such as supply-use tables. Of course a large portion of VAT expenditures will be generated through domestic transactions, and so data on domestic transactions as provided in supply-use tables is crucial to the estimation exercise. The methodology attempts to restrict the use of such data to relative shares rather than absolute values when possible.

3.1 Modeling Tax Expenditures for Particular Supplies

To estimate the tax expenditure associated with less than full taxation of a particular supply the approach described herein analyses how the value-added for that supply is generated as it passes from one agent to the next en route to the final consumer, and then evaluates how much of that value-added is not being captured. In addition to the pathway involved, the taxable status of the agents along the pathway will also have implications for any tax expenditure and needs to be considered. Of course there are a vast array of pathways which a supply could follow, for which a vast array of permutations of the taxable status of the agents involved will also exist, however many of these pathways have similar net impacts and can be resolved into a few simplified cases:

1. *Imports by Final Consumers or Exempt Enterprises.*
2. *Imports by Taxable Enterprises.*
3. *Imports by Taxable Resellers for Final Consumers or Exempt Enterprises.*
4. *Imports by Taxable Resellers for Taxable Enterprises.*
5. *Domestic Supplies to Final Consumer and Exempt Enterprises*
6. *Domestic Supplies to Taxable Enterprises for Exempt Supplies*
7. *Domestic Supplies to Taxable Enterprises for Taxable Supplies*

With a few assumptions, these few generalized cases should serve as good proxies for the full array of potential pathways. For example the impact of having multiple resellers involved in passing a given supply onto the end consumer should be exactly the same as one single reseller – the impact on the tax expenditure will be a function of the net value-added, or the mark-up applied by all the resellers, which is added along the way. By assuming that there are competitive markets for a given supply the value-added should be the same no matter how many resellers are

involved, making the exact number of resellers irrelevant.[1] The assumption of competitive markets also allows for precluding the possibility of extensive cascading, so it can be assumed that as soon as a pathway reaches a nontaxable agent, that agent is effectively the final consumer for tax purposes.

Of course any given supply might reach the final consumer along any number of these pathways; a supply might be both imported and produced domestically. In such cases, the full tax expenditure estimate would involve totaling the separate tax expenditure estimates for each of the individual pathways involves.

In reviewing the pathways described above it is clear that can be broken down into two distinct categories; pathways originating from imports versus those originating from domestic production. While economically there should be no great difference in the domestic versus imported original valued added of a product, the distinction is being made here due to due to data reasons, as discussed above. By separating the pathways into these two categories the estimation techniques can make best use of the best data—specifically the methodology is designed to make as much use the customs data on imports as possible, and attempting to restrict the reliance on supply-use table data to relative shares, rather than using absolute values, wherever possible.

3.1.1 *Import Pathways*

The basic data necessary for modeling the import pathways is customs entry records. By cross referencing the customs entries with the tax registry data, statistics can be produced detailing the volume and value of commodities passing through customs to: final consumers, businesses in exempt sectors, businesses in taxable sectors not registered for VAT, and businesses in taxable sectors registered for VAT. This process is, of course, greatly simplified in cases where both a single taxpayer registration number is in use for both Customs and Inland Revenue. In cases where a common identifier is not in use, a process of matching the two identifiers may need to be undertaken.[2]

[1] The net markup of multiple resellers could not be more than the mark-up of the single reseller, or the multiple resellers would not be able to compete in the market.

[2] Typically automated matching, based on identifiers such as phone number or address, is not very successful as often taxpayers provide values for these fields that are for their lawyer or broker, and so are not unique to an individual company. Automated matching by enterprise name also usually only achieves limited success, due to differences in spelling which might be used, acronyms in place of full spelling, or because a contact name has been

3.1.1.1 Imports by Final Consumers or Exempt Enterprises

For imports that pass directly to final consumers and exempt enterprises, the tax expenditure associated with exempt, zero-rated or reduced rate supplies would be the rate of VAT applied directly to the full landed cost of the import, or the Cost, Insurance, and Freight ("CIF") value, plus any import taxes, charges, and other consumption taxes included in the VAT base, less any VAT charged (for supplies to which a reduced VAT rate might apply). Similar treatment would apply to imports by exempt enterprises, as identified as being business registered with customs but not registered for VAT. So, the value of the tax expenditure for these imports can be estimated simply by the equation:

$$\textbf{(1)}\quad (t - t_x) \times (CIF_x^f + CIF_x^g + CIF_x^b)$$

where CIF_x^f = the CIF value for imports of x by final consumers

CIF_x^g = the CIF value for imports of suppliers in exempt sectors

CIF_x^b = the CIF value for imports of suppliers in taxable sectors but not registered for VAT

t = the standard VAT rate, and

t_x = the rate of tax applied to import x (zero if exempt).

There may be cases where exempt supplies imported by nonregistered enterprises re-enter the tax chain. A small wholesaler or retailer under the threshold may be making supplies to taxable businesses, making taxable supplies to final consumers, for example. In this case the impact on the tax expenditure would be the tax applied to the original import, plus the additional tax that would be charged on the "bump" in the cost of supply for the taxable business. However, given that most taxable businesses would have a preference to making purchases from taxable suppliers, in order to claim the input tax credit, the purchases from nontaxable suppliers likely only represents a small fraction of such activity. As such, given that only a marginal portion of these supplies likely have an additional tax expenditure cost, and that the additional tax expenditure cost is only a marginal addition to the basic tax expenditure cost, using the

registered in place of a company name. Once any automated matching which can be performed has been achieved, it is recommended that the manual matching be undertaken by prioritizing the customs registrants based on the total value of their imports for a given year.

simplifying assumption that all such imports are for final consumption should have a negligible impact on the final estimates.

3.1.1.2 Imports by Taxable Suppliers

There is no net revenue implication resulting from exempt, zero-rated, or reduced-rate imports that are used in the manufacture of taxable supplies, as a full input tax credit would be available for any tax applied to these supplies as a result of making them fully taxable.[3] As a consequence, all imports of exempt, zero-rated, and reduced rate supplies being made by entities registered for VAT, and identified as being primarily involved in making supplies in fully taxable sectors can be identified as having no associated tax expenditure. This holds true whether the supply is imported directly by the maker of the taxable supply, or whether the import passes through other taxable intermediaries first. For example, if rice were an exempt supply, there would be no tax expenditure associated with the import of rice by a (taxable) hotel, as any tax that would be collected if rice were a taxable supply would simply be provided back to the hotel through their input tax credits.

For imports into sectors with mixed taxable and exempt supplies, either due to the taxable status of the supply or the nature of the supplier, the portion of the imports being used for the exempt supply would have a tax expenditure associated with it, and so the imports by these importers needs to be apportioned. If the enterprises engaged in the activities in these sectors are typically providing mixed supplies themselves (e.g., financial institutions), then data collected on the VAT return as to their total value of exempt versus taxable supplies could be used for the apportionment. However, if the sector is divided into firms which either specialize in the provision of the taxable supplies or the exempt supplies (e.g., life insurance suppliers versus property and casualty insurance providers), than data on how the output of the sector is proportioned will need to be obtained, either through national accounts data by detailed sectors, or from input/output tables for the economy. In either case, the proportion of the imports being used in making the exempt supplies should be treated in the same manner as described in the following section for imports by fully exempt entities.

[3] Of course, if full input tax credits are not provided for the supply in question, there may be some net revenue impact.

For imports used in making exempt supplies by taxable enterprises, however, some adjustment to this equation is necessary to apportion the imports of taxable enterprises, yielding a slightly amended version of equation (1):

$$(2)\ (t - t_x) \times CIF_x^{t-r} \times \left(\frac{Y_E^{t-r}}{Y^{t-r}}\right)$$

where CIF_x^{t-r} = the CIF value for imports of x by VAT registrants in taxable sector t, excluding resellers

Y_E^{t-r} = the output of exempt supplies by taxable sector t, excluding resellers

Y^{t-r} = the total output of taxable sector t, excluding resellers

3.1.1.3 Imports by Taxable Resellers for Final Consumers or Exempt Enterprises

For imports made by taxable resellers (identified as being imports by entities registered for VAT and listing their primary activity as a retailer, wholesaler, or other form of trader) the value of the tax expenditure will vary based on whom they make their supplies too. While the treatment of these imports largely mirrors the treatments described for the direct imports, there a few additional data requirements—the value of mark-up to be applied and the distribution of the imports by resellers.

The simplest approach to estimating reseller mark-up (value-added) is through data on trade margins typically recorded under the "supply" or "output" statistical tables by product category. In the absence of such detailed data, a generalized mark-up value could be estimated based on the ratio of value-added to total output for the retail/wholesale sector from the "use" tables. Obviously data on a more detailed product category basis is preferable due to the fact that typical reseller margins can vary dramatically across product types; typically as a function of the value of the product type and the number of competitors in the market (i.e. the margins on basic staples like flour and rice are typically much lower than the margins on automobiles and consumer electronics, although this can vary).

For determining the proportion of imports by resellers that passes to final consumers and exempt sectors, or to taxable sectors, two possible allocation schemes could be used; either using the share of the total output of the retail sector purchased by final consumers and exempt sectors, or the share of the total supply of the particular supply used by final consumers and exempt

sectors. Each allocation procedure has its faults. In the first case, using the share of total output of the retail sector, this can misallocate as the average overall share will not necessarily be indicative of any given supply. For example, the total output of retailers might be 50 percent rice and 50 percent photocopiers, but all of the rice is sold to final consumers, while all the photocopiers are sold to taxable businesses. Using the share of total output used by a particular supply can be equally misleading—for example the statistics could indicate that 50 percent of all rice is consumed by households and 50 percent by hotels; using the above allocation would result in the assumption that only 50 percent of the rice being sold by retailers has any associated tax expenditure, while it could be that the hotels are importing all their rice directly. More sophisticated modeling could be conducted to attempt to isolate use of domestic supplies from imported supplies by using the customs data broken down by the sector of the taxpayer. The most readily available data, however, would be to use data from the statistical "use" tables, which provides the amount of a supply consumed by any given sector, and by final consumers.

So, for the resupplies to final consumers and fully exempt sectors, the value of any tax expenditure flowing along this pathway would be the total potential tax for the supply, inclusive of the estimated retail mark-up, multiplied by the proportion determined as being used by final consumers and exempt sectors. Using the proportion of total consumption apportionment process yields the following expression for the value of the portion of the tax expenditure from this portion of imports:

$$(3)\ (t - t_x) \times CIF_x^r \times \left[\left(\frac{C_x^f}{C_x}\right) + \left(\frac{C_x^s}{C_x}\right)\right] \times (1 + M_x)$$

where CIF_x^r = the CIF value for imports of x by taxable resellers r,

C_x = the total consumption of supply x,

C_x^f = the consumption of supply x by final consumers

C_x^s = the consumption of supply x by exempt sectors

M_x = the markup for supply x

The value for M_x, as discussed above, can either be a specific value for a particular supply, or an overall average value with the overall average value determined by the ratio of the value-added by that sector to its total cost of goods, as provided in statistical "use" tables, or the

value for a supply specific mark-up determined by the ratio of the margins for that supply indicated from the “supply” statistical tables to the total supply at basic prices.

3.1.1.4 Imports by Taxable Resellers for Taxable Enterprises

For supplies passing from resellers to the taxable sectors, tax expenditures will arise in cases where the purchaser is either an exempt enterprise in the taxable sector (businesses below the threshold for the most part) or where those supplies are being used in the output of an exempt supply. For supplies to taxable suppliers using the import as an input into making taxable supplies, there would be no associated tax expenditure, as a full input tax credit would be available.

Data on the proportions of supply in a given sector by exempt enterprises is typically not available. For sectors primarily consisting of a few large entities, such as public utility providers, insurance and financial services, the proportion of output by unregistered businesses can be assumed to be zero (assuming decent compliance levels in these sectors). For the remainder of the sectors assumptions as to the proportion are typically necessary. Using the total output reported by business in a given sector and comparing that value to statistics on the total output of the sector can be misleading, as this would include potential noncompliant output, and output of exempt or zero-rated products by the sector. However this data can be used to help inform construct an estimate. Analysis of reported output can yield statistics on estimated compliance levels, and distribution of output across the sector (i.e. whether it is composed of lots of small businesses, or whether the bulk of reported output is concentrated amongst a few large sectors). This implicitly assumes that the input/output ratio is constant across the sector.

For determining the proportion of exempt supplies by taxable businesses in a taxable sector, the supply or output statistic tables can again be used. In this case a simple ratio of the total output of exempt supplies to the total supplies can be applied. The implicit assumption here is that the input/output ratio is not only constant across all suppliers within the sector, but also across all individual outputs of a sector.

The value of the tax expenditure for these imports can be represented by the equation:

(4) $$(t - t_w) \times \left[CIF_w^r \times \left(1 - \left[\left(\frac{c_x^f}{c_x}\right) + \left(\frac{c_x^g}{c_x}\right)\right]\right) \times (1 + M_w) \right] \times \sum_t \left[\left(\frac{Y_t^f}{Y^t}\right) + \beta^t - \left(\left(\frac{Y_t^f}{Y^t}\right) \times \beta^t\right)\right]$$

where

Y^t = the total output of taxable sector t,

Y_t^f = the output of taxable sector t of exempt supplies,

β^t = the proportion of output of taxable sector t by exempt enterprises

Note that instead of attempting to determine the proportion of imports by resellers being resold to taxable sectors, the proportion of supplies not going to exempt sectors and consumers is used. The two values should be identical, but by performing the calculation in this manner, it ensures that all the imports by resellers are accounted for in the estimation process. The final portion of that expression captures the portion of the imports passing to exempt businesses in taxable sectors, and the imports used by taxable businesses for making exempt supplies, without double counting the imports by exempt businesses making exempt supplies.

3.1.2 *Domestic Production Pathways*

The primary data source for modeling the domestic pathways would be domestic production statistics. The data provided in input-output or supply-use statistical tables are ideal. Of course the level of detail on these production statistics is typically much more highly aggregated than customs data, and specific production data for many supplies with explicit tax treatment is not available. This can be dealt with by either trying to determine what proportion of a particular supply (e.g. rice) relates to a given class of supply (e.g., agricultural goods) from the available production statistics, or by aggregating a number of supplies in a given class of supplies, provided they have a common tax treatment, to make an aggregated estimate, or some combination of the two approaches.

Another important factor that has to be taken into account on the domestic production side is the level of tax compliance. The compliance factor was not discussed in the import

pathways as it is typically implicitly excluded. Noncompliance with imports generally involves either outright smuggling, or undervaluation. In either case the noncompliant portion of the supply has already been excluded from the data. For the domestic production pathways, however, noncompliance will need to be explicitly accounted for as the base domestic production statistic would represent the full potential tax base.

For the imported supply pathways, there was virtually no distinction between the implications of an exempt or zero-rated supply. For domestically produced supplies, however, in the case of an exempt supply where the producer is a taxable enterprise, or where the producer would a taxable enterprise if the particular supply were taxable, there is what could be considered a negative tax expenditure associated with the input tax credits currently being denied, or a reduction in the positive tax expenditure created by the exemption. This offset to the tax expenditure pertains to all the domestic production pathways for the supply.

Determining the value of taxes being collected on inputs into exempt supplies can be difficult, as this information is not typically available on a tax return, in particular in cases where the supplier is exempt and thus not required to file a VAT return. An estimate of the total potential input tax credits available for a certain supply can be constructed by using input output tables to determine the typical proportion of taxable goods used in the manufacturing process by the primary manufacturing sector as indicated on the input or use tables, and multiplying that ratio by the tax rate and the total value of the supply on the output or supply tables. For tax expenditure estimates, this value would need to be further refined taking into account that supplies by noncompliant and exempt taxpayers (such as those below the threshold) would still be subject to tax on their inputs.

So, the negative tax expenditure associated with the potential loss of input tax credits being denied for an exempt supply *x* supplied by a taxable, compliant enterprise in sector i can be represented by the equation:

$$(5)\quad Y_x \times \left(\frac{\sum_z (C_z^i \times t_z)}{Y^i}\right) \times \left[(1-\beta^i) \times (1-\eta^i)\right]$$

where Y_x = the total domestic output of supply x

Y^i = the total output for sector i, the main supplier of supply x

C_z^i = the amount of taxable supply z used in sector i

t_z = the tax rate that applies to supply z

β^i = the proportion of output of sector i by exempt producers, and

η^i = the proportion of output of sector i by noncompliant producers.

The reason that the above equation uses that amount of supply z used as an input into in sector i, rather than directly using the amount of supply z used in the production of supply x is due to nature of the structure of the data; supply/use tables are provided in a rectangular sector by supply format, not a square supply by supply format. In some cases there may be multiple sectors involved in the production of a given supply (for example many sectors might be involved in providing rental services, as a secondary output of their operations).

Generating estimates for the value of η^ican be difficult, as the observable data usually cannot distinguish between the tax expenditures and noncompliance. For example, comparing tax collections from a sector to national accounts data on the total value-added for the sector (similar to a tax efficiency measurement) would implicitly be measuring the full tax gap, including both the involuntary loses due to noncompliance and the voluntary loses due to tax expenditures. An iterative process could be used to simultaneously estimate the tax expenditure and noncompliance level (where the full tax gap is assumed to be due to noncompliance to generate an initial noncompliance estimate, which is then used to estimate the tax expenditure portion of the tax gap, which is then used to update the proportion of the tax gap which is due to expenditures producing a new noncompliance value, etcetera until the difference between two iterations is below the margin of error) such a method would be extremely time intensive. In general it can be assumed that the larger the number of agents active in a given sector, and the smaller their relative output, the higher the degree of noncompliance. So, for agents in the financial services sector the degree of noncompliance could be assumed to be relatively low as compared to agents in the agriculture or transportation sectors.

3.1.2.1 Domestic Supplies to Final Consumer and Exempt Enterprises

For domestic supplies of exempt, zero-rated, or reduced rate goods to final consumers and exempt enterprises the positive portion of any tax expenditure will be the difference between the general VAT rate and the tax rate applied (zero in the case of exempt or zero-rated goods) multiplied by the value of the supply, just like with direct imports.

By using data on total consumption at market prices, separate distinction between those supplies made directly from the producer and those that pass through retailers can be avoided, as any margins applied will already be included in the data. The data will need to be adjusted, however to exclude the value of imports as the statistics on total use or consumption of a given supply, as provided in the "use" or "input" statistical tables, does not distinguish between consumption of imports versus domestically produced goods. This can be achieved by simply subtracting the portion of CIF attributable to a particular user, as determined in the import estimates exercise, from the total use values on the statistical tables; e.g. subtracting the value for both direct imports by households and those imports passing to households from resellers from the indicated value for total consumption of supply x by households.

Another adjustment which needs to be made, as discussed above, is to remove from the supply the portion of the use or consumption which might pass through nonregistered enterprises in a taxable sector (e.g., businesses below the threshold) or noncompliant enterprises.

Finally the estimation process needs to recognize the problems that can arise when mixing and matching data from different sources; in this case imports from the customs data and consumption from the supply use statistical tables. It is possible that the customs data for the value of imports, both direct and as deemed to have occurred through resellers, might exceed the value indicated for total consumption, yielding a negative value for consumption from domestic supplies. Therefore, the estimation process needs to be constructed so as to avoid the production of a negative value for domestic production, so that it does not result in a negative value for this portion of the tax expenditure estimate.

This, then, yields the following equation for the portion of the tax expenditure associated with domestically produced supplies to final consumers and exempt enterprises by compliant, taxable enterprises:

(6) $$(t - t_x) \times \left[min\left(0,\ C_x^f - CIF_x^f - CIF_x^r \times \left(\frac{C_x^f}{C_x}\right) \times (1 + M_x)\right) + min\left(0,\ C_x^g - CIF_x^g - CIF_x^r \times \left(\frac{C_x^g}{C_x}\right) \times (1 + M_x)\right) + min\left(0,\ C_x^k - CIF_x^k - CIF_x^r \times \left(\frac{C_x^k}{C_x}\right) \times (1 + M_x)\right)\right] \times \left[(1 - \beta^t) \times (1 - \eta^t)\right]$$

where C_x^f = total consumption of supply x by final consumers,

C_x^e= total consumption of supply x by exempt sectors,

C_x^b= total consumption of supply x by exempt enterprises in taxable sectors.

While the values for the consumption of a supply by final consumers and exempt sectors are supplied explicitly in the "use" tables, the value for consumption by exempt enterprises in taxable sectors is not. By assuming that the ratio of input to output is constant across the sector, this value can be determined by applying the values for β for each taxable sector to the statistics for the consumption of a given supply by that sector; for example:

$$(7)\quad C_x^b = \sum_t(\beta^t \times C_x^t)$$

where C_x^b= total consumption of supply x by taxable sector t.

It should be noted that an implicit assumption being made here is that no sector is re-exporting any of their imports; that imports are all for domestic consumption. This assumption is important to keep in mind when compiling the data, as any significant re-exports should be netted out of the import data.

3.1.2.2 Domestic Supplies to Taxable Enterprises for Exempt Supplies

The method for estimating the tax expenditure for supplies to taxable enterprise making exempt supplies is similar in structure to the method for estimating the expenditure for supplies to final consumers and exempt enterprises, but in this case it is only a portion of the supplies which generates the tax expenditure; the portion of the supplies which are used in making the exempt supply. So, for any taxable sector purchasing exempt, zero-rated or reduced rate supplies for making exempt supplies, the associated tax expenditure can be represented as:

$$(8)\quad (t - t_w) \times \sum_r \left| \left[min\left(0, \sum_t \left((1-\beta^t) \times C_x^t\right) - CIF_x^t - CIF_x^r \times \left(\frac{C_x^b}{C_x}\right) \times (1 + M_r)\right) \right] \times \left[\left(\frac{Y_r^t}{Y^t}\right) \right] \right| \times [(1-\beta^t) \times (1-\eta^t)]$$

There are a few components of this equation that are important to note. The first item to note is that it is not the total consumption of supply x by sector t used in the equation, but rather only that proportion determined to be consumed by taxable (registered) enterprises. It is also important to note the difference in the sector notation of the last two blocks; the second last block is distinguishing that is the portion of supply x bought by sector t for use in making exempt supplies, while the last block is the portion of supply x which would have been supplied by compliant, registered taxpayers. In the first case the sector notation is the same as that used for the purchasing sector, while in the second case it is that associated with the supply.

3.1.2.3 Domestic Supplies to Taxable Enterprises for Taxable Supplies

As with imported goods, there is no direct tax expenditure associated with exempt and zero-rated supplies acquired for making taxable supplies, as any tax that could be charged would be fully reclaimable as an input tax credit.

There may, however, be negative tax expenditures occurring related to the negative tax expenditure associated with the denial of input tax credits to the supplier, as described above. Some marginal tax revenues may be generated from the increase in the tax base tax for any taxable supply produced which uses the exempt supply related to the denied input tax credits for the producer of the exempt supply. In other words, some marginal increase in revenue may be occurring as a result of tax cascading, and this could be considered a negative tax expenditure that may need to be factored into the overall tax expenditure calculation.

If it is assumed that the cost of any taxes on inputs in the making of the exempt supply are fully passed along, with no additional mark-up, then the value of this negative tax expenditure can be estimated as the rate of tax for any taxable supply using the exempt supply as an input, multiplied by the total of all the estimated denied input tax credits for the exempt input. The following equation represents this expenditure:

$$(9)\quad \sum_y \left| t_y \times \left(\frac{c_x^j}{Y_x}\right) \times ITC_x \times \left[\left(1-\beta^j\right) \times \left(1-\eta^j\right)\right] \right|$$

where t_y = the tax rate applied to any supply y which uses supply x as an input

C_x^j = the total amount of exempt supply x used as inputs by sector j

Y_x = the total domestic production of supply x

ITC_x = the total denied input tax credits for supply x.

Again, because statistical "use" tables are provided in a sector by supply format, rather than supply by supply, direct statistics on the amount any supply x used in the production of any supply y are not available, so, as a proxy, the value of inputs specified is C_x^j, which is the value of the inputs of supply x used in sector j, which would be the predominant sector associated with the manufacture of supply y The value of ITC_x for any exempt supply x would be determined by equation 5, above.

3.1.3 *Producing the Final Estimate for a Particular Supply*

The final stage in producing the tax expenditure estimate for a particular supply is to sum all the component estimates produced from each of the pathways as specified above. So for an exempt supply x, the full tax expenditure estimate ε_x would be expressed using the following extensive equation:

(10)

$$\begin{aligned}
\varepsilon_x = {} & (t - t_x) \times \left(CIF_x^f + CIF_x^s + CIF_x^b\right) \\
& + (t - t_x) \times CIF_x^{s-r} \times \left(\frac{Y_x^{s-r}}{Y^{s-r}}\right) \\
& + (t - t_x) \times CIF_x^r \times \left[\left(\frac{C_x^f}{C_x}\right) + \left(\frac{C_x^s}{C_x}\right)\right] \times (1 + M_x) \\
& + (t - t_x) \times \left[CIF_x^r \times \left(1 - \left[\left(\frac{C_x^f}{C_x}\right) + \left(\frac{C_x^s}{C_x}\right)\right]\right) \times (1 + M_x)\right] \\
& \times \sum_z \left[\left(\frac{Y_x^z}{Y^z}\right) + \beta^z - \left(\left(\frac{Y_x^z}{Y^z}\right) \times \beta^z\right)\right] \\
& + (t - t_x) \times \left[\min(0, C_x^f - CIF_x^f - CIF_x^r \times \left(\frac{C_x^f}{C_x}\right) \times (1 + M_x)) \right. \\
& + \min(0, C_x^s - CIF_x^s - CIF_x^r \times \left(\frac{C_x^s}{C_x}\right) \times (1 + M_x)) \\
& \left. + \min(0, \sum_z (\beta^z \times C_x^z) - CIF_x^b - CIF_x^r \times \left(\frac{C_x^b}{C_x}\right) \times (1 + M_x))\right] \\
& \times \left[(1 - \beta^t) \times (1 - \eta^t)\right] \\
& + (t - t_x) \times \sum_z \left[\left[\min(0, \sum_z ((1 - \beta^z) \times C_x^z) - CIF_x^s - CIF_x^r \times \left(\frac{C_x^s}{C_x}\right) \times \right.\right. \\
& \left.\left.(1 + M_x))\right] \times \left[\left(\frac{Y_x^z}{Y^z}\right)\right]\right] \times \left[(1 - \beta^t) \times (1 - \eta^t)\right]
\end{aligned}$$

$$- Y_{ic} \times \left(\frac{\sum_k (c_k^i \times \tau_k)}{Y^i}\right) \times [(1 - \beta^i) \times (1 - \eta^i)]$$

$$- \sum_j \left[t_{jc} \times \left(\frac{c_k^j}{Y_{ic}}\right) \times ITC_{ic} \times [(1 - \beta^j) \times (1 - \eta^j)] \right]$$

For a zero-rated or reduced rate supply, the consolidated equation would be similar to equation (10), but it would not include the last two terms related to the negative portion of the tax expenditure related to the revenue associated with input tax credits denied for exempt supplies.

While there are certainly a few ways in which equation (10) could be simplified, the methodology for constructing this estimator is based on the presumption that in practical application the simplest method for deriving the estimate would be determining the value for each of these component parts in isolation. It is still important, however, to review the equation in complete format, as presented above in equation (10) in order to see how all the components are supposed to mesh with each other, and ensure that there is no duplication occurring.
In reviewing the components dealing with the importation pathways, it can be seen that in the first four segments of the equation all imports are accounted for, without duplication. That is to say that total imports are equal to the imports by final consumers, plus imports by enterprises in exempt sectors, plus imports by businesses not registered for VAT in taxable sectors, plus imports by VAT registered businesses in taxable sectors except resellers, plus imports by VAT registered resellers; for example:

(11) $$CIF_{ic} - CIF_{ic}^{f} + CIF_{ic}^{g} + CIF_{ic}^{b} + CIF_{ic}^{s-r} + CIF_{ic}^{r}.$$

Similarly it can be shown that equation (10) accounts for all domestic consumption of domestic production, without any double-counting.

3.2 Modeling Tax Expenditures for Particular Suppliers

The methodology for dealing with tax expenditures associated with particular suppliers is similar to the methodology for particular supplies. The procedure for the estimation is simplified somewhat given that a tax expenditure can only be associated with domestic suppliers, reducing the need to consider different assessment methods based on different origins of the supply.

For the tax expenditures associated with particular suppliers, a separate estimator is provided for the various tax expenditure treatments generally associated with suppliers; one for suppliers zero-rated due to the nature of their activity, one for suppliers whose supply is taxed at a reduced rate, one for suppliers exempt due to the nature of their activity, and one for suppliers exempt due to the level of their output i.e. suppliers under the threshold.

3.2.1 *Zero-rated Suppliers*

For a zero-rated supplier making supplies to final consumers or exempt suppliers, the value of the tax expenditure would be equal to general tax rate applied to the total value of output of the supplier. In cases where taxpayers are required to report the value of zero-rated output on their VAT return, the value for the total value of the zero-rated output can be derived from summing up all the declared zero-rated output from taxpayers registered in that area activity, otherwise data from the supply-use tables may be necessary.

Determining the proportion of output of a supplier that goes directly to final consumers can be complicated due to the way the supply-use tables provide data on final consumption by supply not by sector. A simplified apportionment system can be used, based on the ratio of consumption by final consumers and exempt suppliers to total output of the most significant supply associated with the supplier, which would yield the following equation:

(12) $$\varepsilon^{z} = t \times Y^{z} \times \left(\frac{c_{k}^{f} + c_{k}^{g} + \sum_{i}(\beta^{i} \times c_{k}^{i})}{Y_{k}}\right) \times [(1 - \beta^{z}) \times (1 - \eta^{z})]$$

In cases where the output of the supplier is an input for another taxable supplier making taxable supplies, as any tax charged would be refundable as an input tax credit, there would be no increase in tax revenue associated with making the supply taxable, and so equation (12) is the complete estimator for this tax expenditure.

3.2.2 *Reduced-Rate Suppliers*

For reduced rate suppliers, making supplies to final consumers (or exempt suppliers), the value of the tax expenditure is nearly identical to that for zero-rated suppliers, except the tax expenditure is based on the difference between the reduced rate and the general rate, as opposed to the full general rate. Again the primary source for the data on the output being taxed at the reduced rate would be the tax return forms, assuming that the taxpayer is required to declare that output.

(13) $$e^k = (t - t^k) \times V^k \times \left(\frac{c_k^f + c_k^g + \sum_i (\beta^i \times c_k^i)}{V_x}\right) \times [(1 - \beta^k) \times (1 - \eta^k)]$$

3.2.3 *Exempt Suppliers*

For exempt suppliers, supplying directly to final consumers and exempt suppliers, the value of the tax expenditure can be determined by simply applying the general tax rate to the total value-added for that sector as provided by national accounts statistics by sector of activity (if the statistics provide a sufficient level of disaggregation such that the sector definition closely matches the definition of the suppliers' activity type). Again, the proportion of those supplies that go directly to final consumers is not provided by the supply-use tables, and so an apportionment system based on the ratio of consumption by final consumers and exempt suppliers to total output of the most significant supply associated with the supplier is used, yielding the following equation for this portion of the tax expenditure:

(14) $$t \times V^e \times \left(\frac{c_k^f + c_k^g + \sum_i (\beta^i \times c_k^i)}{V_x}\right) \times [(1 \quad \beta^e) \times (1 \quad \eta^e)]$$

where: V^e = the value-added of exempt sector e

While, again, any taxed charged on supplies made for the purposes of making other taxable supplies would be netted out due to input tax credits for the recipient of the supply, the introduction of the input tax credits to the supplier could have a negative impact on tax revenues.

As with the exempt supplies, this negative impact would be comprised of two components; the cost of the tax on inputs being paid by the exempt sector, plus any losses due to tax being generated on the increase in the cost base of the taxable supply using the exempt supply as an input. These two factors can be combined in to one term expressed by:

(15) $$-\sum_y \left[(1+t_y)\times\left(\frac{c_R^k}{r_y}\right)\times\left[\left(\frac{\sum_z (c_z^p \times t_{zi})}{r^e}\right)\times[(1-\beta^e)\times(1-\eta^e)]\right]\times[(1-\beta^f)\times(1-\eta^f)]\right]$$

The reason the negative portions of the tax expenditure associated with particular suppliers as expressed in equation (15) can be expressed in a single term, as compared to negative portion of the tax expenditure associated with particular supplies covered by the last two terms in equation (10), stems from the manner in which the positive portion of the tax expenditure is being estimated. In equation (10) the tax expenditure associated with supplies to final consumers is calculated based on total output, and so any input tax credits associated with that total output must be netted out to avoid double counting the tax on that portion of the supply. In equation (14) the tax expenditure associated with supplies to final consumers is based on value-added, and so there is no need to net out the tax on inputs associated with supplies to final consumers. This allows the negative portion of the tax expenditure in equation (15) to be simplified to one term, all related to supplies for the purpose of making taxable supplies.

Adding equations (14) and (15) together provides for the full tax expenditure estimate for exempt suppliers:

(16) $$\varepsilon^e = t\times V^e\times\left(\frac{c_R^e+c_R^k+\sum_i(\beta^i\times c_R^i)}{r_R}\right)\times[(1-\beta^e)\times(1-\eta^e)]$$
$$-\sum_y\left[(1+t_y)\times\left(\frac{c_R^k}{r_y}\right)\times\left[\left(\frac{\sum_z (c_z^p\times t_{zi})}{r^e}\right)\times[(1-\beta^e)\times(1-\eta^e)]\right]\times[(1-\beta^f)\times(1-\eta^f)]\right]$$

3.2.4 *General Threshold*

As discussed above in section 2, it is debatable as to whether or not there is any tax expenditure associated with the general exemption threshold. While there are both good arguments both for and against including an estimate for the cost associated with the tax expenditure, for the sake of completeness a method for computing this cost is being provided, in order to accommodate those cases where it is decided that such a measure should be included.

The estimation method for the tax expenditure associated with the exemption of supplies from those businesses below the threshold would be similar to the general estimator for exempt suppliers given in equation (16), simply adjusting the terms previously used to exclude the output of those supplier to only include their output, i.e. replacing $(1-\beta^i)$ with β^i, and to remove any terms which previously restricted the impact from being associated with businesses below the threshold (while still excluding the impact to compliant businesses), which yields the following expression:

(17)
$$\varepsilon^b = \sum_i \left[t \times V^i \times \left(\frac{c_k^f + c_k^g}{Y^i} \right) \times \left[\beta^i \times (1-\eta^i) \right] - \sum_y \left[(1+t_y) \times \left(\frac{c_y^f}{Y_y} \right) \times \left[\left(\frac{\sum_z (c_z^g \times z_z)}{Y^i} \right) \times \left[\beta^i \times (1-\eta^i) \right] \right] \times \left[(1-\eta^j) \right] \right] \right]$$

4 Accommodating Data Gaps

In some jurisdictions detailed supply-use statistical tables may not be available, or supply use tables may not be available for the tax year being reviewed. The above methodology can still be applied in both cases, with some adjustments.

4.1.1 *Lack of Current Supply-Use Tables*

It is not uncommon for there to be a few years lag in the availability of supply-use tables for any given year. In recognition of this, the approach in the above model framework was to try to restrict the use of data from supply-use tables to relative sizes wherever possible, rather than to rely on absolute values. In some cases, however, absolute values have been used, such as for current levels of consumption. In such cases National Accounts data on the value-added by the sector involved could be used to gross up the supply-use data; that is:

(18)
$$c_{w\,2009}^f = c_{w\,2004}^f \times \left(\frac{Y_{y\,2009}}{Y_{y\,2004}} \right)$$

Of course, the margin of error associated with such an approach will increase the greater the gap in time periods. If the supply-use tables are too far out of date, it might be best to

consider the treatment for cases where no supply-use tables are available at all. The determination of what constitutes “too far out of date” will vary, but, in general it should be for any period during which shifts in either the general structure of the economy may have occurred (i.e. changes in the shares of the various sectors to total output), or shifts in the structure of particular sectors of importance (i.e. shifts in the capital to labor ratios for a sector).

4.1.2 *Supply-Use Tables Unavailable*

If supply-use tables are unavailable, the use of supply-use tables from a similarly structured economy could be employed until such time as domestic supply-use tables could be produced. Again, for those cases where relative values have been employed from the supply use tables, the data from the foreign supply-use tables could be employed without modification. In cases where absolute values appear, however, the foreign supply-use data should be scaled to the local economy, which could again be done using national accounts data for the value-added of the pertinent sector; for example:

(18) $$C^{\ell}_{w\,domestic} = C^{\ell}_{w\,foreign} \times \left(\frac{V^{i}_{domestic}}{V^{i}_{foreign}}\right)$$