**VAT Gap Model – Production side**

**Using**

**Supply and Use Tables**

**In Microsoft Excel**

**Definition of the VAT Gap:** The VAT Gap refers to the **VAT Policy Gap** or the **VAT Compliance Gap**. The VAT Policy Gap is the difference between the **Potential VAT collectible under a benchmark or standard regime**[[1]](#footnote-1) of the VAT (where there are no exemptions, lower rates or special treatment of any type of consumption or sector/class of taxpayers), and the **Potential VAT collectible under the current regime[[2]](#footnote-2)** (which includes any special treatment of consumption or sector/class of taxpayers). The VAT Policy Gap estimates the revenue foregone due to the current policy of the government. The VAT Compliance Gap is the difference between this **Potential VAT collectible under the current regime** and the **Actual VAT collection**. The VAT Compliance Gap estimates the gap in VAT due to non-compliance by taxpayers. In this note we aim to estimate both the Policy Gap as well as the Compliance Gap for Palestine.

Policy Gap = Potential VAT collectible under a Benchmark VAT system – Potential VAT collectible under Current Policy

Compliance Gap = Potential VAT collectible under Current Policy – Actual VAT collected

**Standard Methodology of estimating VAT Gap in Brief:**

In order to calculate the potential VAT, we apply the VAT policy, either benchmark or current policy to the consumption of the different commodities or services.

Potential VAT = Final Consumption \* Tax Rate -----------------------(1)

The potential VAT could also be derived alternatively which links the consumption side with the production side that generates the goods and services being consumed.

The Supply-Use Tables that forms part of the national accounts provides the information of the final consumption as well as the production and use of goods and services in the economy.

Supply Table: Supply Table shows the supply of all ‘m’ commodities into the economy with the supply of commodities shown in rows and the ‘n’ industry/sectors that supply them in columns. Hence cell [5,7] would show the supply of commodity ‘5’ by industry ‘7’. Supply could be from domestic production or from Imports. In the figure below, Domestic production/supply is shown below as a ‘m’ x ‘n’ matrix by the ‘m’ Commodities and the ‘n’ Industries that supplies these commodities. Imports (M) are shown by commodity in one column though in some countries, it may also be provided in an ‘m’ x ‘n’ matrix showing the imports of ‘m’ commodities by each of the ‘n’ industries. The Supply Table also includes by commodity, the Trade/Transport margins (R) and the tax or subsidies by commodity (T). Here too such column vectors could also be available as an ‘m’ x ‘n’ matrix.

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| **SUPPLY TABLE** | **USE TABLE** |

Use Table: The Use Table provides the use of commodities in the economy. Use of commodity is shown in the figure below as Use of commodity by Industry (Intermediate Use) represented as an ‘m’ x ‘n’ matrix , use by Final Consumers (FC), use for Gross Capital Formation (GCF) and finally use by Exporters (E) shown as column vectors. Here too it is possible that the Gross Capital Formation and Exports are shown as an ‘m’ x ’n’ matrix showing the sectors that use or export these commodities respectively.

Potential VAT = -----------------------(2)

Where is a column vector of the rates of VAT applied to the m commodities. This also allows us to obtain the potential VAT for each of the ‘m’ commodities. This is known as the **consumption approach**.

Potential VAT could also be calculated by industry **(production approach)**. However, this requires the information (2) to be converted into a ‘m’ x ‘n’ matrix form. Further, it would also be useful to also get the various components of the VAT calculation from the point of view of the business/industry paying the VAT. This requires the use of the identity that the **total Supply of a commodity should be equal to its total Use**.

From the Supply and Use Tables this implies,

Domestic Supply (S) + Imports (M) + Margins (R) + Tax (T) = Intermediate Use (U) + Final Consumption (FC) + Gross Capital Formation (GCF) + Exports (E) -----------------------(3)

From equations (2) and (3) we obtain,

VAT Potential = =

---------(4)

Note that the sum of Margins across commodities = 0, as any positive Trade/Transport margin paid by the non-Trade sector is balanced by positive margins earned by the Trade sectors. Hence this term does not appear in (4).

As column vectors, (GCF), (M) and (T) could be allocated to industries, they could be converted to rectangular matrices, [GCF]mxn , [M]mxn and [T]mxn . Hence the right-hand side of Equation (4) would be an ‘m’ x ‘n’ which when added across all the rows (commodities) allows us to summarize the VAT Potential by industry.

This means that the VAT potential could be obtained by industry and which allows us to compare it to actual VAT Collection which is typically available by industry from the tax administration.

**Complexities associated with VAT Policies:** Under a benchmark VAT regime, equation (2) would be sufficient to estimate the VAT Potential. Estimating the VAT Potential under current VAT policy is more challenging because VAT Policy may include exemptions.

Under VAT policy, any business providing exempt supplies are not allowed to claim input tax credit to the extent of their exempt supplies. If this exempt supply is an intermediate good then it implies for example, that a business selling 40% of their supplies of this intermediate goods that are exempt are not allowed to claim credit of 40% of their input tax credits. However, this business would continue its activities which eventually result in final consumption. This means that while VAT is collected on final consumption, the disallowed input tax credit implies additional revenue for the government. Hence,

Potential VAT under current law =

+ Disallowed Input Tax Credit --------(5)

Where is a column vector of the rates of VAT applied to the ‘m’ commodities where the entries are zeros where supplies of such commodities are exempt.

Equation (5) is applicable when the supply of the commodity that is exempt is an intermediate good. However, when the commodity is a final consumption good it only results in reduced tax without the additional tax from the disallowed input tax credit.

Notation – individual cells of the Supply (S) and Intermediate Use (U) matrices are referred to by commodity ‘c’ as well as industry ‘i’ and is denoted as and respectively. Column vectors given by commodity have the subscript ‘c’ such as for Exports, Trade/Transport Margins , Imports , Gross Fixed Capital Formation , Imports and Taxes . Row vectors are given by industry subscript have the subscript ‘i’.

Among the policy parameters, the Tax Rate is given by commodity, the percentage of supply that is exempt for each of the industries (i) is given and the percentage of the value added in Industry (i) that is produced by VAT registered entities is given by .

**Model for estimating potential VAT and VAT Gap – Consumption approach:** The Excel Model estimates the VAT base as shown in equation 5.

(4) ----------- {Supply (S) - Exports (X)} x is the domestic output that is taxed for each Industry.

(5) ----------- {Intermediate Use (U) + Gross Capital Formation (I) – Tax (T)} x is the input tax credit that is available for each Industry.

(6) ----------- Imports (M) x is the VAT paid on importation by each Industry.

While Supply and Use are available by commodity as well as industry, the other terms are sometimes only available by commodity. Hence these need to be allocated across industries. In order to do so we apply certain assumptions,

Assumptions -

1. Imports of a commodity (c) are allocated to industry (i) in the ratio of its intermediate use by industry (i) to its total use i.e. intermediate use, final consumption and gross capital formation

---------------------------🡪 (5)

1. Gross Capital Formation by commodity (c) are allocated to industry (i) in the ratio of the intermediate use by industry (i) to the total intermediate use across all industries

--------------------------------🡪 (6)

1. Exports of a commodity (c) are allocated to industry (i) in the ratio of its supply from industry (i) to its total supply across all industries.

----------------------------------🡪 (7)

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| Industry  Commodity | Agriculture | Manufacturing | Trade | Hotel |  |  | Investment |  |  |
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**Excel Worksheets description:**

parameters – In this worksheet we enter the year (2014 to 2016) for which the VAT Gap is needed. It includes the GDP Growth factor and a shift factor that helps with the excel model.

Key – This shows the Latvian to English translation of the names of the commodities and Industries.

use\_2014 – The Use Table for2014

supply\_2014 – The Supply Table for 2014

use – The Use Table for the current year which is obtained by multiplying the use\_2014 sheet by the ratio of the GDP of the current year to the GDP of 2014.

supply – The Supply Table for the current year which is obtained by multiplying the supply\_2014 sheet by the ratio of the GDP of the current year to the GDP of 2014.

**INPUTS PROVIDED**

effective\_tax\_rates\_table – The tax rates by commodity. The rates are given as an effective rate if each commodity category consists of sub-commodities that are taxed at different rates.

rc\_ratio – The ratio by commodity group of the reverse charge that is applied. rc\_ratio of 0.5 means that half of the commodities in that group falls under the reverse charge scheme whereby in transactions between registered entities, it is the buyer that collects the tax and deposits with the government.

exemption\_ratio - The ratio by commodity group of the exemption that is applied. exemption\_ratio of 0.5 means that half of the commodities in that group are exempt.

exempt\_supply – the exemption ratio by commodity is applied to the supply to obtain the exempt supply by commodity and industry.

exempt\_supply\_sector\_ratio () – the exempt supply is summed by Industry and the ratio of the exempt supply to the total supply by industry gives the exempt supply industry ratio.

vat\_by\_reg\_ratio () – the vat\_reg\_ratio is estimated by dividing the supply of the Industry to the total from the supply use table and the total supply as given in the tax returns.

vat\_revenue – This worksheet shows the VAT revenue by Industry which is used to calculate the VAT Gap as it represents the performance of the tax administration.

**CALCULATED DATA**

supply\_mat\_comm\_ratio – This is the ratio that is calculated.

use\_fin\_gcf\_comm\_ratio – This worksheet calculates the ratios, .

inter\_fin\_gcf\_tax\_alloc – This worksheet allocates the tax shown in the supply use table on the proportion of use\_fin\_gcf\_comm\_ratio.

inter\_use\_mat\_comm\_ratio – This worksheet calculates the ratio .

use\_fin\_gcf\_tax\_excl – The use table is reduced by the inter\_fin\_gcf\_tax\_alloc to get the tax exclusive use table.

exports\_alloc – This worksheet calculates equation (9).

gcf\_alloc – This worksheet calculates equation (8).

domestic\_output – This worksheet calculates the supplies to the domestic economy as shown in (4) by subtracting the domestic supplies (by industry as well as commodity) shown in the supply use table with exports (allocated to industry as well as commodity) as calculated by exports\_alloc.

dom\_output\_pos – In the case of some commodities, the domestic output is less than exports. This means that the exports are supplied by imports in the form of **re-exports**. This worksheet only includes the supplies that are positive, i.e. those supplies by the domestic producers. Zero for a (commodity, industry) indicates that all the supplies for that commodity by that industry is directed towards exports. This is illustrated in the figure-1 below. As the exports for the commodity (500) is greater than domestic production (200), this implies that the exports have to be supplied by the only other source available which is imports. Hence 300 of imports that are re-exported would make up for the difference. It may be possible that the re-exports are higher and that some domestic supplies are made by domestic producers (Figure-2). This can only be inferred when additional data is made available.

**Fig-1: Example - Model Assumption for re-exports**

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| Supply from Domestic Sources = 200  Imports for re-export = 300  Exports = 500  Supply to Domestic Economy = 0 |

**Fig-2: Example – Alternative possible Assumption for re-exports**

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| Supply from Domestic Sources = 200  Imports for re-export = 300  Exports = 500  Supply to Domestic Economy = 0 |

net\_imports – The net imports worksheet removes the re-exported imports from the total imports. This is the imports that are used in the domestic economy.

dom\_output\_inter – Given the amount of supplies provided to domestic economy from domestic producers we estimate how much of these supplies goes to intermediate producers and for gross capital formation, and to final consumers. This information is needed to calculate the output taxes that are not collected due to reverse charge. Such non-collection of input tax due to reverse charge arises only when the domestic supply is made to domestic producers hence final consumption needs to be removed for the estimation of this output tax not collected.

rev\_charge\_output – This worksheet calculated the output on which reverse charge is applied. As reverse charge is applied on transactions between producers taxpayers, it uses the data given in the worksheet dom\_output\_inter and the data given in the worksheet rc\_ratio, which is the ratio of supplies by commodity on which reverse charge is applied.

inter\_use – This worksheet estimates the sum of the intermediate use given in use\_fin\_gcf\_tax\_excl and the gross fixed capital formation calculated in the worksheet gcf\_alloc.

Imports\_alloc – This worksheet allocates the imports which is shown by commodity to (commodity, industry) using the data from the worksheet net\_imports, the use\_fin\_gcf\_comm\_ratio and the data from the worksheet inter\_use\_mat\_comm\_ratio as shown in (7), .

Imports\_eu\_alloc and imports\_noneu\_alloc – Just as the total imports are allocated above, in a similar manner the imports from EU and non-EU which are shown by commodity are allocated to (commodity, industry).

inter\_use\_dom – As we know the domestic use by (commodity, industry) we can estimate the use from domestic sources by subtracting the supply from imports allocated by (commodity, industry) as calculated in the worksheet imports\_alloc.

imported\_final\_cons – In this worksheet we allocate the imports to final consumption in proportion to the total use as calculated in the worksheet use\_fin\_gcf\_comm\_ratio. This worksheet is not used but could provide an option to address the lack of data on the resale of commodities by the trade sector if we assume that all imported final consumption goes through the trade sector.

rev\_charge\_purchases – This calculates the reverse charge that purchases of the applicable commodities. It uses the data on domestic purchases from inter\_use\_dom and the relevant commodities coming under the reverse charge policy rc\_ratio.

rev\_charge\_pur\_tax – This worksheet calculates the tax on the supplies in which reverse charge is applied by multiplying the data in rev\_charge\_purchases with the tax rate by commodity provided in the worksheet effective\_tax\_rates\_table.

output\_tax – This worksheet calculates the output tax as shown in equation (4) using the data from the worksheet dom\_output\_pos.

rev\_charge\_output\_tax – This worksheet calculates the amount of tax on reverse charge using the data from the worksheet rev\_charge\_output and the tax rate provided in the worksheet effective\_tax\_rates\_table.

input\_tax\_credit\_dom – This worksheet calculates the input tax credit on domestic inputs which is shown in the expression in (5).

Input\_tax\_credit\_noneu\_imp – This worksheet calculates the tax on the imports from non-EU jurisdictions using the data from the worksheet imports\_noneu\_alloc and the tax rates from the worksheet effective\_tax\_rates\_table.

input\_tax\_credit – This worksheet calculates the input tax credit as shown in expression in (5) by

input\_tax\_credit\_disallow – This worksheet calculates the disallowance of the input tax credit. As per VAT, input tax credit is disallowed in the proportion of exempt output to total output for the Industry.

import\_vat – This worksheet while not being used is estimated. This is because in this case VAT is not collected on imports from EU countries. It estimated by using the worksheet given in import\_alloc and the tax rates.

import\_vat\_eu – This worksheet while not being used is estimated. This is because in this case VAT is not collected on imports from EU countries. It estimated by using the worksheet given in import\_eu\_alloc and the tax rates.

import\_vat\_noneu – This worksheet calculates the VAT on imports from non-EU countries and is estimated by using the worksheet given in import\_noneu\_alloc and the tax rates.

sector\_mapping – Mapping the 65 sectors into fewer consolidated sectors.

potential\_value\_added – This worksheet shows all the components of the Value Added by sector which is picked up from the many worksheets

pot\_value\_added\_trans – The transpose of the potential\_value\_added worksheet for preparing the pivot charts

pot\_value\_added\_pivot – The summary in the form of a pivot table of the value added.

pot\_value\_added\_chart – A copy of the pot\_value\_added\_pivot worksheet that allows the summary as well as making of charts.

potential\_vat – This worksheet calculates the potential VAT based on (1) and the base shown in (3). It includes

1. The taxes on output from which the tax on reverse charge is subtracted
2. The net Output tax is then adjusted for those who are VAT Registered
3. Input Tax Credit on taxes paid on domestic purchases
4. Input Tax Credit on taxes paid on imports non-EU countries
5. Input Tax Credit disallowance based on the extent of exempt outputs to total output
6. The Input Tax Credit tax is then adjusted for those who are VAT Registered
7. The reverse charge that is collected by purchases is added
8. The reverse charge is then adjusted for those who are VAT Registered
9. The VAT collected on non-EU imports at the border are added
10. The import VAT is then adjusted for those who are VAT Registered
11. The potential VAT is calculated from the Output Tax less the input Tax Credit plus the reverse charge on purchases and import VAT collected
12. The VAT Gap is calculated as the difference between the Potential VAT and the VAT Revenues

potential\_vat\_trans – The transpose of the potential\_value\_added worksheet for preparing the pivot charts

potential\_vat\_pivot – The summary of the potential\_vat\_trans worksheet in the form of a pivot table.

potential\_vat\_incl\_trade – A copy of the pot\_value\_added\_pivot worksheet that allows the summary as well as making of charts. In this chart we include the VAT on final consumption that is included in the Trade sector that is calculated using the worksheet imported\_final\_cons (see Note below).

**Important Note regarding the Trade Sector:** The potential VAT from the Trade Sector (Wholesale and Retail) cannot be estimated in the same manner as the other sectors. This is because the Supply Use Table considers these sectors as “pass through” with respect to all commodities acquired for resale. The Supply Use Table records only the margin on the resales in the supply table which also includes the “service” component that is embedded in the margin. The Use table records all the inputs for running the business. While in theory this could still allow us to arrive at the correct VAT to be collected form this sector problems arise on the treatment of imports. Imports are recorded by the industry that eventually uses the commodity even if it is the Trade Sector that has imported the commodity. Hence the allocation of Imports used in the estimation above needs to be changed to correctly record them as being made by the trade sector. Similarly, taxes on imports by the trade sector that are eventually supplied to final consumers are shown as being directly sourced to final consumers, hence we need to allocate final consumption to the trade sector to account of this. These adjustments can be further calibrated using additional data and going back to tax records for calibrating the model.

1. Benchmark VAT system is a VAT applied to all domestic consumption taxed at the standard rate of the country. No exemptions, lower rates or special treatment are applied to different classes of taxpayers. The only exception is a zero-rate applied to exports as this is consumption outside the country and does not come under the benchmark VAT system which only taxes domestic consumption. [↑](#footnote-ref-1)
2. Current Policy is the VAT applied under the VAT law applicable to the country. This would include any exemptions, special rates or special treatment for different classes of taxpayers. [↑](#footnote-ref-2)