

The Reverse Method: A New Indirect Technique for Global VAT Compliance Gap Monitoring

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Patricio Barra (IMF) and Polina Prokof'yeva (IFC)

*Presentation prepared for the 7th Virtual Meeting of the
Community of Practice on Tax Expenditures/Tax Gap
Estimation with the Data, organized by ATI, CEP & IDOS*

Overview

- Motivation
- Theoretical Framework
- Empirical Analysis based on GTED
- Results

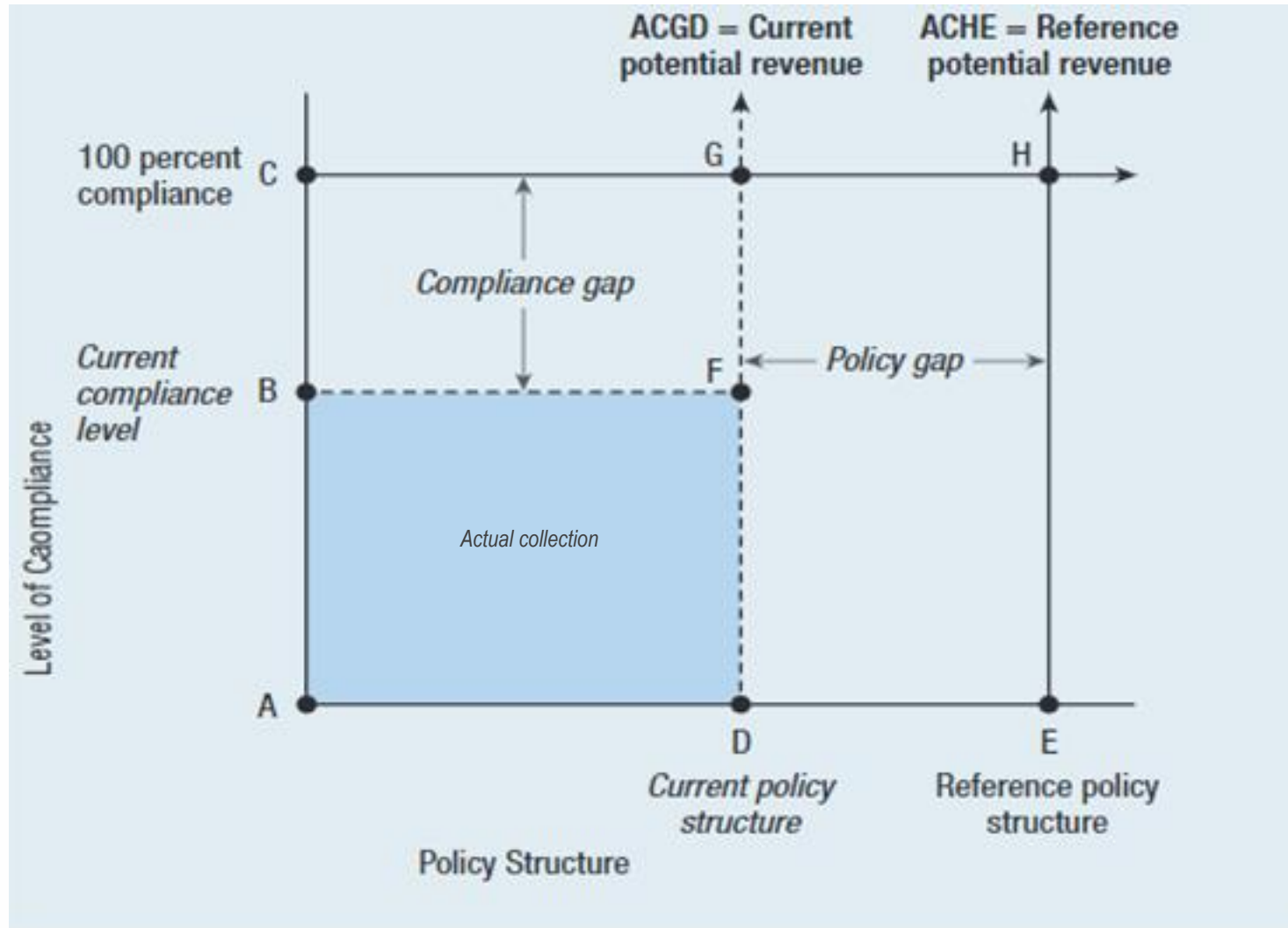
Motivation

A global, scalable, and cost-effective indirect approach to VAT gap estimation

- VAT compliance gap *estimates* rather than *measurements*
- Highly valuable for MoFs, revenue administrations, and the public
- Different estimation methods limit cross-country comparability
- The IMF's RA-GAP standard methodology provides a robust and internationally comparable framework
 - ▶ But its application is costly and not feasible to conduct every year or for all VAT-implementing countries

Theoretical Framework

Theoretical Framework (1)

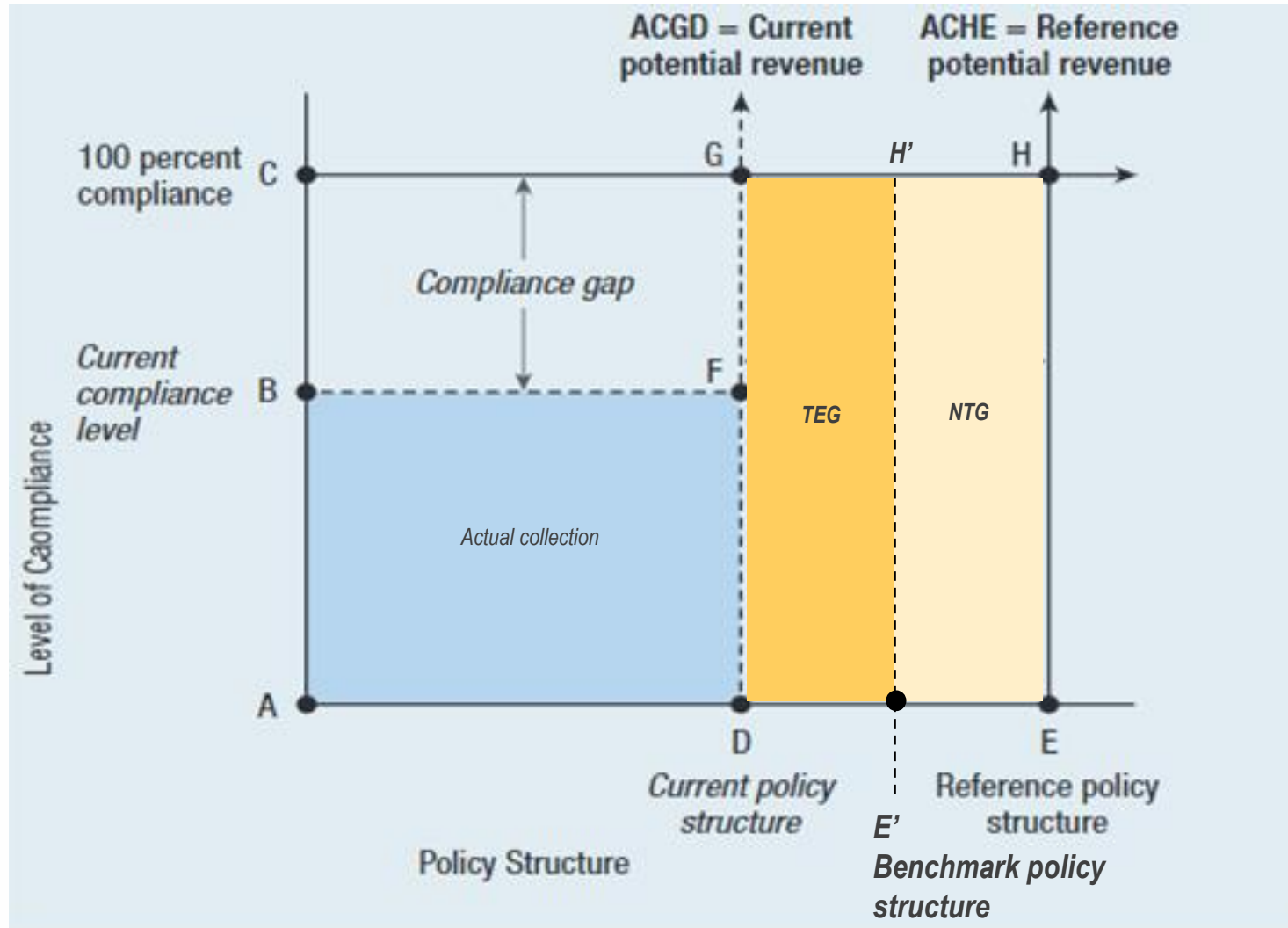


C-efficiency (E_c)
 \square ADFB/ \square AEHC

Compliance Gap to potential (Γ)
 \square BFGC/ \square ADGC

Policy Gap to potential (P)
 \square DEHG/ \square AEHC

Theoretical Framework (1)



Tax Expenditure Gap (TEG) to potential
 $\square DE'H'G / \square AE'H'C$

Nontaxable Gap (NTG) to potential
 $\square E'HH' / \square AEHC$

Theoretical Framework (2)

- Notation recap

Ec: VAT C-efficiency

P: Policy gap to potential (PV3)

Γ : Compliance gap to potential (PV1)

TEG: Tax Expenditure gap

NTG: Nontaxable gap

PV1: Potential VAT under the current policy structure

PV2: Potential VAT under the benchmark policy structure

PV3: Potential VAT under the reference policy structure

Theoretical Framework (3)

- Arithmetic

$$Ec = (1 - \Gamma) \times (1 - P) \quad (1)$$

$$(1 - P) = \left(1 - \frac{TEG}{PV2}\right) \left(1 - \frac{NTG}{PV3}\right) \quad (2)$$

Combining (1) and (2),

$$(1 - \Gamma) = \frac{Ec}{\left(1 - \frac{TEG}{PV2}\right) \left(1 - \frac{NTG}{PV3}\right)} \quad (3)$$

- What we propose? Using the Ec identity in the **reverse** way to produce a compliance gap estimate as the residual (Eq. (3))
- Thus, we will need information of Ec , TEG , NTG , $PV2$, $PV3$

Empirical Analysis based on GTED

Empirical Analysis (1)

- A piece of bad news – E_C , TEG, PV2, NTG, and PV3, are not always publicly available so they can not be directly input into Eq. (3) to obtain a “reverse” accounting estimate of Γ .

How to deal with that?

- With no global datasets available for each variable, we can use proxies and apply a calibrated estimation model
- Calibration hypothesis - systematic differences between variables and proxies are assumed to be constant across countries and time (we only distinguish EU vs Non-EU)

Variable	Proxy	Source
E_C	E_C^{FAD}	Global dataset on official cash actual collection (AV0), final consumption adjusted (FC AV0), and the standard VAT rate (r) (FAD Dataset)
TEG	$\sum_{p=1}^n VAT_p^{ExpProv}$	Global dataset of VAT expenditure provisions from the Global Tax Expenditure Dataset (GTED).
PV2	$(FC - AV0)r - NTG$	FAD Dataset
NTG	$(GDP_0 + GDP_P + GDP_Q)r$	National accounts for each country
PV3	$(FC - AV0)r$	FAD Dataset

Empirical Analysis (2)

- Applying $\text{Log}(\cdot)$ over Eq. (3), the proxies-based model would be,

$$\text{Log}(1 - \Gamma) = \mu_0 + \mu_1 \text{Log}(E_C^{\text{FAD}}) - \mu_2 \text{Log}\left(1 - \frac{\sum_{p=1}^n \text{VAT}_p^{\text{ExpProv}} x f}{(\text{FC}-\text{AV0})r-\text{NTG}}\right) - \mu_3 \text{Log}\left(1 - \frac{(\text{GDP}_O + \text{GDP}_P + \text{GDP}_Q)r}{(\text{FC}-\text{AV0})r}\right) + \varepsilon \quad (4)$$

- f : Iterative factor for including compliance gap in TEG provisions

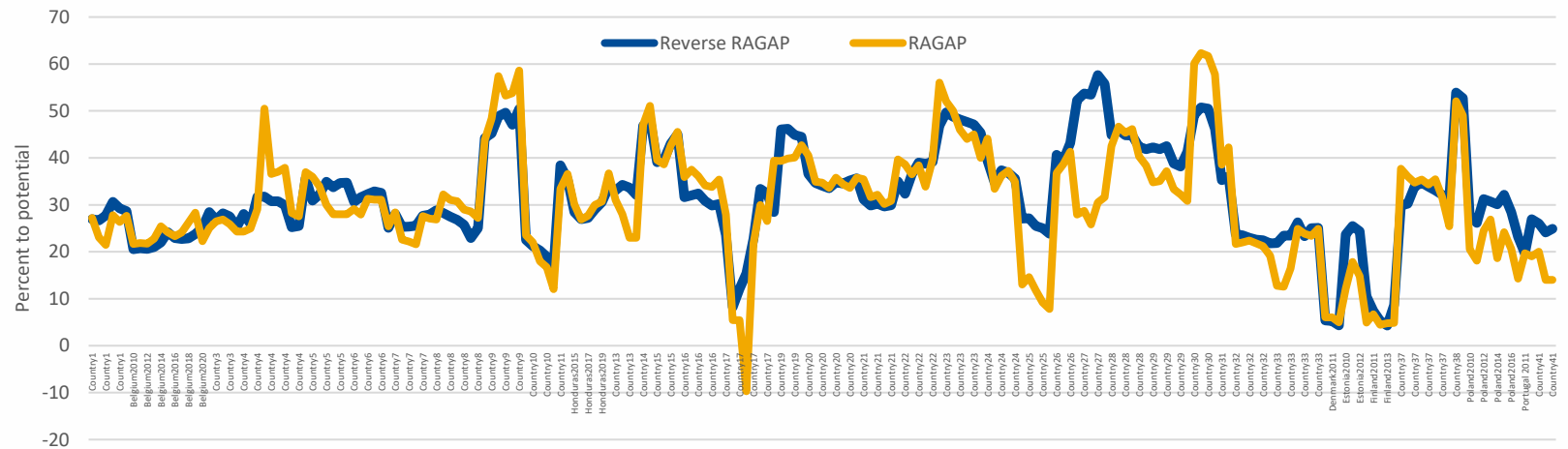
Empirical Analysis (3)

- Equation (4) estimated using a sample of 208 VAT gap observations from 43 countries, based on the IMF’s RA-GAP direct top-down estimates for selected years during the period 2010–2023
- All the signs and magnitudes appear consistent with expectations (Eq. (a)).
- We include specifications with an intercept and a separated calibration for EU and non-EU countries, based on their better fit (Fig. 1).

Table 1. Linear Regression Calibration - Dependent variable: $\log(1 - \Gamma)$

Coefficient	(a) All		(b) All		(c) Non-EU		(d) EU	
	Value	Standard error	Value	Standard error	Value	Standard error	Value	Standard error
μ_0	-	-	-0.50***	0.03	-0.40***	0.04	-0.64***	0.07
μ_1	0.62***	0.03	0.53***	0.03	0.55***	0.03	0.68***	0.06
$-\mu_2$	-0.43**	0.20	-2.14***	0.23	-1.99***	0.23	-3.38***	0.68
$-\mu_3$	-0.30*	0.16	-1.87***	0.09	-1.26***	0.15	-2.23***	0.12
R2 adj.	0.56		0.84		0.80		0.92	
No. obs.	208		208		146		62	
No. countries	43		43		31		12	

Figure 1. VAT Compliance Gap (Γ)

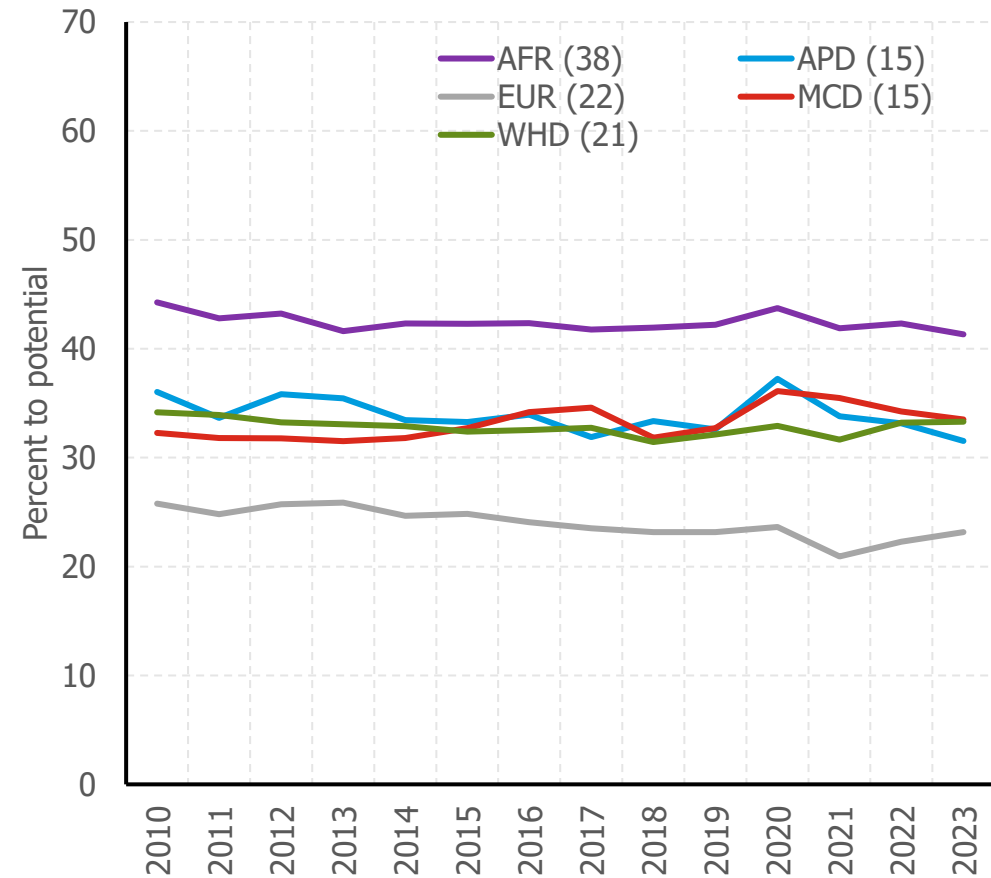
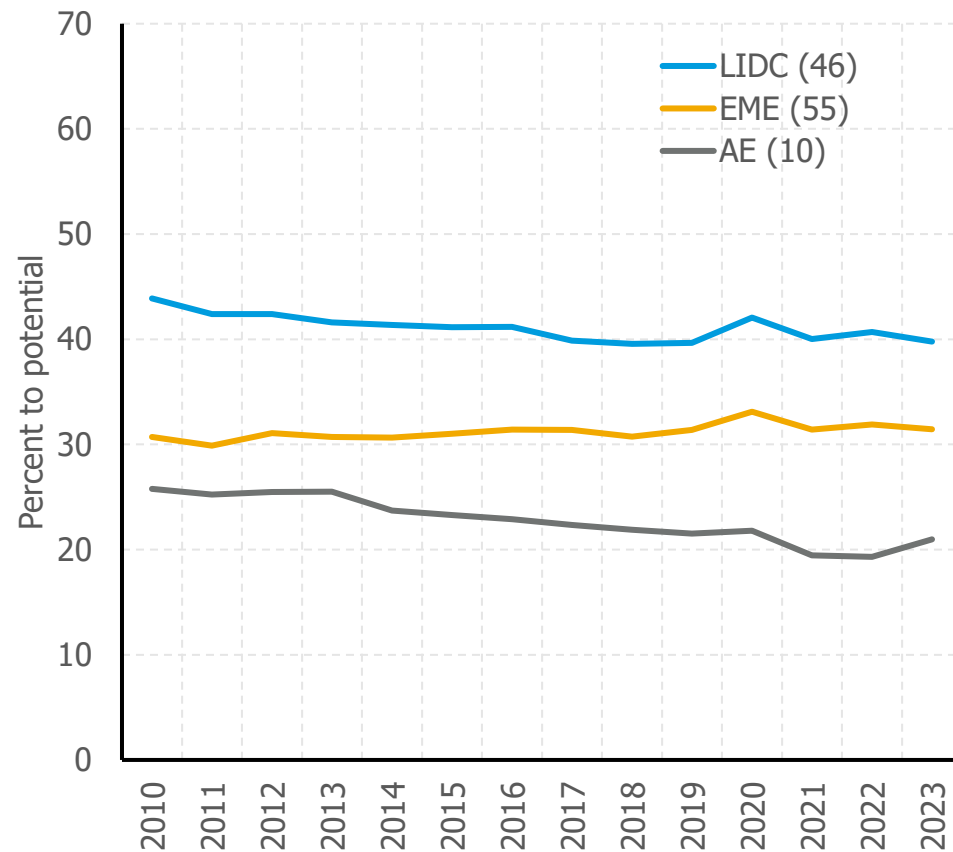


Source: Authors. Note: Each point in the orange line represents one annual observation obtained by a standardized IMF’s RA-GAP VAT gap assessment mission and each point in the blue line represents the results of the calibrated reversed method for the “CountryX” (using columns (c) and (d) of Table 2). The names of the countries have been included only in cases where authorization for the publication of the RA-GAP mission results has been granted.

Results

Results (1)

VAT Gap Estimates by Income and Region (111c, 1,400 obs. for 2010-2023)



AE = Advanced Economy; EME = Emerging Market Economy; LIDC = Low-Income Developing Country (countries with low per capita income, per World Bank Atlas method); AFR = Africa; APD = Asia and Pacific Department; EUR = Europe; MCD = Middle East and Central Asia Department; WHD = Western Hemisphere Department. These classifications are commonly used in IMF reports such as the Fiscal Monitor and RA-GAP analyses to group countries by income level and region. Numbers in parentheses show the number of countries in each group.

Final Remarks

- C-efficiency and national accounts have limitations and may not fully capture VAT complexities
- Differences in VAT design and tax expenditure concepts across countries can bias results
- The Reverse Method tries to adjust for these, but some errors remain
- Enables broad, comparable VAT gap estimates using public data
- Global trends for policymakers to contrast their own estimations
- Ongoing improvements: better calibration, updated data, adding new countries
- VAT expenditure reports – *How can we help increase GTED VAT expenditures both quantitatively and qualitatively?*



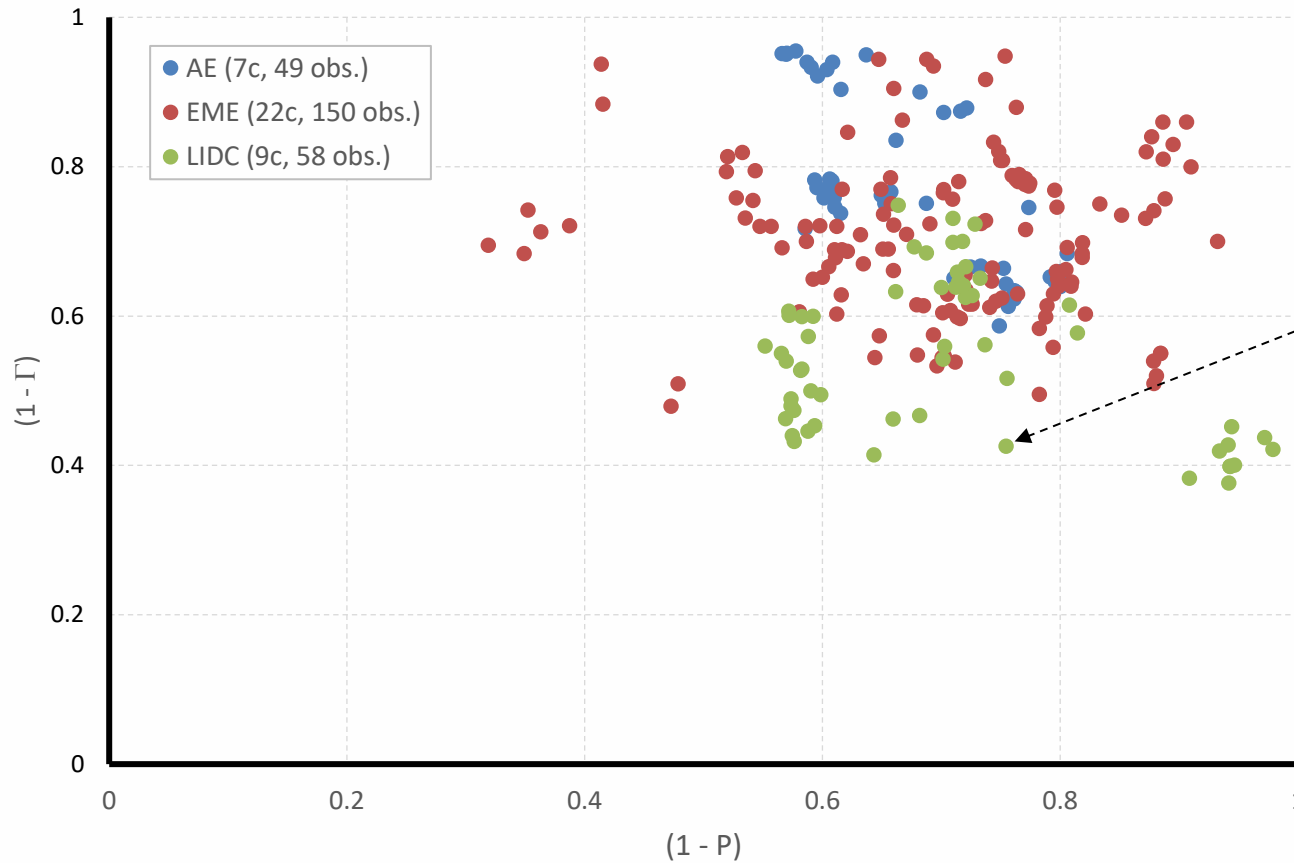
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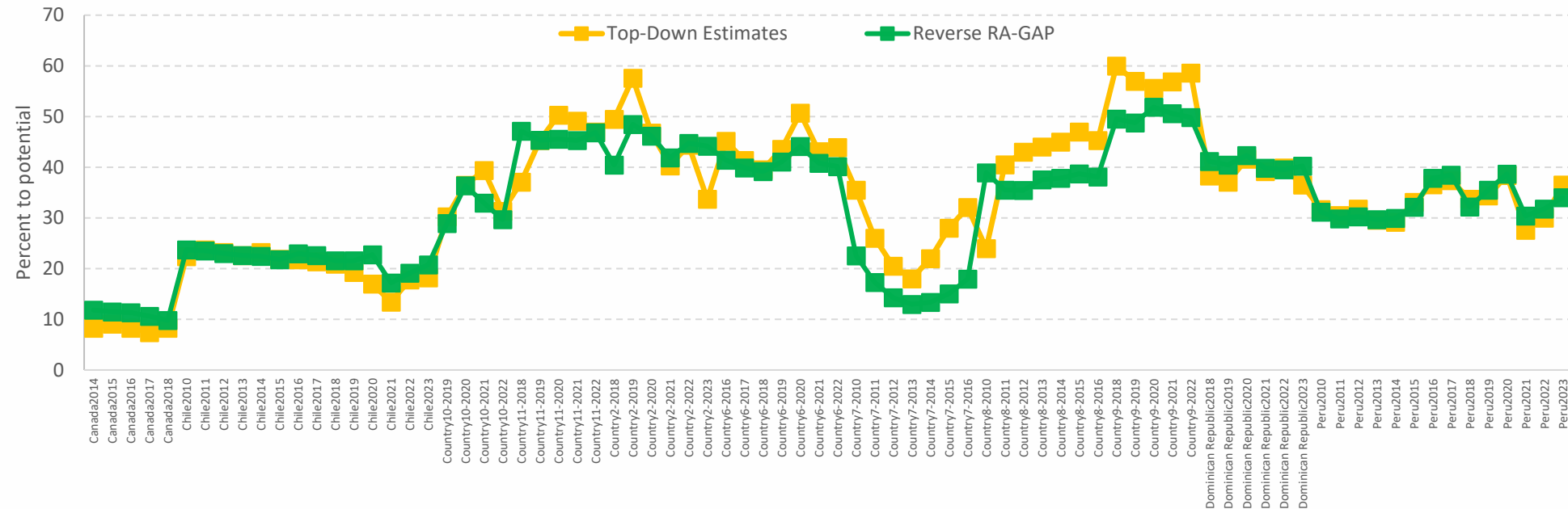
Policy Gap and Compliance Gap in Selected Countries



One of the observations represents a country-year in which the C-efficiency is 32.1 percent, and the estimated VAT policy gap for that country is 24.6 percent. Consequently, the estimated compliance gap will be 57.4 percent (equal to $1 - 0.321 / (1 - 0.246)$).

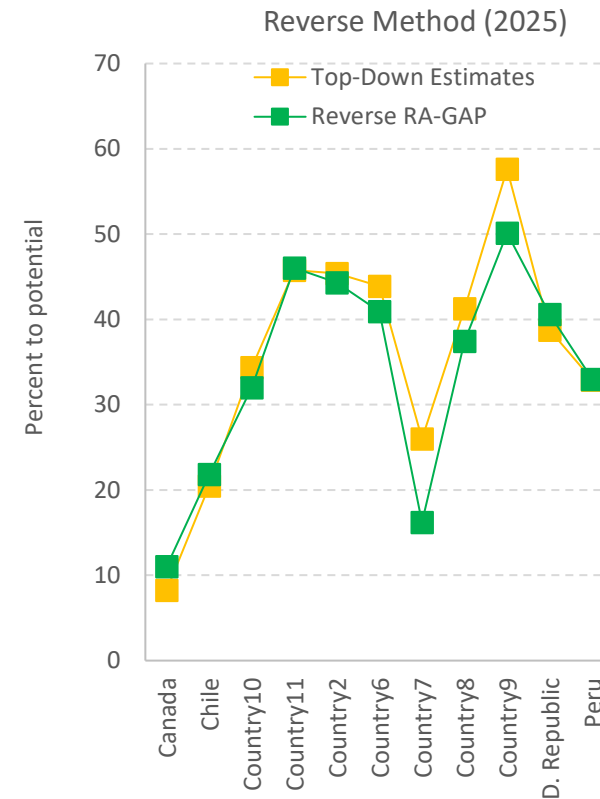
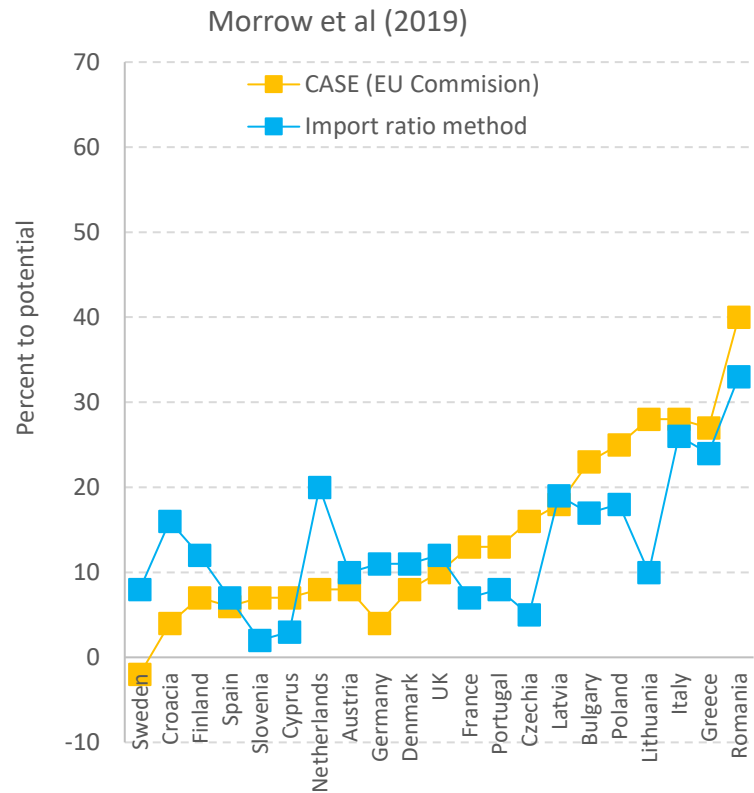
Source: Barra and Prokof'yeva (2025). The names of the countries have been excluded.

Out-of-Sample Predictions



Source: Authors. Note: Each point on the orange line represents one annual observation obtained by (1) country’s own top-down estimations, (2) new standardized IMF’s RA-GAP VAT gap assessment missions, or (3) World Bank estimations using the RA-GAP model. Each point on the green line represents the results of the calibrated reverse method for the “CountryX” (using columns (c) and (d) of Table 2). The names of the countries have been included only in cases where authorization for the publication of the results has been granted.

Indirect Methods Comparison



Source: Authors based on Morrow et al (2019) (left-hand chart) and authors (right-hand chart). In the left-hand chart, each point in the orange line represents a gap average obtained under the methodology from the CASE (EU Commission). Each point on the green line represents the results of an indirect method based on C-efficiency and import-to-consumption ratio. In the right-hand chart, each point on the orange line represents a gap average obtained by (1) country's own top-down estimation, (2) new standardized IMF's RA-GAP VAT gap assessment mission, or (3) World Bank estimation using the RA-GAP model. Each point on the green line represents the results of the calibrated reverse method for the "CountryX". The names of the countries have been included only in cases where authorization for the publication of results has been granted.

Addendum: How can we help increase GTED VAT expenditures both quantitatively and qualitatively?

- Increase the number of countries reporting (?)
- Improve the VAT expenditure conceptual approaches adopted by countries (?)
- Ensure completeness of provisions (?)
- Enhance the reliability of VAT expenditure estimates (?)