

The Revenue Administration – Gap Analysis Program: An Analytical Framework for Excise Gap Estimation

Mick Thackray and Martina Alexova

Fiscal Affairs Department

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INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

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An Analytical Framework for Excise Gap Estimation**

Prepared by Mick Thackray (Fiscal Affairs Department) and
Martina Alexova (Institute of Financial Policy, Slovak Republic Ministry of Finance)

Authorized for distribution by Vitor Gaspar

April 2017

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JEL Classification Numbers:	H20, H21, H25, H26, H30
Keywords:	Tax Administration; Tax Compliance; Excise; Tax Gap; Tax Avoidance; Tax Evasion; Excise Smuggling; Cross-Border Shopping; Shadow Economy; Non-Observed Economy
Authors' E-Mail Addresses:	mthackray@imf.org

TECHNICAL NOTES AND MANUALS

The Revenue Administration—Gap Analysis Program: An Analytical Framework for Excise Gap Estimation¹

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

- How do countries measure noncompliance and other revenue foregone in excises?
- What is an excise gap?
- Why measure the excise gap?
- What are the steps in measuring an excise gap?
- What data is required to measure the excise gap?

¹ Mick Thackray is with the IMF's Fiscal Affairs Department. Martina Alexova is with the Institute of Financial Policy of the Slovak Republic's Ministry of Finance.

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I. HOW DO COUNTRIES MEASURE NONCOMPLIANCE AND OTHER REVENUE FOREGONE IN EXCISE TAXATION?

Many countries are measuring tax revenues foregone through policy reliefs. Many countries follow good practice in publishing estimates of the fiscal impact of tax reliefs that are allowed in law. A common example of such relief is the exemption from excise taxation of road fuels used in agriculture. Such impacts are known as “tax expenditures.” Generally, these estimates are derived from independent data, for example, from income and expenditure surveys; or from relieved transactions declared by taxpayers.

It is generally less easy to measure revenue not collected through noncompliance and avoidance, but an increasing number of countries are doing so. 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. Tax avoidance—though the activities involved may be reported openly—is difficult to define as it is on the border between legitimate and “fair” tax-planning, and avoidance is seen as “culpable.” Even still, the fiscal impacts of avoidance and noncompliance are of critical interest, not just to tax administrations, but also to finance ministries and other stakeholders; a number of countries now regularly produce and publish these estimated revenue losses. This note focuses mainly on the compliance dimension (which implicitly includes avoidance) of excise gaps.

This technical note and manual focuses on top-down approaches to estimating excise gaps, but other approaches can be used. Other estimation approaches used, and sometimes combined for a more comprehensive view of the tax gap, include the following.

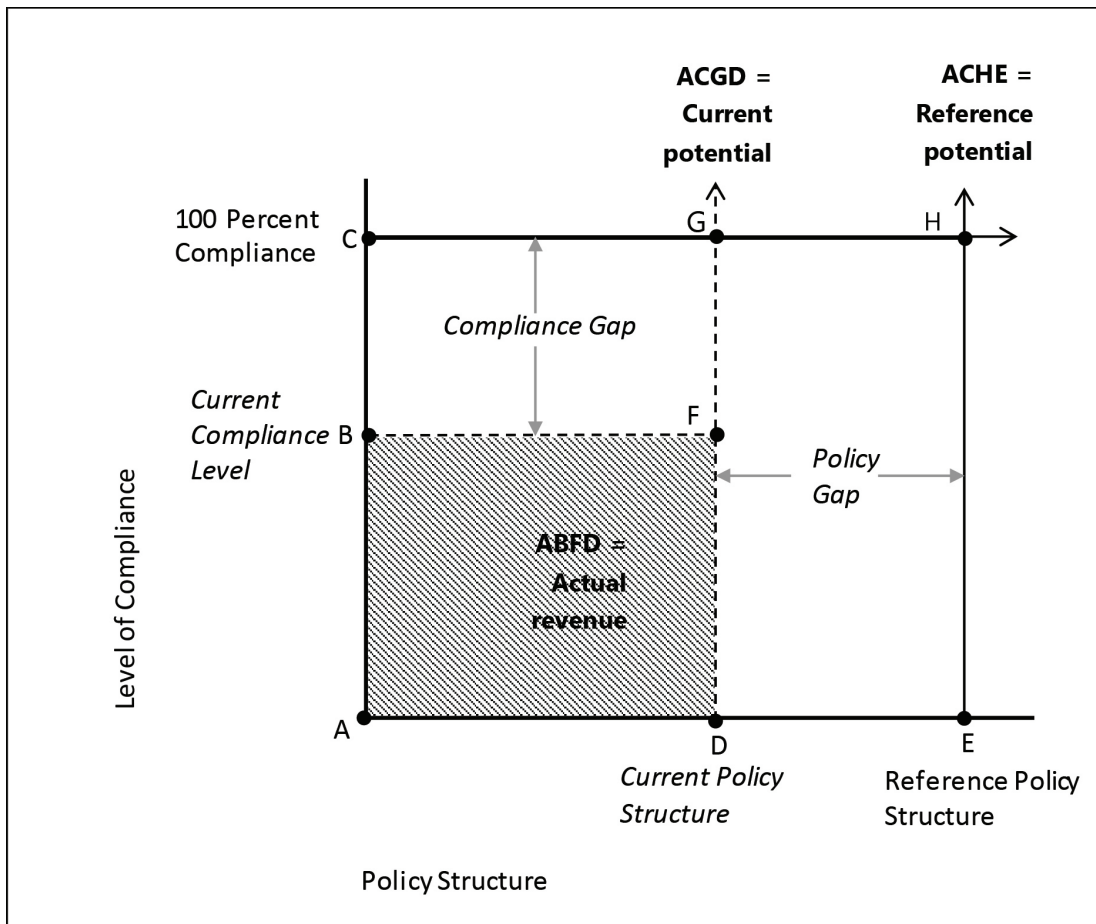
- **Bottom-up approach:** the top-down approach provides a comprehensive estimate of all tax losses from noncompliance, but does not identify compliance behaviors creating the losses. Bottom-up techniques, such as auditing a random sample of taxpayers, or analysis of compliance risk and intervention results, can instead be used to estimate the impact of specific behaviors. These provide valuable insights into compliance behaviors and risks, and can be used to test and interpret top-down estimates. However, such techniques cover only specifically identified sources of the tax gap—not necessarily the whole tax gap—and can be costly to execute.
- **Econometric techniques:** analytical tools, such as frontier or time series analysis, can be used to estimate efficiency or revenue losses. However, their results can be sensitive to the selection of determinants and assumptions used in the model, and can produce perverse results. As well, their 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.
- **Survey techniques:** surveys can be conducted in order to estimate the market share of, for example, tobacco products taken by untaxed goods. These can take the form of household surveys, using questionnaires and sometimes an inspection of smokers’ current cigarette pack to identify indicators of its origin and distribution, including any tax stamps.

An alternative approach, used in Project Star and Project Sun (see Box 2), is to collect discarded cigarette packs from public spaces and use these to deduce the market share represented by untaxed product.

II. WHAT IS AN EXCISE GAP?

The excise gap, as defined in this note, is the difference between potential revenue and actual revenue for a given excise. Under this broad definition, the excise gap can be deconstructed into two main components: the impact of non-compliance (the compliance gap) and the impact of policy measures (the policy gap). This is illustrated in Figure 1.

Figure 1. Illustration of the Components of the Tax Gap



Top-down excise gap estimates use independent statistical data to estimate total potential collections and compare this figure to actual collections, to derive the excise gap. The statistical data is used to model the overall tax base, which can be used to derive total potential collections that are then compared to actual collections. The difference between potential and actual collections is the excise gap.

Tax gap estimates need to adhere to certain design criteria. The design criteria identified by the IMF RA-GAP program (see Box 1) for effective top-down gap estimation methodologies are set out in Figure 2. Close adherence to these criteria will ensure that estimated results are as robust as possible.

Box 1. IMF RA-GAP Program

The Revenue Administration Gap Analysis Program (RA-GAP), conducted by the IMF Fiscal Affairs Department's Revenue Administration Divisions (FADR1 and FADR2), provides revenue administrations with comprehensive and detailed estimates of the gap between current and potential collections, as well as a review of current operational performance in a number of key functions.

The goal of RA-GAP is to estimate the tax gap and identify some of the underlying causes of the gap. While the tax gap is a crucial key performance indicator (KPI) for a revenue administration's overall effectiveness in collecting tax revenues, it is as important to be able to identify what is contributing to the gap.

In the initial phase of the program, its focus was largely on estimating the VAT gap for individual countries. RA-GAP's detailed methodology for estimating VAT gaps is set out in (Hutton, 2017). The program is currently in the process of being extended to other taxes, as with excises.

Such estimates are inevitably associated with some uncertainty. The framework for estimating excise gaps presented in this TNM aims to minimize such uncertainties through a robust approach to data capture, analysis and reporting. Available data sources will vary from country to country, as will their coverage and reliability, but the framework is applicable in all countries for any excise levied on specific commodities. In principle, it can be applied to any commodities, subject to specific volume-based or ad-valorem taxation. In practice, it may be more difficult to apply it for less significant commodities whose base is too small to be identified separately in independent data and analysis.

In the analytical framework used in this TNM, top-down tax gap estimates do not take into account potential price effects. The top-down approach assumed in the framework creates a static model. That is, it measures the compliance and policy gaps, given current levels of consumption, and does not take into account possible behavioral changes were compliance levels or the policy framework to change. Clearly this is not entirely realistic; if compliance rates change, or the excise rates or their coverage change, this could well affect prices and, therefore, consumption and production behavior. The gap estimates are, therefore, measures of current behavior and indicators of the efficiency of tax administration and policy, rather than estimates of potential additional revenues.

It is likely that excise noncompliance is itself a source of VAT noncompliance, but this should be accounted for in the VAT gap where it is estimated. Typically, noncompliant excise taxpayers are, also, likely to be noncompliant in other taxes, and should be accounted for in tax gap losses for those tax headings. More specifically, since VAT is generally levied on excise, any underpayment of excise will usually lead directly to an underpayment of VAT. Although an argument could be made that any such undeclared VAT could be added to the revenues lost through excise nonpayment, where the VAT gap is being separately estimated, it is better to exclude VAT from the excise gap, so as to avoid double counting the losses.

Figure 2. Design Criteria for an Effective Top-Down Gap Estimation Methodology

1. Independent Source of Statistics for the Tax Base
A top-down program relies on having good statistics on the size of the tax base, derived from sources other than taxpayer records; nominally independent data sources should be checked to ensure they do not rely on tax records to impute critical missing values or control totals. For example, income surveys are often grossed up to income totals reported by tax authorities, in order to correct for nonresponse at very low and very high income levels.
2. Accurate Statistical Data
The statistical data needs to be relatively accurate with detailed documentation on the method of compilation and, ideally, an indication of the estimation error.
3. Consistency in Statistical Data
When statistical data from different sources are combined, it must be ensured that they are consistent—both in terms of definitions and in scale of the data. For example, when combining national accounts statistics with consumption survey data, it should be verified that the overall level of consumption reflected in the survey data is consistent with that in the national accounts data. It also needs to be verified, when using statistical data that spans a period of time, that changes in definitions have not occurred.
4. Sufficiently Detailed Statistical Data
In order to be able to accurately model the policy framework, the statistical data needs to be sufficiently detailed. Commodities and sectors should be disaggregated sufficiently to match the most detailed definitions in the tax rate schedules.
5. Comprehensive Statistical Data
The statistical data used needs to cover the full tax base for the tax type. Because top-down models are usually more accurate in identifying changes to tax gaps than their precise level, the data should be available for more than one period.
6. Accurate Modeling of the Tax Structure
The model of the tax structure should adhere as closely as possible to the statutory description of the application of the tax; using statutory rates where possible instead of average effective rates and capturing all special treatments, such as exemptions, thresholds, credits, etc.

III. WHY MEASURE THE EXCISE GAP?

Tax gap analysis provides tax administrations and their stakeholders with a measure of the amount of tax revenues lost or foregone through noncompliance, avoidance, and policy decisions. While a modern tax system is predicated on voluntary compliance, there are often few tools available to a revenue administration to measure and monitor taxpayer compliance.

Top-down tax gap estimates can be used to provide a breakdown of the overall tax gap into the compliance gap and the policy gap. The compliance gap is defined as the difference between actual and potential collections, given the current policy framework, and is assumed to be the result of taxpayer noncompliance. The policy gap is defined as the difference between potential collections under current legislation and that under some normative regime in which all domestic activities and imports are taxed at the standard rate.

Top-down tax gap estimates provide estimates of overall noncompliance and changes in the level of noncompliance. If properly executed, top-down analysis provides an estimate of the overall impact of noncompliance, *whether or not the noncompliant behavior has been identified by the excise administration*. However, as in any statistical exercise, there are inevitable margins of error associated with the measure. These margins of error in the estimated level of noncompliance are typically higher than in observed changes to those levels from one year to the next. The reasons for this are set out in Box 3. As a consequence, tax gap estimates provide a more robust metric for changes in compliance than levels.

Unless they are specifically excluded, top-down estimates of compliance gaps generally include avoidance losses. Tax avoidance can be broadly defined as using artificial, though legal, arrangements to avoid tax liabilities. Arguably, tax revenues not received due to such schemes belong in the policy, rather than the compliance, gap because they are the direct consequence of the tax law. However, insofar as the activities involved are categorized in statistical data—most notably countries' national accounts series—under their true nature, they will likely be included in the estimated tax base and potential tax as derived from the statistical data. Because avoidance reduces the tax payable, it reduces collections and so contributes to the observed compliance gap unless separately identified and quantified² so as to adjust the final estimate.

² In practice this is often very difficult to do, not least due to the problem of defining the boundary between 'acceptable' tax planning and 'unacceptable' avoidance. However, if it can be done, an appropriate adjustment to the compliance gap should be considered—the appropriate treatment for avoidance is generally a change in policy, not a compliance intervention.

IV. WHAT ARE THE STEPS IN MEASURING AN EXCISE GAP?

There are four stages in the estimation of excise gaps (Figure 3). The estimation of tax gaps is an iterative process, involving four stages.

1. **Context:** identifying the scope and feasibility of any excise gap study, based on the motivation and data availability.
2. **Data capture:** the data required—discussed in Section V—for the study needs to be identified and captured. This will include not only the statistical data needed to model the tax base, but excise returns and payments data, and the legislative and administrative framework for the excise being studied.
3. **Analysis:** the excise tax base is modelled and compared to actual collections. For this, the data being used needs to be cleaned and prepared so as to match the specification and definitions used in the excise tax base model.
4. **Reporting:** the estimated level and trend of the excise gaps should be reported and interpreted with reference to the motivation for the study. Any conclusions and recommendations for further work should also be reported.

The framework is shown here in linear form, for simplicity, but individual steps may need to be repeated. For example, data availability often dictates the tax base model specification and the coverage of the estimate. If the data first identified as appropriate for the study turns out not to be reliable, alternative sources need to be identified, which can in turn mean a revised model specification.

Each step of the analytical framework is discussed in more detail below. Each stage is, also, illustrated as a case study using the methodology used to estimate the mineral oils excise gaps in Slovakia, as published by the Slovak Institute of Financial Policy in 2015 (IFP, 2015).³ A report on the IFP's estimation exercise is contained in Appendix 2.

³ This report was subsequently updated in 2016 (IFP, 2016).

Figure 3. Analytical Framework

1. Context		
Motivation <ul style="list-style-type: none"> • Revenue analysis indicating unexplained shortfalls (or over-performance) against forecasts • Tax administration risk assessment, performance monitoring, or business intelligence • Market intelligence and trade reports 	Feasibility <ul style="list-style-type: none"> • Detailed taxpayer returns and payments data • Detailed, independent data sources to model tax base, i.e. production or consumption 	Scope and coverage of tax gap study
2. Data Capture		
Legislation <ul style="list-style-type: none"> • Current definition of tax base, rates, and coverage of each rate • Past changes in legislation, coverage, and rates 	Administration data <ul style="list-style-type: none"> • Detailed taxpayer returns & payments data • Administration processes and impacts of, e.g. process changes, cash effects, one-off events 	Statistical data <ul style="list-style-type: none"> • Independent data on production or consumption
3. Analysis		
Data preparation <ul style="list-style-type: none"> • Data formatting and cleaning: anomalies, duplication, missing entries 	Model specification <ul style="list-style-type: none"> • Matching model parameters to legislative framework and administration processes • Matching model parameters to data definitions 	Analysis <ul style="list-style-type: none"> • Data input and output of results • Test results against external data and analysis • Sensitivity testing of assumptions and error margins
4. Reporting		
Presentation of results <ul style="list-style-type: none"> • Levels and trends; decomposition of gap estimates into sectors/taxpayer segments • Policy and compliance gaps • Caveats: data issues and limitations of analysis 	Interpretation of results <ul style="list-style-type: none"> • Risks and behaviors driving gaps, reconciliation to existing risk, and revenue analysis 	Conclusions and future work <ul style="list-style-type: none"> • Strategic view of risk and treatments • Further analysis and monitoring

A. Context

Motivation

1. **Excise taxation typically shows stable collections levels unless undermined by noncompliance or cross-border shopping.** Excises typically levied on commodities with low own-price elasticity, so as to tax a stable base. This property means that collections should generally be relatively stable. However, where otherwise identical goods are available to consumers at both taxed and untaxed prices, many consumers will naturally prefer the latter, cheaper option. In other words, there will be relatively high cross-price elasticities, and collections are put at risk from noncompliance. Absent changes to excise rates or coverage shortfalls against forecast revenues can, therefore, be indications of emerging compliance risks and should be investigated. In economic terms, tax-paid goods may be substituted by the same or similar goods on which domestic excise has not been paid. The substitution goods may be purchased legitimately in other countries where excise rates and prices are lower, or smuggled into the domestic market without paying tax. Or they may have evaded excise by other means, for example, non-tax paid counterfeit goods, or diversion or other frauds.
2. **Excise compliance risks may be reported by tax administrations and other government agencies.** In the course of their compliance and administration activities, revenue agencies should be expected to understand, and systematically report, compliance behaviors in taxpayer populations. In addition, risk, intelligence, and/or investigations resources may be used to identify the nature of compliance risks and their scale. Other government agencies, such as the police, border agency, or health professionals, may also report changes in the source and distribution of excise goods.
3. **Compliance risks may, also, be reported by trade representatives and other external agencies.** Compliant excise taxpayers, cross-border shopping, smuggling, and noncompliance in general in their market, represent a commercial risk. These taxpayers and their representatives can be expected to report such concerns to the revenue agency. Similarly, other external agencies, such as health lobbyists and pressure groups, may report concerns about changing patterns of purchasing and consumption of excise goods to the revenue agency.

Feasibility

4. **The critical requirement for estimating excise gaps is for statistical data with good coverage of the excise tax base that is independent of taxpayers' returns.** Typically, the number of excise taxpayers in any one country is relatively small, and the legislative framework is straightforward to model. Calculating actual excise collections and modeling the tax base are, therefore, rarely problematic. The area of potential difficulty is identifying sources of statistical data on consumption of excise goods that are sufficiently independent of excise returns to be used to populate the model of the tax base reliably and independently.

Scope and coverage

5. **The scope of the excise gap study should always be for more than one period.** The scope of a tax gap study is often determined by the availability of suitable data. However, the study should always try to estimate excise gaps for more than one year, and aim for at least five years. This will allow testing of the consistency and reliability of the estimates and allow trend estimates. Not only are they of interest in themselves, the estimated trends are generally more reliable than estimated levels (see Box 3).
6. **The coverage and detail of an excise gap study may be determined by the availability of appropriate statistical data.** In some cases, independent statistical data may only be available for part of the tax base. If actual collections can be determined for that tax base segment, a useful, albeit partial, analysis can still be executed. Similarly, the level of detail available in the statistical data may prevent a decomposition of the estimated excise gap by individual tax rate or commodity type. Expectations should be set at reasonable levels.

TABLE 1. IFP CASE STUDY: CONTEXT	
Case Study	IFP Mineral Oils Excise Gap Estimate
Motivation	Long-term decline in excise collections, not explained by excise rate changes.
Feasibility	No single independent source for production, consumption, or expenditure available. Consumption can be derived from combined data sets on motor vehicle registrations, controls, and road tolls.
Scope and Coverage	Potential excise defined as domestic consumption multiplied by the appropriate excise rate. Several years' data available for time series.

B. Data Capture

Legislation

7. **The legislative framework of the excise needs to be established for the period of the study.** The legal framework for excise taxation is generally straightforward, consisting of only a few different rates applied to specific commodities. Even still, to model potential excise collections accurately, the relevant rates and their coverage need to be established for all the years of the study. As well, for some goods, such as alcoholic drinks, excise rates may be determined by the goods' content or type rather than by their volume or value; and this needs to be taken into account in the model.

Administration data

8. **Where possible, micro-taxpayer returns and payments data should be used to calculate actual excise collections.** Excise collections are generally reported in aggregate form on a cash basis. For a tax gap study, it is better to calculate actual excise collections using detailed taxpayer returns and payments data, so as to accrue payments to the tax period for which they were made. This provides a better link between payments and the underlying consumption. The use of detailed data can also allow the disaggregation of collections into tax bands and commodity types and help understanding excise transactions and their distribution.

9. **Where they are an issue, forestalling and other timing effects should be discounted in the actual collections series.** In many countries, excise payers avoid anticipated rate increases through forestalling,⁴ the early clearance of excise goods ahead of the rate increase. Such forestalling can involve up to several months of clearances being made in advance. In such cases, and where other timing effects occur, for example, because of process or market changes or adjustments to existing returns, the timing effect should be taken into account and discounted so that collections are matched to corresponding consumption periods as closely as possible.

Statistical data

10. **Statistical data for estimating the excise tax base should be captured at the most detailed level possible, preferably at a micro-level.** In order to accurately model the coverage of different tax rates in excise regimes, it may be necessary to use disaggregated data. Where available, the detailed microdata used in the data source can also be very helpful in modeling particular segments of the excise tax base and other distributions. The microdata, also, allows data quality to be checked and appropriate data cleaning to be done (see below).

11. **While excises are generally levied on production and import, independent production data to model the tax base is rarely available and consumption or expenditure data is used instead.** In general, the analytical framework assumes that consumption data, expenditure, or other proxies converted to consumption are used to model the potential excise tax base.⁵ In principle, production data can, also, be used to model the tax base, and arguably should be, since the tax point for excise taxation is most often the production or release from warehousing of the excise goods in question. However, reported production data for excise goods will very often be based on excise declarations or otherwise calibrated to them. This is problematic in a tax gap estimate, where estimated potential excise needs to be independent of actual excise declarations. It is sometimes possible to use proxy data for production—for example, the supply of source materials to excise goods producers—but such an approach is more likely to produce an assessment of risks and their trends than a robust central estimate of the excise gap, due to the need to use assumptions to convert proxy values to production values.

TABLE 2. IFP CASE STUDY: CONTEXT

Case Study	IFP Mineral Oils Excise Gap Estimate
Legislation	Detailed descriptions of excise law and practice obtained from Ministry of Finance and Financial Administration.
Administration Data	Taxpayers returns and payments microdata obtained from Financial Administration.
Statistical Data	Microdata obtained from databases maintained for vehicle registrations, control and road toll payments.

⁴ In general, such forestalling provides the government with a cash flow benefit in excise payments brought forward, but a permanent loss of the additional excise that would have been collected had the excise goods been cleared at the usual time. Forestalling against excise increases can be seen as another form of avoidance, behavior that is very often legal but avoids tax that is intended to be levied. As such, the cost and cash flow effect of the forestalling are of interest to policy makers, and should be quantified. NB: to the extent that forestalling is illegal, as is the case in some countries, any cost should of course be included in the compliance gap.

⁵ Note that there are potential under-reporting issues for consumption of alcohol and tobacco products, which could bias gap estimates downwards (see Box 4).

C. Analysis

Data preparation

12. The data to be used for the study should be examined in detail to identify potential issues. Both administrative and statistical data and their aggregates should be reviewed against the design criteria for effective tax gap estimation methodologies (Figure 2). There can be a number of quality issues to be resolved, including.

- Missing data
- Outliers and other anomalies
- Duplication
- Consistency (both internally and across different data sources)
- Typographic errors
- Coverage (also discussed above)

13. The data may also need further manipulation and re-formatting before being used in the study. Where more than one data source is being used, they may need to be matched, preferably at the micro-level. This can create matching issues that need to be resolved. In addition, derived variables may be required, for example, converting alcoholic drink volumes to units of alcohol or converting mileage data points to average mileage per tax period. Such manipulation is generally better done before data is input into the excise gap model, to check the reasonableness of results at each stage and aid diagnostics.

Model specification

14. Modelling parameters should accurately match the legislative framework and administration process. The parameters chosen, for example, tax rates and their coverage, should accurately reflect both the current legislative framework and historic changes to it within the period of the study. The parameters should, also, reflect any administrative processes that affect the reporting of excise clearances and payments

15. Model parameters, also, need to match data definitions. This may require the manipulation of the data, for example, combining the results of different vehicle types to estimate the excise tax base for road fuels or decomposing alcohol consumption into different drinks types. Where possible, model parameters should preserve the greatest level of disaggregation possible until the final results are produced, so as to facilitate peer reviews and diagnostics.

Analysis

- 16. Once the data has been prepared and the model specified and programmed, data is input and the results produced.** This is very often an iterative process because it is only at this stage that problems in the data or model specification may become apparent, either because the model fails to work, or because it produces non-credible results.
- 17. The results of the analysis should be tested against external data and analysis.** Tax gap estimation is not a precise science. As good practice, the results should be tested against external data and analysis, where they exist. This can include expert opinion, for example, from risk and compliance specialists in the revenue agency. Where there are significant differences, they should be understood and reconciled, and a judgment reached on the accuracy of the excise gap estimate. Again, this can be an iterative process, often requiring going back to data and model specification stages, or even back to the selection of data sources, in order to reconcile differences and reach a judgment on the most likely estimate of the excise gap.

Box 2. Tax Gap Estimates Produced by the Trade

Noncompliance by excise taxpayers is not just an issue for the tax administration, but also for those businesses that meet their excise obligations, those that do not represent unfair competition. Legitimate businesses also have an interest in maintaining ordered markets that would be put at risk by widespread noncompliance, or “informality.” In particular, domestic producers’ competitiveness is put at risk by the smuggling of cheaper, untaxed product from abroad. Trade representatives may well argue that widespread noncompliance in excise is an indication that excise rates are too high.

Consequently, it is quite common for large businesses or trade representatives and advisors to publish their own estimates of noncompliance in excise goods markets. Prominent examples of such exercises include:

- *Project Sun*: a study of the illicit cigarette market in the European Union, Norway, and Switzerland, conducted by KPMG for a number of cigarette manufacturers. (<https://home.kpmg.com/uk/en/home/insights/2015/05/project-sun-a-study-of-the-illicit-cigarette-market.html>)
- *Asia-14 Illicit Tobacco Indicator 2013*: a study of the illicit tobacco trade in 14 selected Asian markets prepared by International Tax and Investment Center and Oxford Economics for Philip Morris International management S.A. (<http://www.iticnet.org/asia14>)

Such studies can provide invaluable evidence for a tax administration, whether it is to test the administration’s own understanding or to motivate a tax gap study by the administration itself. Even still, the methodology and data used to produce the private sector’s estimates should be examined critically not only from normal professional considerations, but also to ensure that the trade’s particular agenda does not unduly influence the analysis itself or the presentation of results.

18. **Sensitivity testing should be used to test the impact of alternative assumptions and data.** Such sensitivity testing will most often take the form of running the model using alternative assumptions or data, so as to judge the relative impact of each alternative and the range of possible results. As an alternative, it may be possible to use statistical techniques, such as Monte Carlo analysis, to estimate the likely scale and distribution of error margins for each assumption or choice of data. Such sensitivity testing may lead to different assumptions being used or even to changes in the model specification and data sources used.

TABLE 3. IFP CASE STUDY: ANALYSIS	
Case Study	IFP Mineral Oils Excise Gap Estimate
Data Preparation	Anomalous and incorrect data entries corrected, and incomplete entries removed.
Model Specification	Average mileage per year per fuel type and vehicle type derived or inferred from database entries. Actual collections calculated from taxpayer returns and payments data.
Analysis	For each fuel type and vehicle type, consumption derived from annual mileage and used to determine potential excise collections. Actual collections compared to potential collections to derive tax gaps per fuel type and overall. Sensitivity of results to data cleaning rules tested to find upper and lower bounds.

D. Reporting

Presentation of results

19. **Reporting the results should include the level and trend of the excise gaps, together with caveats on any uncertainties or limitations in the analysis.** Not only the level of the tax gap should be reported, but its trend; the latter is likely more accurate than the former (see Box 3). The report also needs to recognize any limitations in the analysis or uncertainty in the estimates. Where there is significant uncertainty that produces a range of possible results, presenting the estimate explicitly as a range, using plausible upper and lower bounds, should be considered.

Box 3. Levels and Trends in Tax Gap Estimates

Tax gap estimates are statistical exercises, and inevitably associated with some uncertainty. A tax gap study attempts to measure behavior that cannot easily be directly observed, and in the case of deliberate noncompliance may well be deliberately concealed. Consequently, the study derives estimates by calculating potential excise from independent statistical data. Such statistical data are often based on sample survey data; sampling errors and other issues will create margins of error in the results that are not always calculable. Sampling errors that are a consequence of confidence intervals associated with sample sizes should generally be unbiased and not systematically bias the gap estimate in any one direction. Those associated with such factors, as selection or non-response bias, likely systematically create biases in one direction or another in the results (assuming the same, consistent data source is used for each year in the study).

In addition, assumptions and simplifications very often have to be used to model the potential tax base. Further assumptions and simplifications are likely to have been used by statistical bodies when grossing up from sample results to aggregate values. Such assumptions and simplifications will also be subject to margins of error that are highly unlikely to be calculable. If the same assumptions and simplifications are used for each year of the study then it is likely that they too will be systematically biased.

As a consequence of both sampling and non-sampling errors being present, it is very rarely possible to quantify robustly the margins of error in the observed level of tax gaps, but they are likely significant. However, systematically biased errors mean that the overall error in the observed change or trend of the annual tax gap estimates is likely less than in the level.

Consequently, estimated tax gap changes and trends are generally more robust indicators than their estimated levels. This is an important property of the estimates that allows their use as a performance indicator to monitor changes in the effectiveness of tax administrations and their compliance treatments.

20. **It is good practice to publish the results of an excise gap study.** Tax gaps are key indicators of tax administration and policy performance, and are a legitimate area of interest for taxpayers. To support transparent government decision making, the excise gaps should be published. Publication also allows external experts to understand and test the estimates; their feedback can be very helpful in developing and improving tax gap estimates in the future.

Interpretation of results

21. It is not enough simply to estimate the scale of the excise gap, as it is as important to understand it and the nature of the risks driving it. For a tax administration, knowing the size of the excise gap is only part of the story. The administration needs to understand the risks and taxpayer behavior underlying the gap so that it can address them with appropriate measures. The estimated tax gap should be reconciled and mapped to existing risk and compliance analysis and be used as a cornerstone for strategic compliance risk management.

Conclusions and future work

22. The excise gap estimate should be used to take a strategic view of risks and treatments. Excise gap analysis allows the administration to take a strategic view of both compliance and policy risks. It should be used to help quantify strategic risks and in prioritizing resource allocation and other measures so as to minimize revenue inefficiencies efficiently. It can, also, be used to provide an outcome-based analytical framework for excise policy and risk and compliance analysis more generally, and a ‘currency’ for a performance management framework and results-based management.

23. Finally, existing excise gap analysis should be updated and improved as more data become available, and through its use in monitoring excise revenues. The excise gap estimates should be kept as up to date, and improved, as possible. This could mean updating the model as new statistical data becomes available or fiscal budget arrangements dictate. Perhaps, more importantly, understanding of the current excise gaps and their trends can be improved through ongoing engagement with other stakeholders, including tax administration operational managers and experts, analysts, both internal and external, and senior managers and officials. While it is good practice to update the gap model periodically, it might be more expedient to monitor ongoing developments through a quicker, proxy measurement. For example, absent policy changes, the Effective Tax Rate (ETR)—that is, excise collections divided by the value of sales of the relevant commodity (or reasonable proxy)—can provide a useful indicator of the market share of taxed goods, and hence likely changes in the gap.

TABLE 4. IFP CASE STUDY: REPORTING

Case Study	IFP Mineral Oils Excise Gap Estimate
Presentation of Results	Results were published in a detailed report by the IFP, presented as upper bound estimates.
Interpretation of Results	Report generated interest from both the trade and the public. General acceptance of the existence of compliance gaps, but estimated levels questioned.
Conclusions and Future Work	Financial Administration announced series of measures to close the compliance gap. IFP plans to refine and update the estimates in 2016.

V. WHAT DATA IS REQUIRED TO MEASURE THE EXCISE GAP?

RA-GAP analysis for tax gaps relies on two data sets: taxpayer records and statistical data. The first is the tax administration's detailed records of taxpayer activity. The second is statistical data on economic activities. The data should be for at least five full calendar years. Statistical data should be collected on a consistent basis, so as to minimize measurement errors.

A. Specification of Tax Administration Records

The tax administration data used in tax gap analysis should be at the detailed micro-level. This allows individual payments and refunds to be matched to their corresponding tax periods for a closer link to the timing of underlying economic behavior. In addition, use of the detailed data can be very helpful in identifying errors and anomalies, and in resolving queries generally.

1. Taxpayer registry data:

- a. ATIN—Anonymized Taxpayer Identification Number (see below);
- b. date of registration for excise taxation;
- c. date of deregistration for excise (if applicable);
- d. periods of inactive status (if any);
- e. main sector of activity; and
- f. any special filing provisions (e.g., identifying quarterly versus monthly filers).

2. Excise return data:

- a. ATIN;
- b. excise tax period;
- c. filing date;
- d. original volumes and/or values from all lines on the return used in calculating the excise due as submitted by the taxpayer; and
- e. current assessed volumes and/or values for the same lines.

3. Excise payment and refund data:

- a. ATIN;
- b. type of transaction (payment or refund);
- c. tax period(s) that the payment/refund is for;
- d. date of transaction; and
- e. amount of the transaction.

4. **Customs declarations data (where excise is collected by the customs agency):**

- a. ATIN of the declarant;
- b. date of the importation for excise purposes;
- c. customs procedure code providing details on the nature of the transaction;
- d. any special codes detailing any special tax applications for the declaration;
- e. commodity code for each item on the declaration;
- f. landed volume and/or value of each item in local currency; and
- g. amount of excise declared.

Taxpayers' privacy should be respected. Where the tax gap analysis is being conducted by a third party, for example an academic or research organization, it is critical that taxpayers' confidentiality be maintained and that, wherever possible, the data sets do not allow individual taxpayers to be identified.⁶ For security, this data should be provided in an encrypted format, such as password protected zip files, and transmitted in a secure fashion.

Tax administration datasets provided to third parties should not include names, addresses, or any other details that could allow individual taxpayers to be identified. In particular, existing taxpayer identification numbers (TIN) should be replaced by ATIN by the tax administration before the data are passed to the third party. What is required here is that the taxpayer's actual TIN be replaced with a separate unique identifier (the ATIN) in order to maintain taxpayer confidentiality (by disguising the real TIN) while still retaining the ability to link the taxpayer's various data records in the tax gap study datasets. Generally, this is best done by the tax administration using an algorithm to convert TINs into ATINs, and not passing the algorithm to the third party. This will allow the tax administration to identify particular taxpayers from ATINs in case of later queries whilst ensuring that the third party cannot identify those taxpayers.

B. Specification of Statistical Data for Excise Tax Bases

Independent statistical data is required to estimate the potential collections for each excise, which will differ from country to country. The formulae for this estimation are shown below. The general form for specific duties is the total amounts of excise goods consumed or produced (including imports) multiplied by the relevant excise rates. In the case of ad-valorem excise, values of excise goods are used instead of volumes or weights.

⁶ In many countries one, or very few, large producers or distributors of excise goods dominate the market for their products—most frequently hydrocarbon oils, tobacco and beer. Where this is so, it will not be possible to satisfy this condition—even anonymized records will indicate the identities of the largest taxpayers. In such cases, the tax administration at least needs to satisfy itself that the third party will preserve taxpayer confidentiality.

Critical requirements for the statistical data are part of the design criteria for an effective top-down gap estimation methodology (Figure 2). Particular care should be taken to ensure that the statistical data used are independent of excise declarations and payments. The link is often obvious—for example, reported production and imports produced either directly from excise returns or using the same accounting data—but not always. For example, aggregate results for estimated consumption of alcohol and tobacco from household surveys are typically adjusted to match declared domestic and imported production. Where this is so, the data may still be usable, particularly if the unadjusted data can be obtained (see Box 4).

Box 4. Under-Reporting of Consumption of Alcohol and Tobacco Products

Under-reporting is a major issue in surveys of smoking and drinking behavior, including expenditure surveys, around the world; respondents typically underestimate the amount of alcohol and tobacco that they consume, often to a considerable extent. This phenomenon is thought to be at least partly a consequence of respondents—unconsciously or otherwise—trying to reduce their embarrassment at acknowledging what society believes to be their “bad” behavior.

Any such under-reporting needs to be taken into account in the aggregate data used to model potential excise, otherwise consumption, and thus potential excise, will be under-estimated. Any such under-estimation would lead in turn to an under-estimate of the excise gap.

The reported aggregate results may already have made such an adjustment. If not, an independent assumption will need to be made on the level of under-reporting. If an adjustment was made, but based on production and imports declared for excise goods, that adjustment will need to be discounted and an independent assumption used instead. Otherwise, any gap analysis will be essentially circular, comparing excise declarations against excise declarations.

Where possible, the level of assumed under-production should be based on extant research. Where it is not, it may be possible to create an implicit assumption by indexing the potential excise results back to periods during which there was little or no market share taken by untaxed product (see for example (HMRC, 2012 (1))). Even if it is not possible to find such a reasonably neutral base year, applying a constant adjustment factor to the source data may at least enable the estimation of a reasonable metric for *changes* in the gap, even if uncertainty remains over the actual *level*.

Time series for consumption of, or expenditure on, excise goods need to take into account any methodological or definition changes made in the production of each year's results. Where a single statistical agency or other institution is responsible for publishing a time series for consumption of a particular good, for example, in a health survey of smoking prevalence, it is good practice to ensure that individual results are comparable, i.e., consistent, with one another. Where methodologies, definitions, or other parameters have changed over the course of the time series, this would ideally mean revising results prior to any such change so as to preserve the consistency of the series. Alternatively, the series may be “chain linked” so that results just after the change are presented both with and without applying the changes. This enables appropriate adjustments to be made to the results either before or after the change so as to maintain consistency. Where such adjustments have not been published, as is often the case, the tax gap analysis will need to take an informed view on the likely impact of the change on the results, preferably based on discussions with the body producing the series.

It is not usually appropriate to use published production data to estimate potential excise. Published aggregate production, including import, figures for excise goods are typically derived directly from aggregated excise returns, and so do not provide an independent measure of the tax base against which actual excise collections can be usefully compared. This also includes scenarios in which excise manufacturers and importers publish their results; they will have been compiled from the same accounting and reporting systems as excise.⁷

Estimates of total consumption and expenditure are generally assumed to include untaxed products. As a matter of good practice, estimates of total consumption of excise goods should include not only domestic purchases, but also both goods that have evaded domestic excise and legitimate personal imports of goods that have not been charged for domestic excise. However, there is a potential risk that, where consumers have knowingly consumed excise goods on which excise has been evaded, for example, smuggled goods or from street sellers, they may be reluctant to disclose this to an interviewer, especially in government-run surveys. Though this could mean a downward bias in the gap estimate, in practice, there is no substantive evidence that this is a major problem; respondents are rarely asked in regular surveys for the particulars of where they purchased their product, and anyway may not know whether or not excise has been paid by the producer on the goods they purchase. Where expenditure survey data is used to estimate consumption, average prices of both tax-paid and untaxed goods will be needed (see Box 5).

⁷ Production and trade data can still be useful in estimating excise gaps, but in bottom-up, not top-down, approaches. For example, where domestic manufacturers export large amounts of branded goods to neighboring markets with low tax rates and little or no local demand for those brands, this anomaly can be a good indicator that the exports are being re-imported without domestic excise being paid, whether by (legitimate) personal shoppers or smugglers.

Box 5. Accounting for Untaxed Purchases in Expenditure Data

Where excise is charged as a specific duty, potential excise collections can be estimated as consumption of the excise good multiplied by the relevant excise rate. Where it is charged ad-valorem, the potential excise is total consumption multiplied by average taxed prices, multiplied by the tax rate. Where reliable consumption data is not available, but expenditure is, consumption is estimated from expenditure divided by average prices for both taxed and untaxed goods.

In the context of estimating a tax gap, this last averaging of prices presents a potential problem as they need to take into account the prices of untaxed consumption, which will be lower than taxed prices (else there would presumably be no gap!). To do this, consumption can be derived from the following equations:

$$(1) \text{ Taxed expenditure} = \text{taxed clearances} \times \text{average taxed price}$$

$$(2) \text{ Total consumption} = \text{taxed clearances} + (\text{total expenditure} - \text{taxed expenditure}) \div \text{untaxed price}$$

Untaxed prices may already be known. It is good practice for tax administrations to monitor the price of untaxed products as part of their risk assessment, using it not only to judge relative risks of smuggling and fraud across different commodity groups and industrial sectors, but also as an indicator of changing supply or demand.

Where the untaxed price is not known, it has to be assumed. This assumption may be informed by market research, for example, by finding out typical prices of the untaxed goods at their source, or calculated by deducting the excise tax from the price of taxed goods.

Alternatively, if the tax gap can be assumed to be relatively small, say, less than ten percent of potential collections, or the price difference between taxed and untaxed goods is relatively small, untaxed prices can be ignored for a first approximation of the size of the gap. Though the gap estimate will be biased downwards, the error will likely not be more than about one percent of potential collections.

Note: using the above equations, the estimated gap here for specific duty becomes:

$$\text{Untaxed consumption} \times \text{excise rate} = (\text{total expenditure} - \text{taxed expenditure}) \div \text{untaxed price} \times \text{excise rate}$$

For ad-valorem taxation it is:

$$\text{Untaxed expenditure} \times \text{excise rate} = (\text{total expenditure} - \text{taxed expenditure}) \times \text{excise rate}$$

Tobacco Products

1. The largest share of the tobacco market is taken by ready-made cigarettes and loose cigarette tobacco. These are typically subject to different excise rates: excise on cigarettes being calculated as a specific duty per stick⁸ and/or ad-valorem, and loose tobacco being taxed by weight. Consequently, their tax bases should be modelled separately.⁹
 - a. **Household consumption (or smoking prevalence) surveys.**¹⁰ It is not uncommon for health authorities to track smoking trends through regular household surveys that measure one or more of smoking prevalence, amount of cigarettes consumed, and type of tobacco product. Where such surveys have been carried out on a consistent basis, they can be used to create time series of potential tobacco excise, using the following models for excise for each product type:
$$\text{Potential specific duty} = \text{total number of smokers} \times \text{average consumption} \times \text{excise rate}$$
$$\text{Potential ad-valorem excise} = \text{total consumption} \times \text{average price} \times \text{excise rate}$$
 - b. **Household expenditure surveys.**¹¹ Many countries conduct annual surveys of householders' income and expenditure, and such surveys will likely capture expenditure specifically on tobacco products. These can be used to estimate potential excise, as follows, for each product type:
$$\text{Potential specific duty} = \text{total expenditure} \div \text{average price} \times \text{excise rate}$$
$$\text{Potential ad valorem excise} = \text{total ad valorem excise paid} + (\text{untaxed expenditure} \times \text{taxed price} \div \text{average untaxed price}) \times \text{excise rate}$$
 - c. **National accounts.** GDP breakdowns in national accounts generally include specific figures for household expenditure on manufactured tobacco products. In principle this figure can be used in the same way as expenditure survey results (see above). However, where possible, the source data for the national accounts figure should be identified and used instead, as it will likely contain more granularity on product types, and may have been adjusted for under-reporting and the informal economy.
 - d. **Pack swap and pack collection surveys.** Favored by the tobacco industries (see Box 3), these surveys estimate the market share of tobacco products taken by untaxed goods directly by examining a sample of cigarette packs to determine their origin and place of purchase. The sample may be taken in household surveys by offering to swap smokers' partly used packets with new packets of the same brand, or collected from

⁸ This is not universally the case. If tobacco excise is levied on cigarettes on the basis of weight, even though it is sold and consumed by the stick; it should be possible to convert the number of sticks consumed to weight using an assumed average weight per stick—typically (and fairly consistently) around one gram of tobacco per stick.

⁹ Even though loose tobacco normally represents only a small share of the tobacco market, it is still important to monitor its level due to potentially high rates of substitution between cigarettes and cigarette tobacco and the ease with which loose tobacco can be concealed for smuggling purposes. Similarly, in countries where excise rates for pipe, cigar, or raw tobacco are lower than for cigarettes, substitution may occur with or without misdescription of cigarette tobacco as such other tobacco types.

¹⁰ See Box 4.

¹¹ See Box 4.

discarded packs in shopping malls or sports venues. There are established methodologies for such surveys, but they can be relatively expensive and for a country first estimating its excise gap, will have to be run for a number of years to produce a useful time series. As well, for pack collection surveys, care needs to be taken to avoid selection bias to ensure as far as possible that the collection sites present a representative picture of smoking behavior in the general population. Even still, they can provide added value on a one-off or ad-hoc basis by testing estimates that use different approaches and providing a richer understanding of the untaxed sources and behaviors behind excise gaps.

- e. **Other data:** where existing survey data is not available, it can be expensive and potentially time-consuming to conduct new surveys for an excise gap study. If such is the case, alternatives should also be considered. For example, even where there is no time series of tobacco consumption based on survey data in a particular country, health concerns in this market are such that it is very likely that published assessments of smoking levels and trends will exist for that country. These can be compared to levels and trends in excise declarations for an assessment of the trend in excise gaps. Where the assessment of smoking trends has been presented by special interest groups, for example, the anti-smoking lobby, it should be examined critically for potential bias, just as for trade estimates (see Box 2).

Alcoholic Drinks

- 2. There are a variety of ways that excise is levied on alcoholic drinks. It may be levied as a specific duty on the volume of the drink, on its alcoholic content, and/or ad-valorem. In many countries, excise is levied in different ways and at different rates for different drinks types (the most common being beer, wine, and spirits). Similarly, excise rules and rates may differ according to alcoholic content, for example, by banding alcoholic drinks into low, medium, and high strength/alcoholic content. As well, many countries apply special rules or rates to particular types of alcoholic drinks so as to support local concerns, for example, traditional local beverages and micro, or artisan, companies may be charged excise at a reduced rate. Consequently, the tax bases should, where possible, be modelled separately for each product type and tax band.
 - a. **Household consumption surveys.**¹² It is not uncommon for trends in alcohol consumption to be measured by regular household surveys that record alcoholic drinks consumed by householders, and very often by product type. Where such surveys have been carried out on a consistent basis, they can be used to create time series of potential excise using the following models for excise for each product type or band:

For product types or bands where excise is charged at a specific rate per volume:

$$\text{Potential excise} = \text{total number of households} \times \text{average consumption} \times \text{excise rate}$$

¹² See Box 4.

For product types or bands where excise is charged at a specific rate per unit of alcohol:

$$\text{Potential excise} = \text{total number of households} \times \text{average consumption} \times \text{average strength} \times \text{excise rate}$$

For product types or bands subject to ad-valorem excise taxation (whether on its own or in addition to specific duty):

$$\text{Potential excise collections} = \text{total consumption} \times \text{average price} \times \text{excise rate}$$

- b. Household expenditure surveys.**¹³ Many countries conduct annual surveys of householders' income and expenditure, and such surveys will likely capture expenditure specifically on alcoholic drinks, often separately for each of the main product types. In principle, these can be used to estimate potential excise that are subject to two caveats:
- i. The price of alcoholic drinks generally differs substantially between those purchased for home consumption and those purchased for consumption in restaurants, bars, clubs, and the like. The latter, generally more expensive than the former, will likely account for a substantial share of the market for alcoholic drinks. Therefore, when using expenditure data, it is best to estimate the consumption of alcoholic drinks separately for drinks bought for home consumption and those consumed on commercial premises.
 - ii. Although alcoholic drinks are most typically purchased by householders, some may be purchased by businesses, for example, for catering at corporate events or entertaining. Where such business purchases form a material part of the market, they should either be modelled separately or an appropriate adjustment made to household expenditure to account for them.

So, for each product, tax band and purchase type:

For product types or bands where excise is charged at a specific rate per volume:

$$\text{Potential specific duty} = \text{total expenditure} \div \text{average price} \times \text{excise rate}$$

For product types or bands where excise is charged at a specific rate per unit of alcohol:

$$\text{Potential specific duty} = \text{total number of households} \times \text{average consumption} \times \text{average strength (percent of alcohol)} \times \text{excise rate}$$

For product types or bands subject to ad-valorem excise taxation (whether on its own or in addition to specific duty):

$$\text{Potential ad valorem excise} = \text{total ad valorem excise paid} + (\text{untaxed expenditure} \times \text{taxed price} \div \text{average untaxed price}) \times \text{excise rate}$$

- c. National accounts.** GDP breakdowns in national accounts generally include specific figures for household expenditure on, and intermediate consumption of, beverages, which may be disaggregated into alcohol and non-alcoholic drinks. In principle these figures can be used in the same way as expenditure survey results (see above). However, it is unlikely that the

¹³ See Box 4.

national accounts figures will have sufficient granularity to model consumption of the different types of alcoholic drinks needed to estimate potential excise, although their source data may).

Petroleum Products

3. Excise taxes may be levied in different ways and at different rates on the different types of petroleum products. In most countries, the great majority of excise tax for this product type will likely be collected on gasoline most often used in private motor vehicles, and diesel, typically used in commercial vehicles. If the potential excise for these two markets can be modelled, it may be sufficient to account for the remainder of the market by an assumption or simple adjustment.

a. **Household consumption surveys.** Whilst it is unlikely that household surveys will collect data on households' consumption of petroleum products as such, surveys that capture their motor vehicle usage, most often as miles travelled by vehicle type, engine type and size, age, etc. The coverage of such surveys will generally exclude consumption by commercial operators, but the data may be used to model an important part of the petroleum products market.

In order to calculate consumption, data will be needed on the fuel efficiency of private motor vehicles, which may be found, for example, in data published by the ministry of transportation, market research, or other advisory material released by manufacturers or distributors. Where appropriate, the mileage recorded by householders should be adjusted to exclude travel abroad, assuming that potential excise are defined by domestic consumption.

Distance travelled per householder or per passenger should be converted to distance travelled per vehicle, and adjusted to remove double-counting of trips in which more than one passenger or household is travelling in the same vehicle. The likely impact of such an adjustment should be reviewed, but it may be safe to assume that the proportion of trips in which passengers from more than one household occupies the same vehicle is negligible. The equivalent assumption for distance travelled per passenger would not likely be as safe, so an adjustment based on the average number of passengers per vehicle should be made.

As a matter of good practice, consumption should be modelled at the most disaggregated level possible, so for each fuel type, vehicle type, engine size, age, etc:

For product types or bands where excise is charged at a specific rate per volume:

$$\text{Potential excise} = \text{total distance travelled} \times \text{fuel efficiency (per km or mile)} \times \text{excise rate},$$

Where:

$$\text{Total distance travelled} = \text{distance travelled by vehicle} \times \text{total number of vehicles}$$

For product types or bands subject to ad-valorem excise taxation:

$$\text{Potential excise} = \text{total distance travelled} \times \text{fuel efficiency} \times \text{average price} \times \text{excise rate}$$

b. **Expenditure surveys.** Expenditure on road fuels is typically an important component of household spending and therefore captured in household surveys. However, as with

household consumption surveys, this will not capture commercial travel. In addition, the household expenditure will need to be split between fuel types, particularly between gasoline and diesel oils. The expenditure survey is not likely to capture details on vehicle type, etc. for each fuel type and for private vehicles:

Where excise is charged at a specific rate per volume:

$$\text{Potential specific duty} = \text{total expenditure} \div \text{average price} \times \text{excise rate}$$

Where excise is charged ad-valorem:

$$\text{Potential ad valorem excise} = \text{total ad valorem excise paid} + (\text{untaxed expenditure} \times \text{taxed price} \div \text{average untaxed price}) \times \text{excise rate}$$

In addition to household surveys, business expenditure surveys may, also, capture commercial expenditure on petroleum products. The results of such surveys can, in principle, be used in the same way as household surveys by using the same formulae to model potential excise collections. However, in the case of businesses, it is more important to distinguish between vehicle and fuel types (there being, for example, a great difference between fuel consumption by buses and taxi cabs), and to exclude expenditure on travel abroad. Where excise rates are determined by usage of petroleum products, this also needs to be taken into account appropriately.

- c. **National accounts.** GDP breakdowns in national accounts generally include specific figures for the values of final consumption and intermediate consumption by businesses of petroleum products. Although, in principle, these figures can be used in the same way as expenditure survey results (see above), it is very unlikely that they will have sufficient granularity to serve as a model to estimate potential excise. As well, the national accounts aggregates may well be calibrated to excise clearances.
- d. **Transport surveys.** Many countries run regular transport surveys by reporting distances travelled in differing vehicle types by businesses and householders. These can, in principle, be used to derive consumption totals and hence potential excise. However, very often the distances travelled will be reported in “passenger miles” or “passenger kilometers.” Where this is the case, the reported distances will need to be converted to distances travelled by vehicles using average passengers per trip before being used to estimate total consumption. So, for each vehicle type:

$$\text{Total distance travelled by vehicles} = \text{total distance travelled by passengers} \div \text{average passengers per trip}$$

Where excise rates vary by fuel type, the distances should be disaggregated similarly—if the split is not available from the reported data (or in source data, where that is available) then it may have to be estimated separately, for example, from market research or by assumption (for example, private vehicles are more likely to use gasoline, whereas almost all large commercial vehicles use diesel oil).

For product types or bands where excise is charged at a specific rate per volume:

$$\text{Potential excise} = \text{total distance travelled} \times \text{fuel efficiency (per km or mile)} \times \text{excise rate},$$

For product types or bands subject to ad-valorem excise tax:

$$\text{Potential excise} = \text{total distance travelled} \times \text{fuel efficiency} \times \text{average price} \times \text{excise rate}$$

- e. **Administrative data from transport authorities and road tolls, etc.** Motor vehicles may be subject to regulatory regimes and road or other charges. Examples include vehicle registrations, roadworthiness checks, licensing, road tolls, or other charges. Relevant authorities include local authorities, ministries of transport, police, road authorities, and road toll franchises who will maintain detailed databases containing details for each vehicle including, for example, vehicle and engine registration number, distance travelled, vehicle and engine type, size, age, and so forth.

Where such regimes exist with sufficient coverage of motor vehicle transport, their data may be used to estimate the consumption of petroleum products from total distances travelled (as shown above). It is possible that more than source is required to cover sufficient breadth and detail of the excise tax base. An example of this is the estimate of the Slovak mineral oils excise taxation gap prepared by the IFP (described in Appendix 2). Using vehicle registration number to match individual records, this study combines the detailed databases from police and transport ministry controls and from road tolls to provide a reasonably comprehensive, robust picture of distances travelled by private and commercial motor vehicles in Slovakia.

Appendix 1. Model Specification for Excise Gaps

Mathematical Expression of Potential Excise and Tax Gaps

The tax gap is defined as the difference between potential excise collections and actual collections, i.e., it can be expressed in the form:

$$\text{Excise gap} = \text{Potential excise collections} - \text{Actual excise collections}$$

Where:

$$\text{Excise gap} = \text{policy gap} + \text{compliance gap:}$$

$$\text{Potential excise collections}$$

$$= \sum_{\text{product type}} [\text{Consumption (dutiable product)} \times \text{excise rate (product type)}]$$

and

$$\text{Actual excise collections} = \text{Domestic excise collections} + \text{Import excise collections}$$

Notes:

1. This general form of the model assumes that excise is charged at specific rates based on the volume and type of goods concerned. Where the excise is calculated on an ad-valorem basis—i.e., it is proportionate to the value of the excise goods—the calculation of potential excise collections should use the defined taxable value¹⁴ of the goods instead of consumption.
2. The model of potential excise is based on consumption, not production, despite the fact that excise is generally based on production. Consumption is used here because production data for excise goods is very rarely independent of excise returns and payments, so consumption is used as a proxy for production (including imports).
3. Generally, consumption is defined as domestic consumption, that is, consumption by both residents and non-residents (including of imports) within the country concerned.

Defining the coverage of an excise

When calculating tax gaps, the potential excise tax base must be defined. Compliance gaps are the difference between potential and actual collections under current law, and policy gaps are the difference between potential collections under the current policy framework and those under some theoretical framework in which all relevant transactions are taxed at the standard rate. The taxable transactions are expenditure and/or production/consumption. For modelling purposes, consumption data is often used as a proxy for production (see Section V).

¹⁴ Ad-valorem excises can be calculated using either tax-inclusive or tax-exclusive prices. The taxable value used in the model should be set correspondingly.

In defining the excise tax base, its potential coverage must be defined. Although it is not always discussed explicitly, it is generally assumed that the relevant transactions that form the potential base are domestic. For a VAT, it is domestic final consumption that forms the base for the tax, whereas for income taxes it is usually, though not always, domestic and repatriated income that is taxed. So for an excise, the tax base is generally the production and (commercial) importation of the goods in question. This is not necessarily the same as domestic consumption. For example, countries generally allow international travelers to import small consignments of alcohol and tobacco free of domestic excise taxation so long as the goods are for the traveler's personal consumption and not for re-sale.

Personal imports of excise goods

Assuming a domestic tax base for the excise in question, personal imports of tax-free goods represent excise tax foregone or lost through policy choices and should be included in the estimated excise gap. Excise revenues foregone on legitimate personal imports of excise goods should not be included in the compliance gap,¹⁵ but arguably should be included in the policy gap insofar as they represent tax expenditure, which is the impact of a tax relief. Because the potential tax base for an excise is generally modelled using (domestic) consumption or expenditure data, tax-free personal imports will be included in the base, unless specifically discounted from it. Consequently, a simple comparison between potential excise collections derived from the consumption data and actual collections will identify the excise tax foregone as a component of the total excise compliance gap.

Exports of tax-paid excise goods

Exports of tax-paid excise goods represent additional collections to the intended tax base. Most excise regimes allow 100 percent excise relief for commercial exports of excise goods, but this is generally not available for travelers' personal exports. Thus, any excise paid on personal exports will be additional to that derived from domestic consumption. There are valid arguments both that these amounts should be included in the estimated tax base and, alternatively, that they represent "negative gap" (i.e., that they are windfalls against the intended tax base). Symmetry and pragmatism both suggest that the latter position is adopted:

- Personal imports represent positive tax gap amounts, so personal exports should represent negative tax gap amounts, and
- Due to a lack of data, it is likely difficult to estimate the impact of personal exports for inclusion in the estimated tax base.

¹⁵ Consumers' purpose in travelling abroad is just to purchase excise goods free of domestic excise is actually a form of avoidance and, arguably, could be included in the compliance gap as an issue to be addressed by the authorities. If this is desired, personal imports need to be split between those imports representing avoidance and those representing incidental purchases in the course of travel for other purposes.

Positive and Negative Excise Gaps

Generally, excise gaps are positive (representing net revenue losses), but it is possible for them to be negative (i.e., representing additional revenue gained against the intended base). Where the excise collected is less than the total potential, the result is a positive excise gap, and this is generally the case (noncompliance being typically more prevalent than voluntarily over-paying tax). However, negative gaps can, and do, occur where actual collections are more than the potential estimated from domestic activities.

Negative excise gaps most often occur when a country has relatively low excise rates.

Where a country exports more taxed excise goods than it imports non-domestic taxed goods, a negative gap will occur. Examples of this occur when domestic taxed prices are lower than prices in neighboring countries, or because of import restrictions. In such a scenario, excise paid on domestic sales could exceed that due on domestic consumption and the estimated tax gap would be negative.¹⁶ The negative gap could contain both policy gap and compliance gap components, for example, legitimate cross-border shopping and illegal smuggling, respectively.¹⁷

¹⁶ A good example of how this scenario can exist is the land border between Southern Ireland and Northern Ireland, which is part of the UK. Price differentials across the border are generally more a function of exchange rates between the euro and the British pound than of underlying price differences or differences in excise rates, which are usually very similar in the two countries. Consequently, HMRC estimated that the compliance gap in road fuels duty in Northern Ireland was very high in the 1990s (up to 50 percent in some areas) due to cross-border shopping and smuggling bringing lower priced Eire purchases into Northern Ireland. However, ten years later, changes in the exchange rate meant that the price differentials were reversed and HMRC observed a negative gap in Northern Ireland (HMRC, 2012 (2)).

¹⁷ It could perhaps be argued that tax-paid goods smuggled out of a country do not represent a negative compliance gap if no laws in the exporting country have been broken. Again, however, symmetry suggests that they should be treated as so, since untaxed excise goods smuggled into a country most certainly represent a positive compliance gap for that country.

Appendix 2. IFP Mineral Oils Excise Tax Gap Estimate for Slovakia Reported Using the Analytical Framework

A. Context

Motivation

1. Revenues from mineral oils excise taxation form the largest share of overall excise taxes by commodity group in Slovakia (Table 2.1). Total revenues from excises were EUR 1,077 million in 2014. Of this, EUR 354 million were received from excise taxes on gasoline, EUR 716 million from diesel, and EUR 7 million from other mineral oils. Overall, mineral oils excise tax accounted for 53 percent of total excise taxation in 2014.

Year	Mineral Oils	Tobacco	Spirits	Other	Total
2006	1,090	262	169	68	1,589
2007	1,118	783	201	70	2,171
2008	1,185	325	220	79	1,809
2009	1,047	436	197	81	1,761
2010	1,032	602	197	100	1,931
2011	1,071	623	205	100	1,998
2012	1,036	640	195	101	1,973
2013	1,045	636	201	102	1,985
2014	1,077	640	202	96	2,015

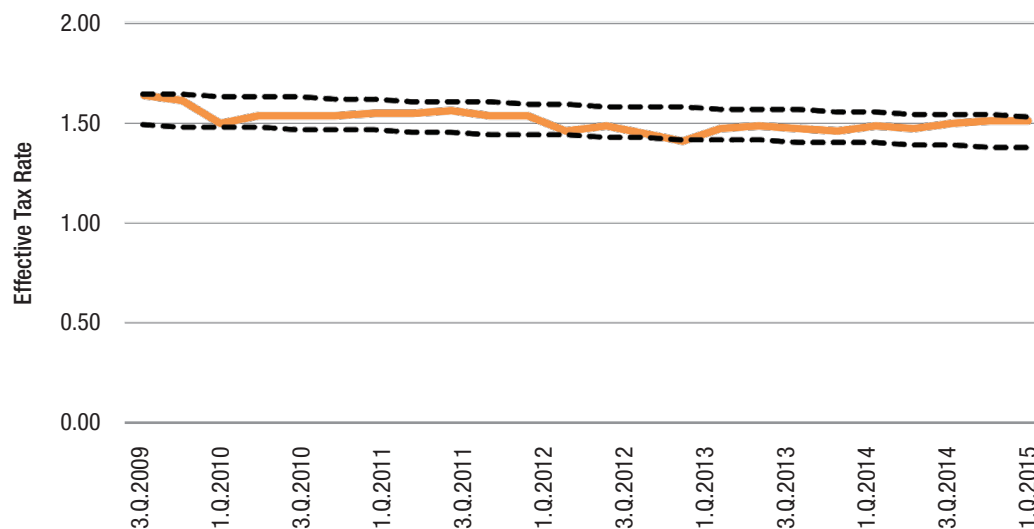
Source: Country authorities.

2. There has been a long-term decline in the Effective Tax Rates (ETR) for mineral oils in Slovakia (Figure 2.1). The effective tax rate for mineral oils is calculated by the following formula:

$$ETR = (Total\ collections) / (GDP)$$

Total collections and GDP are measured at constant prices. The calculated ETR for mineral oils has declined from 1.6 percent of GDP in Quarter 3 of 2009 to 1.5 percent in Quarter 2 of 2015. It is possible to interpret the decline as being a result of a single, gradual downwards trend, or as a decline to 1.4 percent in Quarter 3 of 2012 and subsequent stabilization.

Figure 2.1 Effective Tax Rate of Mineral Oils 2009–15



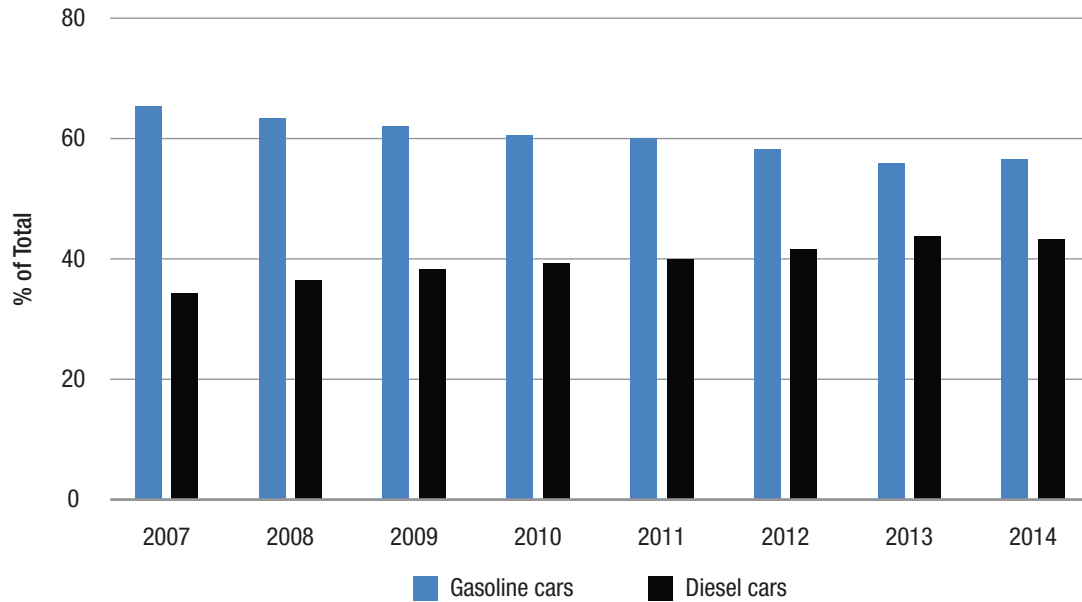
Source: Country authorities.

3. The decline in the ETR cannot be explained by changes to excise rates or their coverage.

During the period 2009 to 2015, there was only one change in excise rates: a decrease of diesel duty in February 2010 from EUR 481.31 per 1,000 liters to EUR 368 per 1,000 liters, which explains the drop in the ETR of mineral oils excise that year. However, there has been no other significant change subsequently.

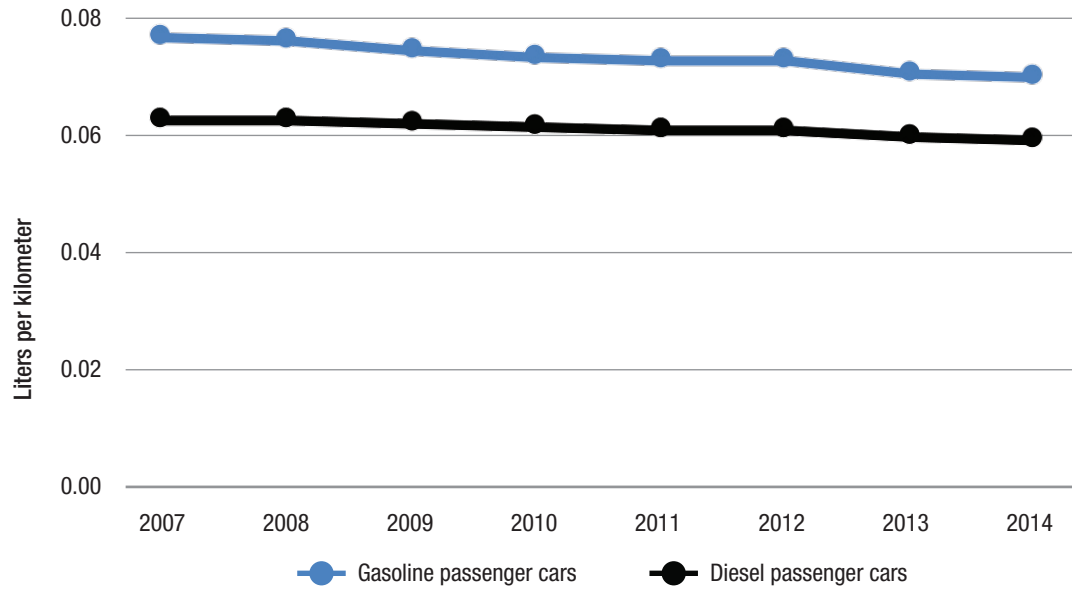
4. There are a number of other trends in road transport in recent years that need to be understood in order to understand trends in mineral oils excise. The number of road vehicles using diesel has increased rapidly relative to gasoline (Figure 2.2). Average consumption per vehicle is decreasing, which is probably connected with improved car manufacture (Figure 2.3). Tax returns also show an increasing trend for diesel consumption since 2010, as well as increasing market share. In contrast, in gasoline consumption there is a significant decline (Figure 2.4).

Figure 2.2 Road Vehicles by Fuel Type



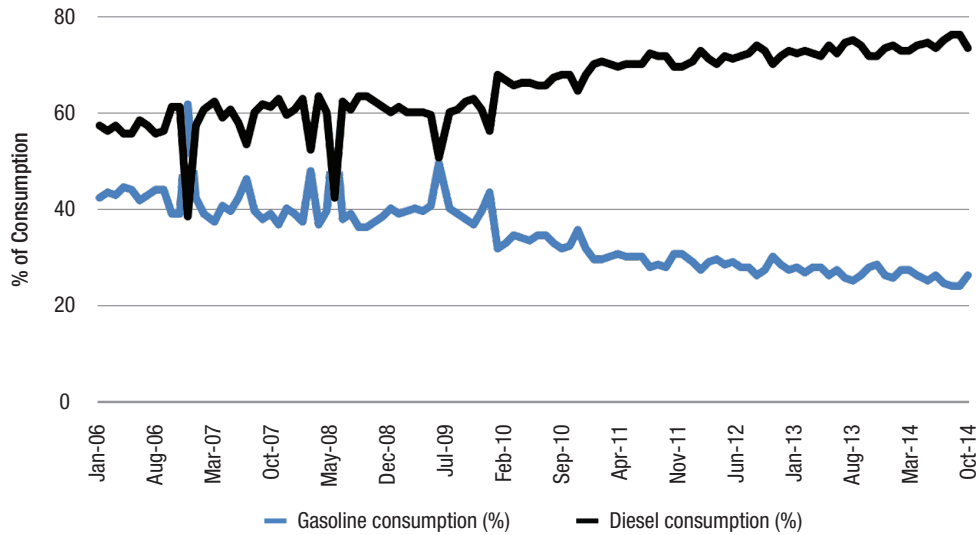
Source: Police registration database.

Figure 2.3 Average Consumption per Vehicle 2007–14



Source: Police registration database.

Figure 2.4 Gasoline and Diesel Market Shares 2006–14



Source: Country authorities.

5. **Gasoline excise rates, and thus prices, in Slovakia are higher than in neighboring countries, whereas diesel rates are similar to neighboring countries' rates.** Most countries surrounding Slovakia are not part of the Euro area, and so exchange rates affect relative excise rates and the final prices of fuels. Gasoline excise tax rates and final prices in Slovakia are the highest in the region so there is a significant risk of cross-border shopping, especially as most population centers in Slovakia are relatively close to land borders. By contrast, diesel excise tax rates and final prices are competitive with neighboring countries (except for Ukraine).
6. **Estimating the tax gap for mineral oils would help improve the effectiveness of the authorities' administration of the excise by allowing the evaluation of measures to minimize fraud and evasion.** Tax avoidance and evasion shifts the tax burden from the non-tax payers to compliant tax payers, and reduces financial resources needed for necessary government expenditure. Experience in VAT has demonstrated the benefits of VAT gap analysis in improving the effectiveness of tax administration so estimates of excise gaps should allow improvements in that area.

Feasibility

7. **To estimate the excise gap for mineral oils, an estimate of total consumption of mineral oils in Slovakia is required.** For the purposes of estimating the tax gap for mineral oils, it is assumed that all oils consumed should be taxed (in Slovakia). Amounts of excise not paid on domestic consumption represent the overall tax gap. Ideally, the total gap should be split between the policy gap and the compliance gap. The former would include mineral oils bought abroad and legitimately imported into Slovakia for the purchasers' own use—this could range from purchases made in the course of normal activities abroad, such as freight movements or vacations taken by householders to oils bought in cross-border shopping trips that purely occur to take advantage of lower excise rates abroad, which

is akin to tax avoidance. The latter would include smuggling of non-Slovak taxed mineral oils into Slovakia for re-sale to other consumers and excise evaded through fraud or non-declaration.

8. **There are a number of potential data sources on consumption of mineral oils in Slovakia (Table 2.2).** For an estimate of the tax gap in mineral oils, the tax base (total consumption of oils) needs to be estimated so that the potential excise collections from that base can be compared to actual revenues. There are several possible sources which can be used as base for total consumption of mineral oils. These are listed in Table 2.2 below with comments on their suitability using RA-GAP's design criteria (see Figure 2):

TABLE 2.2 POTENTIAL DATA SOURCES FOR ESTIMATING CONSUMPTION OF MINERAL OILS			
Data Source	Description	Comments	Suitability
Vehicle registration database (police)	For every vehicle registered in Slovakia, vehicle type, fuel type, date of registration, average consumption per km.	No mileage data; so cannot be used to estimate total consumption. Some data quality concerns. Does not cover foreign registered vehicles.	Limited—incomplete data. Can be used with other data sources.
Household expenditure survey (Statistical Office)	Contains regular information on total expenditure on mineral oils by households.	Does not include business spending, a large part of total consumption. Last complete survey in 2012. 2013 & 2014 data very limited.	Not suitable—incomplete coverage.
Transport survey (Statistical Office)	Data from questionnaire on transport usage sent to companies.	Low response rates. Results expressed in passenger kilometers (private vehicles), or weight (freight vehicles). Conversion to vehicles requires assumptions on passenger numbers and average loads. Does not include empty bus and freight movements.	Not suitable—potentially large selection bias.
National accounts (Statistical Office)	Aggregate supply and use of mineral oils expressed as values.	Aggregate results are indexed to excise returns. No split between gasoline and diesel consumption.	Not suitable—not independent of tax returns, and insufficiently detailed.
Trade data	Published estimate of excise gap produced by Slovak Petrol Association. Based on production reported by association members (fuel producers and wholesalers).	Danger of commercial interests skewing results. Reported production likely to be the same as that declared for excise, i.e., not independent.	Not suitable—not independent of tax returns and potential bias.
Technical and emission controls data ¹⁸ (Ministry of Transport, Construction and Regional Development)	Individual vehicle registration numbers, engine code (VIN), vehicle type, type of fuel and mileage on the date of control, and date of control.	Missing data on average consumption. Limited to domestically owned vehicles. Missing data on mileage travelled since most recent control. Includes mileage travelled abroad.	Limited—incomplete data and coverage. Could be used with other data sources.
Road tolls data ("Skytoll")	Detailed Slovak mileage for all foreign freight and buses entering Slovakia. Electronic data from 2011.	Limited to commercial vehicles. Missing data on mileage travelled in Slovakia by foreign owned private vehicles.	Limited—incomplete data and coverage. Could be used with other data sources.

¹⁸ By law vehicles in Slovakia are obliged to take a technical and emission control, after four years and afterwards every two years in case of personal cars. Buses and freight vehicles are obliged to take a control after two years and afterwards every year.

9. **Using three datasets with limited coverage enabled reasonable coverage of total consumption of mineral oils.** Taken together, the vehicle registration database and the Technical and emissions control data provided comprehensive coverage of miles travelled, and therefore consumption of mineral oils, by domestically owned vehicles in Slovakia. For each vehicle, the mileage travelled each year was calculated as the annual average over the period between successive controls. The road tolls database could be used for a reasonable estimate of oils consumption in Slovakia by foreign owned vehicles.
10. **Missing data for oils consumption abroad by domestically owned vehicles was offset against missing data for domestic consumption by foreign-owned private vehicles.** For best results, the mileage travelled abroad by domestically owned vehicles should have been subtracted from the mileage calculated from the controls database. Similarly, mileage travelled in Slovakia by foreign owned vehicles should have been added to the Skytoll data. However, no reliable data was available for adjustments and so it was assumed that the missing values offset one another. Partial justification for this assumption is that fuel prices in Slovakia are similar to those in neighboring countries, so no particular price advantage lies one way or the other.
11. **Detailed taxpayer returns and payment data was available.** To estimate the tax gap, the potential revenue estimated by modeling the tax base needs to be compared to actual revenues. RA-GAP's approach to calculating actual revenues is to use detailed taxpayer returns and payments data to accrue individual payments to the tax period for which they were made. Using the microdata instead of aggregates can, also, allow the collections to be segmented to match taxpayer segments and different tax categories. Such detailed data was available from the Slovak Financial Administration.

B. Data Captures

Legislation

12. **With assistance from the Slovak Financial Administration, the legal framework for excise on mineral oils was established.** The legal framework for mineral oils excise tax is relatively straightforward. There are two main rates for gasoline and diesel, respectively, and for each fuel type a special rate for biofuels (introduced in 2011). Bio fuels account for only a very small market share. During the period of the study, there has been only one rate change: a reduction in diesel duty from EUR 481.31 per 1,000 liters to EUR 368 per 1,000 liters in February 2010.

Administrative data

13. **Detailed microdata on taxpayer returns and payments were provided by the Slovak Financial Administration.** The tax returns for mineral oils record the volumes of each type of fuel being cleared separately from the corresponding amounts of excise paid together with any adjustments made.

Statistical data

- 14. Detailed microdata from the vehicle registration and controls databases for the period 2007 to 2014 and from Skytoll for 2011 to 2014 were obtained.** Using vehicle license numbers and VINs, the vehicle registration database was merged with the technical and emissions control data to create a single database of the mileage travelled by every domestically owned vehicle in Slovakia, plus the vehicle, its age and engine type, control dates, average consumption per kilometer, and fuel type. The road tolls microdata for foreign owned commercial vehicles was, also, obtained from the toll agency, Skytoll.

C. Analysis

Data preparation

- 15. The vehicle registration and controls databases contained anomalous or incorrect data entries that needed correction.** Entries without the required identification details were removed from the database (about 1.2 percent of 8 million entries, so any biasing effect should be small) because they could not be matched between the two databases. Where two or more entries in the controls databases in the same month were for the same registration number and VIN, only the last entry was kept. Outlier mileage values, defined as those over 200,000 km between controls, were capped at 200,000km. Where appropriate, missing data in the controls database was inferred from matching entries in the vehicle registration database.

Model preparation

- 16. To derive annual consumption from the combined databases, total mileage was converted to annual mileage and adjustments were made for negative mileage values.** For each vehicle, the mileage travelled each year was calculated as the annual average over the period between successive controls. In some cases, the mileage between two controls was shown as a negative number. In these cases, it was assumed that the result was a typographic error and the sign changed. The total amount of negative values was three to five percent of total mileage travelled per year.
- 17. In some cases, kilometers travelled per year for individual vehicles were inferred.** For the first control for each vehicle, average mileage was calculated from the age of the vehicle. For cases where the age of the car was greater than its registration in Slovakia, only the mileage in years the vehicle was in Slovakia was calculated. For vehicles whose last control was in 2011 or later, mileage travelled after the last control were inferred from the previous average mileage, with the assumption that these vehicles were still in use in 2014.
- 18. Adjustments were also made for vehicles not subjected to controls.** New vehicles not yet subject to technical and emission controls would be missing from the controls database. Other vehicles could, also, be missing from the database for other reasons. The missing values for these vehicles were imputed from the vehicle registration database. The numbers of each type

of vehicle were inferred by comparing vehicle registrations database totals with those from the controls data. The average mileage and consumption were then inferred from the averages for similar vehicle types from the combined database.

19. **No adjustments were needed for the road tolls database.** The electronic data, collected by Skytoll, provided a complete record of each foreign owned commercial vehicle's mileage in Slovakia. However, the data contained only information on the vehicles' categories. It was, therefore, assumed that all commercial vehicles used diesel and average consumption for each category were inferred from the vehicles registration database.

Analysis

20. **The specification of the tax gap model is relatively straightforward.** Potential excise is estimated as domestic consumption of mineral oils for each excise multiplied by the relevant excise rate. Actual collections are taken from taxpayer returns and payments data held by the Financial Administration. The tax gap is defined as the difference between the two amounts. The mathematical expression of the model is as follows:

Potential excise (fuel type)

$$= \sum_{\text{vehicle type}} \text{Slovak mileage} \times \text{average consumption per km} \\ \times \text{excise rate (fuel type)}$$

Tax gap (fuel type) = Potential excise (fuel type) - Actual excise (fuel type)

$$\text{Total tax gap} = \text{tax gap (gasoline)} + \text{tax gap (diesel)}$$

The relative share of consumption for each fuel type was derived from taxpayer returns.

21. **As defined for this study, the tax gap includes elements of the policy gap, as well as the compliance gap.** The definition used treats both legitimate and illegal imports of untaxed oils as being in the gap. The former creates the policy gap and the latter the compliance gap. It is not possible to identify the relative shares that these components represent of the total gap under the method used; more detailed analysis of cross-border traffic and compliance risks would be required for that.

D. Reporting

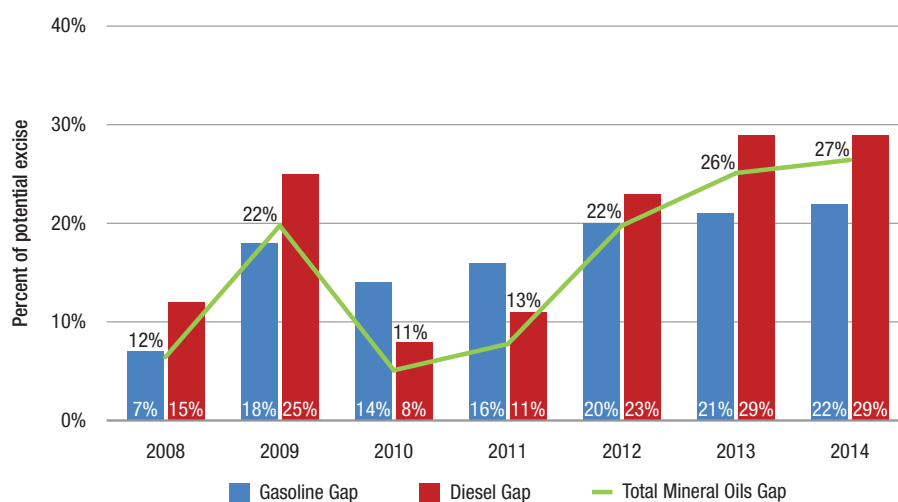
Presentation of results

22. **The results of the study were published in a comprehensive report by the IFP (IFP, 2015).** The note reported the methodology and data used and detailed results in terms of both levels and trends. The note, also, contained details of assumptions used and limitations of the analysis in terms of coverage and likely accuracy. The results and their link to cross-border prices and trends were, also, discussed. The published estimate did not attempt to distinguish between policy and compliance gaps due to the absence of data allowing such a separation (see above).

23. **The published estimate represented an upper bound (Figure 5).**¹⁹ The headline results presented were an overall tax gap in mineral oils excise tax of 27 percent of potential excise in 2014 with a strongly rising trend since 2011. The results are sensitive to assumptions used, two in particular:
- The assumed lifespan of vehicles after the last recorded technical and emissions control; and
 - The treatment of negative mileage values as typographic errors.

The assumptions used to produce the published results both represent upper bounds, and their combined effect is to create a broadly upper bound estimate of consumption, and thus the potential tax gap. The reasoning behind this approach was explained in the published report.

Figure 2.5 Excise Gaps for Mineral Oils 2008–14



Year	Millions of Euros			% of Potential Excise			Percent of GDP		
	Gasoline Gap	Diesel Gap	Total Mineral Oils Gap	Gasoline Gap	Diesel Gap	Total Mineral Oils Gap	Gasoline Gap	Diesel Gap	Total Mineral Oils Gap
2008	34	118	152	7%	15%	12%	0.05%	0.17%	0.22%
2009	91	194	285	18%	25%	22%	0.14%	0.30%	0.45%
2010	69	49	118	14%	8%	11%	0.10%	0.07%	0.17%
2011	77	79	157	16%	11%	13%	0.11%	0.11%	0.22%
2012	92	194	285	20%	23%	22%	0.13%	0.27%	0.39%
2013	92	280	372	21%	29%	26%	0.12%	0.38%	0.50%
2014	99	299	397	22%	29%	27%	0.13%	0.39%	0.52%

Source: Country authorities.

¹⁹ The figures originally presented contained a programming error for 2013 that resulted in over-estimates for 2013 for diesel duty and the overall tax gap. Figure V.5 uses the corrected figures.

Interpretation of results

24. IFP's published report generated media interest and prompted internal and external discussions on its reliability, implications, and measures to close the tax gap.

The estimated gap represents a significant market share of a major commodity and its publication generated interest from the media, trade representatives, and the Financial Administration. Meetings were held between the IFP and the Financial Administration and other stakeholders to discuss the calculation and reliability of the results and potential counter-measures to address the compliance gap.

25. Both trade representatives and the Financial Administration questioned the estimated level of the gap, but agreed on the existence of a gap and increasing risks. The existing risk analysis by the Financial Administration and market research by the trade had, also, identified growing compliance and fiscal risks in mineral oils excise, but generally found a lower level of tax losses. The Financial Administration considered that policy gap elements represented a large, though not quantified, part of the tax gap. In other words, much of the revenue losses were attributable to legitimate cross-border shopping by households and purchases of diesel by international freight companies, both domestic and foreign-owned. In this regard, it should be noted that Slovakia is a small, open country that sits astride a number of major international freight routes and is often used as a transit country for freight destined for other countries.

Conclusions and further action

26. In accepting the existence of a material tax gap in mineral oils excise taxation and increasing risks, the Financial Administration announced a series of counter measures.

Although the Financial Administration believed that the (upper bound) estimate of excise losses over-estimates the true amount, it did accept that there is a material gap and that compliance risks are rising, partly due the use of mineral oils in Missing Trade Intra-Community (MTIC) VAT frauds by criminal gangs. Such frauds are mainly a VAT issue in that the additional imports of mineral oils to facilitate the fraud are generally for re-export, but there is the risk of diversion to the domestic market without excise being paid. Accordingly, a number of additional compliance measures were implemented in 2015 to reduce the compliance gap.

27. The IFP updated its estimate of the mineral oils excise tax gap in 2016 (IFP, 2016). When more recent data became available in 2016, the IFP updated its estimate, taking the opportunity to review and refine its methodology. This update also took into account suggestions made by IMF's RA-GAP program. Overall, the updated estimate was lower than the 2015 estimate, but similar annual changes and trends were found. The methodology was essentially the same as used in 2015, but the estimates were published as a range of upper and lower bounds, so as to better reflect the uncertainties in the model.

GLOSSARY OF TERMS

Ad-valorem excise tax	Excise levied as a percentage of the value (often the retail price) of an excise good. The price used may be the manufacturer's recommended retail price, rather than the actual retail price. This is not the same as a value-added tax (VAT) because there is no general entitlement to credits for input tax paid on intermediate consumption by businesses.
Alcoholic drinks	This commodity group includes beers, wines, and spirits (alcoholic beverages manufactured by distillation). Typically, excise taxation is applied at different rates for different types and strengths of drinks.
ATIN	<i>Anonymized Taxpayer Identification Number</i> : the taxpayers actual TIN, replaced with a separate unique identifier in order to maintain taxpayer confidentiality (by disguising the real TIN) while retaining the ability to link individual taxpayers' various data records.
Compliance gap	The difference between actual and potential collections, given the existing policy framework; tax lost through non-compliance.
Consumption survey	A survey of households' or consumers' consumption in volume terms. Such surveys are typically additional to expenditure surveys and cover particular research topics or policy issues; for example, consumption of alcohol and tobacco for health studies, and transport surveys measuring mileage travelled for transport policy needs. NB: consumption surveys can sometimes be modules in Omnibus surveys that cover a number of different research topics.
Excise tax (duty)	Specific or ad-valorem tax levied on specified commodities—most often goods, not services. The most common products subject to excises are tobacco products, alcoholic drinks, and petroleum products (e.g. road fuels). Other commodities include gambling, entertainment, road vehicles, and particular foods or beverages. Excise is generally levied the production or import stage.
Excise gap	The difference between actual excise collections and potential excise collections.
Expenditure survey	A survey of households' spending. Advanced economies and many other countries run periodic household expenditure surveys, often to international standards. Expenditure can be converted to consumption volumes using average prices.
Forestalling	Where excise rate increases are known in advance or expected, producers and wholesalers may forestall the rise by releasing excise goods and paying early ahead of the rate increases. This allows them to take advantage of the lower rate. Such forestalling may be prohibited or otherwise constrained by the authorities.

Hand-rolling tobacco	Loose cigarette tobacco for consumers to use to make their own cigarettes. Generally this is a cheaper option than regular cigarettes.
HMRC	<i>HM Revenue & Customs</i> , United Kingdom tax administration.
IFP	Institute for Financial Policy, agency of the Slovak Republic Ministry of Finance responsible for providing macroeconomic and fiscal analyses and forecasts to the Slovak government and public. It, also, serves as a policy arm of the ministry.
Microdata	Detailed data sets in which individual persons or transactions are identified separately. Where such data is shared with third parties, it should be anonymized to prevent individuals being identified.
National accounts	A system of accounts used to measure countries' economic activity. National accounts should include the non-observed economy.
Petroleum products	Hydrocarbon oils including gasoline (petrol), diesel oils (DERV), liquid gas, and other petroleum products used to fuel motor vehicles. The coverage may, also, include petroleum products used in energy production, for example, electricity generators.
Policy gap	The difference between potential collections under the existing policy framework and potential collections under some normative policy framework, in which all domestic consumption of the relevant excise goods is taxed at a standard rate.
RA-GAP	Revenue Administration Gap Analysis Program: a technical assistance program to estimate tax gaps for member countries, delivered by the Revenue Administration 1 division in the Fiscal Affairs Department (FAD) of the International Monetary Fund (IMF).
Specific excise tax (duty)	Tax levied on the quantity, generally by weight or volume, of excise goods. For alcoholic drinks, the excise may be levied on the quantity of pure alcohol content. For cigarettes the quantity used is generally the number of individual cigarettes (known as 'sticks').
Tailor made cigarettes	Regular, ready-made cigarettes. Generally sold in packs of 10 or 20 sticks or in cartons of ten or more packs.
Tax base	The sum value of economic activities that generate tax revenues. For excise, this is generally the production or import of the relevant excise goods for domestic sales. Very often modelled using domestic consumption as a proxy.
TIN	<i>Taxpayer Identification Number</i> : a unique number of code identifying each individual taxpayer, enabling the linking of payments, returns, and other tax records.
Trade	In this note, "trade" refers to manufacturers, importers, distributors and retailers of excise goods, and their representatives.

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TNM/17/05

International Monetary Fund

Fiscal Affairs Department

700 19th Street NW

Washington, DC 20431

USA

Tel: 1-202-623-8554

Fax: 1-202-623-6073

ISBN: 978-1475564875

