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Global Taxation of Agriculture and Forestry

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ABSTRACT: Across the globe, the agricultural sector is often the target of special fiscal policies, including tax breaks and subisidies, to promote food security and rural economic stimulus and simplify administration. Increasingly, the sector is also subject to sector-specific taxes aimed at curbing environmental externalities. While there is a large literature on agricultural subsidies and tariff policy, there are few cross-country studies of domestic agricultural tax policies. To fill that gap, we built a detailed inventory of almost 950 tax policy measures specific to agriculture and forestry--both tax concessions and sectoral taxes--for 89 developed and developing countries. We use those data to estimate forgone revenue associated with agricultural income and general consumption tax expenditures and find that agricultural tax expenditures likely exceed agricultural subsidies. We also compare tariffs on food and agricultural inputs to those on other products. We find that while agricultural inputs are generally subject to below-average tariffs, foodstuffs are generally subject to above-average tariffs, such that agricultural tariff policy typically raises net revenue.

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WORKING PAPERS

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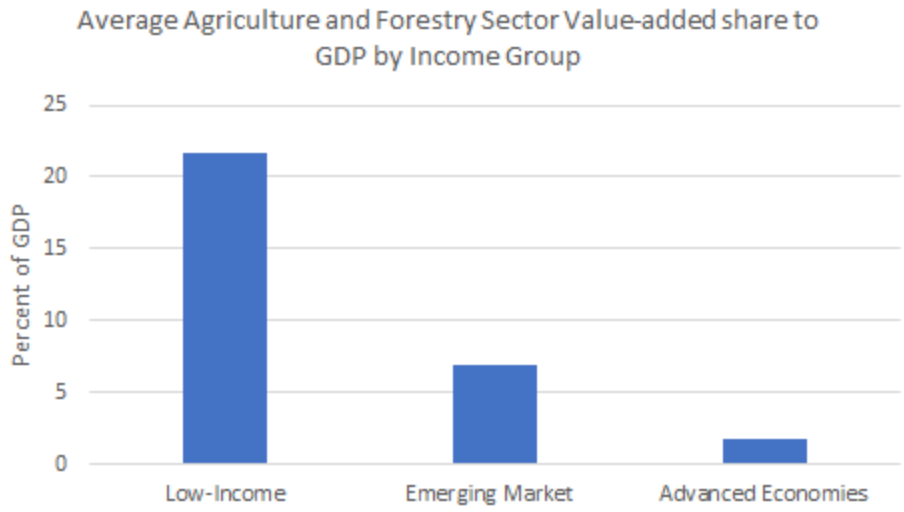
Glossary

AFTD	Agriculture and Forestry Tax Database
AE	Advanced Economies
CIT	Corporate Income Tax
EME	Emerging Market and Middle-Income Economies
GST	General Sales Tax
GTED	Global Tax Expenditures Database
IBFD	International Bulletin for Fiscal Documentation
IMF	International Monetary Fund
LIDC	Low-Income Developing Countries
NRA	Nominal Rate of Assistance
OECD	Organisation for Economic Cooperation and Development
PINE	Policy Instruments for the Environment
PIT	Personal Income Tax
TE	Tax Expenditures
TSE	Total Support Estimate
VAT	Value-added tax
WATR	Weighted Average Tariff Rate
WITS	World Integrated Trade Solutions
WTO	World Trade Organization

I. Introduction

The agriculture and forestry sectors play a vital role in global economies, food security, and rural development. On average, the sectors account for more than one fifth of economic activity in low-income countries, although that share declines as income rises to less than three percent of gross value added in advanced economies (AEs) (Figure 1). Agriculture and forestry are subject to a wide range of public policy interventions, including not only fiscal policies--domestic taxation, tariffs and other trade policies, and direct expenditures—but also regulation and structural reforms. Fiscal policies are generally stimulative, aimed at increasing rural economic activity and promoting food security. Accordingly, most sector-specific tax measures are concessions, although sector-specific surtaxes also apply—notably environmental taxes in higher-income countries. The Global Tax Expenditures Database (GTED) shows that that agriculture is by far the largest recipient of identified sector-specific tax breaks (Figure 2).[1]

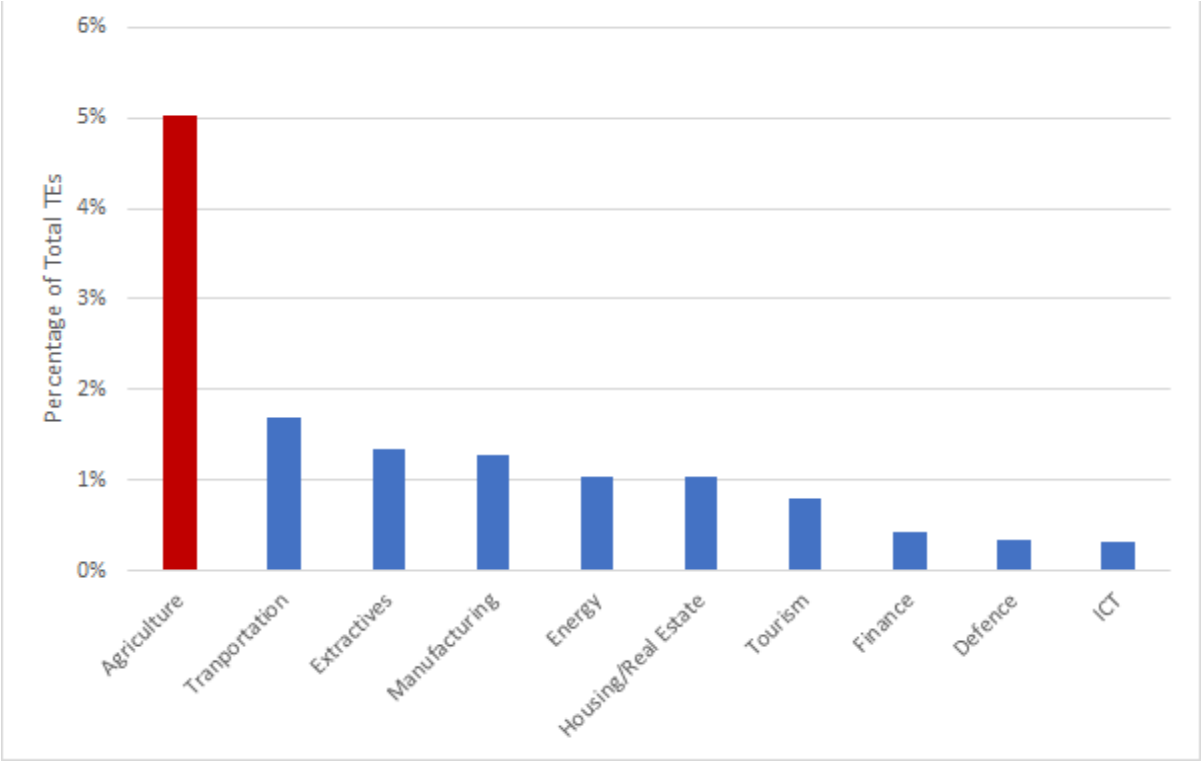
Figure 1. Agriculture and Forestry Sector - Percentage of Gross Value Added by Income Group



Source: UN Stats and authors' calculations.

[1] See Redonda and others (2025). Figure 2 shows GTED observations classified by Level 2 Policy Objective. Note that 7,690 out of a total 31,712 observations showed a "Not stated/unclear" Level 2 policy objective.

Figure 2. Share of Global Tax Expenditure Database Observations by Development Objective



Source: Redonda and others (2025)

While subsidies and tariff policy have been widely studied, there is much less written on domestic tax policy (including tax expenditures) for the sector, especially among developing countries. This paper is the first to systematically document the current tax treatment of the agricultural and forestry sector worldwide and to quantify the fiscal cost of major agricultural tax expenditures (TEs). Its findings complement the existing literature on agricultural subsidies and tariff policies, enabling a more comprehensive view of public support for the sector.

To achieve this goal, we compiled a comprehensive database of 944 agriculture and forestry-specific tax measures for 89 developing and advanced countries. The Agriculture and Forestry Tax Database (AFTD) shows that sectoral tax concessions indeed outnumber sector-specific taxes by an almost 9-to-1 ratio. The largest number of concessions are for income tax, followed by the VAT or general sales tax (GST), property taxes, and excises. About 6 percent of AFTD measures, concentrated among AEs, likely have a positive environmental impact.

We combine the AFTD data with National Accounts data to estimate lower-bound and upper-bound fiscal costs for major direct and indirect agricultural TEs. We find that, in line with the share of agriculture in the economy, agricultural TEs are largest in low-income developing countries (LIDCs) at 1.75-4.5 percent of GDP. Their cost decreases with income level to 0.75-1.5 percent of GDP in emerging and middle-income countries (EMEs) and about 0.25 percent of GDP in AEs. These findings suggest that agricultural TEs are likely larger than agricultural subsidies, which the Food and Agriculture Organization (FAO, 2022) estimates at 0.4-0.7 percent of GDP worldwide.

We also compare agricultural trade tariffs to each country's overall weighted average tariff rate (WATR) using data from the World Trade Organization (WTO) World Integrated Trade Solutions (WITS) database. We find that food tariffs are typically above-average, while tariffs on agricultural inputs are typically below-average. Since food imports are usually of much greater magnitude, tariff policy regarding agriculture and forestry tends to give rise to net customs revenue.

Section II provides a review of the relevant literature on agricultural tax and tariff literature, as well as a discussion of the relevant agricultural subsidy literature. Section III of this paper provides a detailed description of the database's construction and statistical overview of its contents. Section IV combines AFTD and National Accounts data to quantify agricultural tax expenditures (TEs). Section V summarizes our major findings and suggests avenues for further research.

II. Literature Review

Tax policy for agriculture and forestry is a component of overall fiscal policy for those sectors, which also comprises tariff policy (import and export taxes) and expenditure policy. Regulatory policy, which includes fees and penalties, interacts with fiscal policy and can have similar effects but is beyond the scope of this paper. The fiscal policy literature focuses largely on tariffs and subsidies, while the literature on domestic agricultural taxation is less developed. This is largely because the sector receives many tax concessions (or tax expenditures, TEs), which are more difficult to measure than direct budgetary outlays or tariff rates.[2] A principal goal of this paper is to bridge this gap in the literature.

Tax Policy

A significant literature analyzing the conceptual and practical challenges of the tax treatment of the agricultural sector goes back several decades (e.g., Bird, 1974; Khan, 2001; OECD, 2005). The sector is subject to a variety of tax instruments, including income taxes, sales taxes/VAT, sector-specific excises and property taxes. While taxation of the sector is often motivated by the need for revenue generation, especially in developing countries where the sector accounts for a larger share of the economy, sector-specific tax incentives are also common as policy tools designed to achieve socio-economic objectives (e.g., food security, rural economic growth and employment, etc.) Generous tax concessions also reflect sectoral administrative constraints, particularly in developing countries. In recent decades, both tax incentives and sector-specific taxes have increasingly been proposed to encourage behavioral change in the sector, such as investment in sustainable practices.

Bird (1974) lays out the essential challenges of agricultural taxation in developing countries, most of which persist today: Despite the large share of agriculture in developing economies, the sector's tax yield is disproportionately low, due largely to widespread informality and the administrative challenges of measuring agricultural income. Governments traditionally extracted resources from the agricultural sector using a combination of implicit taxation via marketing boards and a combination of overvalued exchange rates and export taxes. Presumptive income taxation based on various factors correlated with income—notably land—is

[2] Accordingly, while the OECD recognizes the importance of tax concessions as a means of support for the agricultural sector (OECD 2005, 2020), only selected agricultural TEs, such as fuel tax concessions, are incorporated into its agricultural producer support estimates (PSEs).

also common; however, land tax yields tend to be weak in developing countries due to weak cadastral and valuation systems as well as the influence of powerful rural elites. Khan (2001) updates Bird's analysis, noting that the interim decline of export taxes and agricultural pricing policies render development of rural income and land taxation even more expedient.

Generous tax treatment of agriculture is not limited to developing countries. OECD (2005), an early review of agricultural tax provisions in OECD member states, finds tax concessions range from 9 percent of potential revenue in the US to 19 percent of potential revenue in Australia. OECD (2020) catalogs a wide range of concessions, including small farmer tax exemptions for both income and value-added taxes, cash-based accounting and other compliance simplifications, reduced recurrent and transactional property taxes, and agricultural fuel tax concessions. Similarly, Gruziel and Raczkowska (2018) identify numerous agricultural tax concessions for the EU, where preferential or simplified tax treatment is granted particularly to smallholder farms in continental Europe.

Several studies show that taxation can affect farmers' income, production and efficiency. Durst and Monke (2001) show that income tax incentives such as accelerated depreciation allowances for capital equipment purchases have a substantial influence on the amount and composition of farm investment, which impacts farm productivity. Gruziel and Raczkowska (2018) find evidence that depreciation allowances and tax averaging provisions reduce disposable income volatility for farmers. Norregaard (2013) posits that higher recurrent property taxes promote more efficient and intensive use of land.

Reduced VAT rates and exemptions on agricultural supplies are common in both developed and developing countries (Warrick et al., 2022). While these policies are usually viewed as promoting food affordability, by supporting food demand they also promote domestic farm production and income. Another common policy, particularly where agricultural goods are exempted, is to relieve VAT on agricultural inputs to prevent cascading. In Europe, numerous countries alleviate VAT cascading in agricultural by implementing a flat-rate farmer scheme (Cnossen, 2018).[3]

Agriculture is a key contributor to greenhouse gas emissions and loss of biodiversity worldwide: FAO (2023) estimates the environmental "hidden costs" of agrifood systems are equivalent to one-third of all agricultural value-added. Tax concessions are a critical component of sectoral support, which like subsidies could (inadvertently) incentivize high-emission farming and forestry: Laborde and others (2021) find that agricultural subsidies can have these effects. The widespread practice of exempting gasoline and diesel used in agriculture from road fuel excises clearly encourages more carbon-intensive farming. A growing literature finds that repealing VAT concessions for foods with greater environmental and/or health externalities, such as meat and dairy, has positive fiscal and social benefits including from reduced consumption (Plinke and others, 2026; Springmann and others, 2024).

Another growing literature examines Pigouvian taxes on agriculture to curb not only GHGs but other harmful emissions as well. Many countries have studied applying a carbon tax to methane emissions from agriculture (mostly from cattle and rice), and Denmark introduced the world's first "fart tax" on livestock emissions in 2025 (Ammal, 2025). Excises on pollutive inputs, such as pesticides and fertilizer, are increasingly being introduced, particularly in northern and eastern Europe. While scholarship supports wider use of environmental taxes in agriculture, most countries follow a regulation-based approach to environmental and agricultural policies.

[3] Flat-rate farmer schemes are discussed in greater detail in the following section.

(Finger and Pedersen, 2025). Countries at all income levels are often reluctant to impose higher input costs on farmers, which would hit small farmers the hardest (Ammal, 2025).

Tariffs

Though import and export tariffs are taxes, tariff or trade tax policy is usually analyzed separately from domestic tax policy. Karp and Perloff (2002) review stylized facts for agricultural and food product tariffs, which countries apply with a wide amplitude of rates. They find that agricultural production in AEs has traditionally been protected against imports, but that tariffs have been less important than non-tariff barriers in distorting agricultural trade.

Anderson (2010) focuses on how international trade policies affect agricultural incentives in developing countries, where many depend on farming for their livelihood. She shows that over 80 percent of the nominal rate of assistance to all agricultural products in developing countries comes from import tariffs on import-competing products or export taxes. Furthermore, while the rate of assistance for tradable agricultural products in developing countries was much higher than for other tradable goods in the 1960s, they have converged since the early 2000s. Anderson and others (2010) suggest that developing countries would gain nearly two times more than high-income countries in welfare terms if measured price distortions from agricultural and trade policies were removed globally.

Gaigné and Gouel (2022) highlight that agri-food trade liberalization generates winners and losers along the food value chain and within each stage, which involves farmers, food processors, distributors, and consumers. Agricultural trade policies often try to mitigate losses for these groups, but assessment of their overall welfare impact is limited by this sometimes-conflicting overlap. Similarly, this paper finds conflict between tariff policies aimed at protecting local agricultural production and tax policies targeted at food affordability (notably VAT concessions.)

Subsidies

The scope and efficacy of agricultural subsidies have received considerable recent attention in the literature for both advanced and developing economies**.** According to FAO and others (2022), agricultural producer subsidies are prevalent, large, and deployed to achieve diverse and, at times, overlapping policy objectives. Among countries accounting for 90 percent of global GDP, the authors estimate food and agriculture subsidies have amounted to 0.3–0.7 percent of GDP over the past decade and a half.

The AgIncentives Consortium (2024) database estimates of the nominal rate of assistance (NRA) for 89 countries. The NRA measures the extent of market price distortion of agricultural products caused by border measures, such as import and export tariffs, quotas and trade bans, as well as fiscal subsidies in the form of targeted production, inputs, and other types of payments. While it aims to capture the extent of producer support to the agricultural sector worldwide, it omits most domestic tax expenditures. The NRA data indicate that EMEs provide larger subsidies as a share of GDP to the sector than either AEs, which have been reducing the magnitude of their support over time, or LIDCs, which historically have provided a net negative subsidy to the sector.

Drawing on the AgIncentives database, Amaglobeli and others (2024) provide a detailed overview of agricultural subsidies, whose various forms include price support, direct cash payments to farmers often linked to production, and input subsidies (e.g., seeds and fertilizers). More than half of public support to the food and agricultural sector takes the form of producer subsidies, and only a quarter is allocated to provision of public goods such as infrastructure and research. By artificially lowering production costs or assuring higher output prices, producer subsidies can result in resource misallocation as well as increased environmental externalities (OECD, 2021; Badiani-Magnusson and others, 2018).

Some of the world's largest economies, including the United States and Europe, have historically provided significant government support to their agricultural sectors (Congressional Research Service, 2021). Since the mid-1990s both regions have adopted less market-distorting policies in response to budget and trade pressures. Simultaneously, policies have shifted from output-based subsidies toward less distortive non-output based subsidies and incentives for sustainable practices. Some evidence suggests that preferential income and wealth tax regimes in AEs have improved after-tax income for farm households relative to non-farm ones (e.g., OECD, 2003).

While agricultural support could in principle also reduce poverty in developing countries (Hossain and others, 2024), research to date does not demonstrate a specific link between TEs and poverty reduction. While agricultural support can be used to target both income level and variability for rural households, its effectiveness is hampered by informality and poor targeting of benefits through the tax system (OECD, 2014; Warwick and others, 2022; Bachas and others, 2024). Also, most rural poor mechanically fall below most income tax thresholds and are therefore not benefited by agricultural tax exemptions (except in terms of compliance simplification). For example, Gupta and Jalles (2022) show that PIT reforms tend to have no positive impact on inequality reduction in Sub-Saharan Africa. Given this lack of strong association with poverty reduction and need for revenue mobilization, several developing countries have begun reducing TEs targeting the agricultural sector in recent years (e.g., Kenya and Pakistan; see Light and others, 2019).

Although beyond the scope of this paper, there is an extensive literature on various structural and regulatory reform options used historically to incentivize growth in agricultural activity. These include improving rural access to financial markets, land market liberalization and land titling reforms, irrigation markets, and product regulatory standards (de Janvry and others, 1997). These tools can often be complementary or overlapping vis-à-vis tax policy instruments.

III. Agriculture and Forestry Tax Database

Coverage and Construction

The AFTD includes all tax measures that deviate from a country's standard tax regime specifically for the agriculture and/or forestry sectors. General tax incentives that benefit all economic activities including agriculture and forestry, such as accelerated depreciation or a reduced rate for small businesses, are therefore not included. However, tax measures that specifically target agriculture and/or forestry but also a small number of other sectors, such as fishing or food processing, are typically included; tax measures specifically targeting fishing and aquaculture are not included unless they also apply to agriculture and/or forestry. The AFTD is cross-sectional: only tax measures currently applicable in 2024-5 were included.

The principal data source for AFTD tax measures is the International Bulletin for Fiscal Documentation (IBFD) country reports, which accounts for almost 80 percent of AFTD observations, supplemented by the PricewaterhouseCoopers (PWC) Worldwide Tax Summaries. The Annex contains a detailed description of how IBFD reports and PWC summaries were mined. We also integrated data from the GTED, the OECD Policy Instruments for the Environment (PINE) database, and two studies by the Organisation for Economic Cooperation and Development (OECD 2020) and the European Commission Directorate General – Environment (EU DGE 2024). From the GTED, which accounts for 13 percent of AFTD observations, we selected observations with the level-2 policy objective of "developing the agricultural sector". OECD (2020), which comprises tax measures applying specifically to agriculture, accounts for about 3 percent of AFTD observations. From the PINE database, which accounts for about 2 percent of AFTD observations, we selected measures based on instrument type (tax measures only) and sector (agriculture and/or forestry only). The EC DGE (2024) yields an additional 16 environmental policy measures. Any redundancies among the various sources were eliminated.[4]

The AFTD includes 944 measures from 89 countries selected to match the country coverage of the AgIncentives Consortium (2024) database. This selection emphasizes global GDP coverage – the included countries produce more than 90 percent of global GDP[5]--at the cost of underrepresenting lower-income countries for which agriculture constitutes a higher share of GDP. Figure 3 shows that the database comprises 45 AEs, 34 Emerging Market and Middle-Income Economies (EMEs), and 10 Low-Income Developing Countries (LIDCs), based on the IMF classification. From a regional perspective presented in Figure 4, Europe accounts for the largest share of countries in the dataset (36), followed by the Western Hemisphere (26), Africa (14), Asia and Pacific (10), and the Middle East and Central Asia (3).

Figure 3. AFTD Distribution of Countries across Income Groups

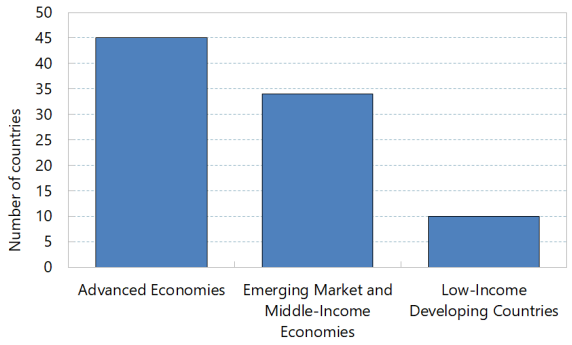
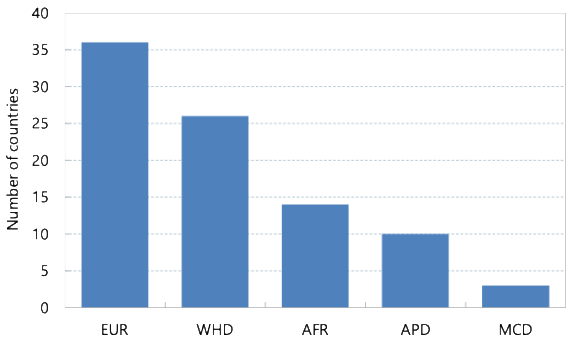


Figure 4. AFTD Distribution of Countries across Regions



Source: AFTD

[4] The WITS import tax data used for the agricultural trade tax policy analysis in Section V are not incorporated into the AFTD database.

[5] Calculated in current prices in U.S. dollars, based on country data from WEO July 2024.

Summary of Contents

The AFTD categorizes tax measures along several descriptive dimensions, including country, income group, region, data source, tax head, and type of tax measure (Table 1). Wherever possible, the tax measures were categorized into tax increases or decreases. More than 87 percent of AFTD measures were categorized as tax decreases, indicating that most agriculture and forestry-specific tax measures aim at relieving taxes on those activities. Tax increases account for almost another 11 percent of AFTD measures, while the impact of the remaining two percent of measures (e.g., turnover-based presumptive taxes) is indeterminate.

Table 1. Structure of the AFTD Database

Major Categories	Source	Tax Head	Tax Measure
Country	IBFD	Capital Gains Tax	Accelerated depreciation
	PWC	Corporate Income Tax	Deduction/allowance
Data Source	OECD (2020)	Excises	Deferral
	PINE	Personal Income Tax	Elevated rate
Income group	GTED	Property Tax	Emissions tax
	EU DGE (2024)	Social Security Charge	Exemption
Region		Trade Tax	Export tax
	Income Group	Transaction Tax	Flat-rate farmer scheme
Description	1 - Advanced	Turnover Tax	Income averaging
	2 - Emerging Market	VAT/GST	Land use change tax
Tax Head	3 - Low-income	Vehicle Tax	Logging tax
			Loss offset
Tax Measure	**Region**		Multiple
	AFR - Sub-Saharan Africa		Natural resource charge
Tax Change	APD - Asia and Pacific		Other environmental tax
	EUR - Europe		Other tax decrease
Standard Rates	MCD - Middle East/Central Asia		Other tax increase
	WHD - Western Hemisphere		Other timing shift
Special Rates			Pollutive input tax
			Presumptive tax
VAT subcategory			Reduced rate
			Simplified accounting
			Tax credit
			Valuation adjustment
			Withholding tax

Broad-based income and consumption taxes (CIT, PIT and VAT/GST) account for more than two-thirds of AFTD observations (Table 2). The most prevalent tax head in terms of policy measures is the CIT, which accounts for more than a quarter of AFTD observations across 70 countries. The second most prevalent tax head in terms of measures—and the most prevalent in terms of countries—is VAT/GST, which accounts for almost another quarter of observations across 76 countries. PIT accounts for another 14 percent of measures across 51 countries, while taxes on capital income and gains account for another 5 percent of measures from

30 countries. Property taxes[6] and excise taxes account for another 13 percent and 8 percent of measures, respectively; other tax types each account for less than 5 percent of AFTD observations.

Table 2. Distribution of Tax Provisions by Tax Category

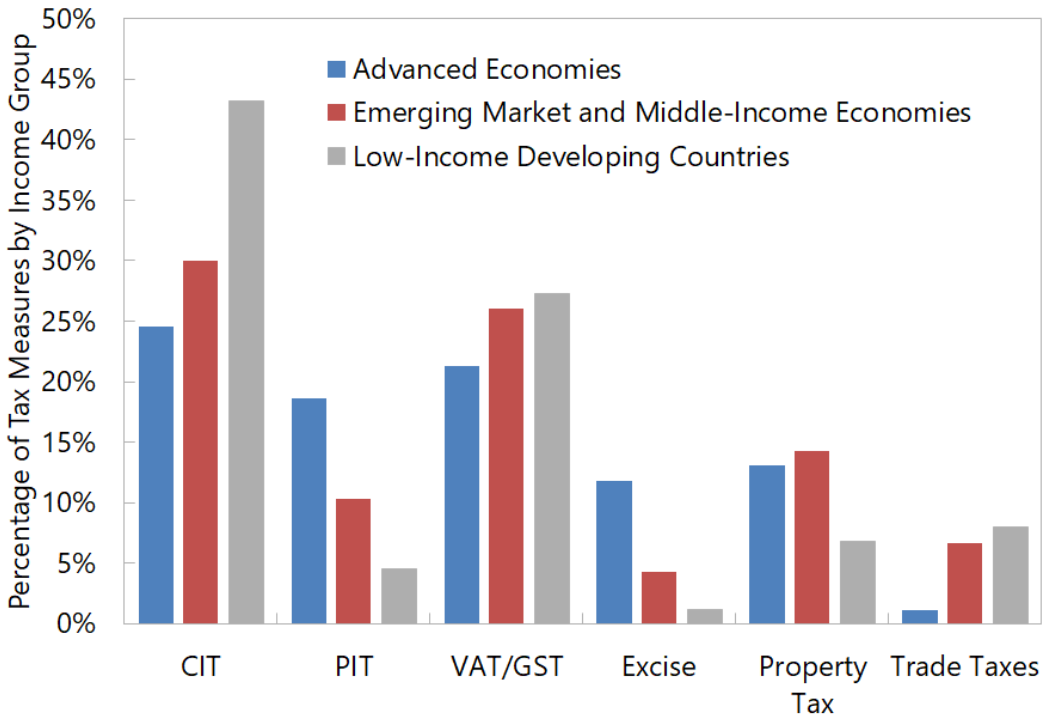
Tax Head	Measures	Countries
CIT	266	70
VAT/GST	222	76
PIT	136	52
Property Tax	122	55
Excise	77	41
Capital gains tax	31	21
Transaction tax	15	12
Trade tax	35	27
Turnover tax	22	17
Social security charge	9	8
Vehicle tax	7	7
Multiple	2	1
Total	944	89

Source: AFTD

The prevalence of tax head use varies significantly by country income group (Figure 5). While CIT and VAT/GST remain the largest tax categories across income groups, they account for a larger share of measures among developing economies (EMEs and LIDCs) than among AEs, reflecting their higher revenue share among the former groups. Similarly, PIT and capital income taxes, which yield a much higher revenue share among AEs than among developing countries, also account for a much higher proportion of AFTD measures for AEs. In AEs, PIT accounts for about 17 percent of measures, vs. 11 percent in EMEs and only 5 percent in LIDCs. Excise taxes also account for a much larger share of measures among AEs—12 percent—than among either EMEs (5 percent) or LIDCs (1 percent). This largely reflects high-income countries greater use of environmental excises than other income groups—although fuel tax concessions for agriculture are common among all income groups. The share of recurrent property tax (RPT, the main component of Property Taxes) measures varies non-monotonically with income, with the highest share (11 percent) observed in EMEs, compared with 8 percent in AEs and 6 percent in LIDCs.

[6] Property taxes include not only recurrent property taxes on real property but also certain property transaction taxes, wealth taxes and gift and inheritance taxes.

Figure 5. Share of Agriculture-Specific Tax Measures by Tax Type and Income Group



Source: AFTD

Prevalent Income Tax Measures

Tax breaks for agricultural and forestry income—whether for corporate, cooperative or individual business income or capital income—are a common feature of many countries' tax codes. The AFTD contains 221 instances of reduced rates and exemptions for PIT, CIT and capital income/gains tax, almost three quarters of which are exemptions (Table 3). Developing countries are somewhat more likely than high-income countries to offer exemptions than reduced rates for the PIT and capital income and gains taxes, but the reverse is true for the CIT. Income tax breaks range from broad, permanent measures applied to all agricultural and/or forestry income[7] to more narrowly tailored and temporary provisions, such as tax holidays and exclusions for certain types of activities (e.g., organic food production). While some of the income tax breaks apply to small farmers and foresters below an income threshold (e.g., Mexico and Turkey), the majority of AFTD income tax breaks are not subject to income limits, such that larger agribusinesses and forestry operations also benefit.

[7] See, for example, India and Vietnam.

Table 3. Income Tax Exemptions and Reduced Rates for Agriculture and Forestry

Tax Category and Income Group	Exemption	Reduced Rate	Total
CIT			
High-income	42	14	56
Developing	50	25	75
PIT			
High-income	31	11	42
Developing	24	2	26
Capital income or gains tax			
High-income	14	4	18
Developing	4	0	4
Total	165	56	221

Source: AFTD

Common income tax provisions to reduce after-tax agriculture and forestry investment costs include accelerated depreciation and/or capital allowances for investment. Some 38 AFTD countries (split evenly between high-income and developing) offer a total of 65 provisions for accelerated write-off of capital investment in the agriculture and forestry sectors. Accelerated depreciation, expensing and/or initial allowances may be applied to structures, land improvements, plant and equipment, and/or livestock[8]. Nine countries allow reforestation expense, which would otherwise be capitalized over the life of the asset, to be immediately expensed[9].

Several income tax provisions reduce the tax cost of farming and forestry by allowing more liberal accounting provisions than for other activities. Seventeen countries (11 high-income and 6 developing) allow more generous loss carry-forwards and other offsets for agriculture and/or forestry. At least four countries – all high income – allow income averaging across multiple years. These provisions help prevent volatile global commodity prices from resulting in over-taxation of farmers and foresters in high-price years that cannot be offset by losses in low-price years.

Several countries reduce farm and/or forestry costs via reduced taxation of financial products and services for those sectors. Ten countries offer exemption from income tax for agricultural loan interest, agricultural leasing income, or the investment earnings for agricultural investment funds, and five countries offer exemption of agricultural insurance income or insurance fund earnings.[10] Additionally, three countries that impose an insurance premium tax (Finland, Italy and the Netherlands) offer exemption for certain agricultural contracts. Conversely, Sri Lanka imposes a one percent income tax surcharge on financial company earnings to cover agricultural losses due to natural disasters.

RPT concessions are another common measure aimed at reducing farm and forestry costs. Some 29 countries offer full exemption from RPT for some or all agricultural properties, while 9 countries offer reduced RPT rates

[8] Though not tracked by this database, some countries also offer accelerated depreciation for the food processing industry, which can bolster demand for agricultural inputs.

[9] Colombia and India also allow a deduction for certain donations for afforestation.

[10] Additionally, Portugal exempts forestry income earned by a real estate investment fund.

and 3 offer valuation reductions. High-income countries account for most of these measures, with emerging market countries accounting for almost all the rest.
Several countries offer simplified accounting and compliance for agriculture and/or forestry. The most prevalent measure among these, offered by five countries, is cash flow accounting. In present value terms, cash flow accounting for income tax confers the benefit of investment expensing; however, cash flow taxable income may be higher or lower than accrual-based income in any given year, depending on investment dynamics.

Prevalent Indirect Tax Measures

Most countries offer general consumption tax (VAT or general sales tax, GST) breaks on some or all agricultural supplies (Table 4). These concessions, which include exemptions and reduced (including zero) rates, usually lower consumer prices and thus increase food affordability. Since VAT/GST typically applies to both imports and domestic production, VAT/GST food concessions increase the affordability of all food regardless of origin.

Table 4. Selected VAT/GST Measures

Selected VAT/GST Measures	Advanced	Developing	Total
Basic Consumption Basket	32	23	55
Exemption	2	10	12
Reduced Rate	30	13	43
Supplies	24	39	63
Exemption	7	22	29
Reduced Rate	17	14	31
Other	0	2	2
Inputs	38	45	83
Exemption	12	28	40
Reduced Rate	24	16	40
Other	2	1	3
Flat-rate farmer scheme	16	2	18
Simplified accounting	3	1	4

VAT/GST concessions for foods are common in both developing and developed countries. More than half of observed concessions relieve tax broadly on agricultural supplies, rather than a narrower list of items. The most common policy to promote food affordability is a reduced positive VAT/GST rate, but exemptions and zero-ratings are also common. Of the 55 countries offering VAT/GST food concessions, the majority (31) apply a reduced positive VAT/GST rate, with the remainder split evenly between VAT zero-rating and exemption. In AEs, reduced positive VAT rates account for three quarters of all VAT/GST food concessions. Low-income and emerging market countries rely exclusively on reduced rates (rather than exemptions) for food, and more than half of reduced VAT rates are zero-ratings.

Numerous countries offer VAT exemptions or reduced rates for agricultural and/or forestry inputs. The AFTD records 56 countries offering 83 different VAT/GST concessions for agricultural inputs. Roughly half of those concessions are exemptions, and of the 40 rate reductions about 40 percent are zero-ratings. High-income countries are more likely than developing countries to offer reduced VAT/GST rates rather than exemptions for agricultural inputs, but a smaller share of their reduced rates are zero-ratings.

Depending on the VAT treatment of agricultural supplies, reduced VAT/GST on inputs may raise or lower production costs or leave them unchanged. If agricultural supplies are VAT-taxable, reduced VAT rates for their inputs will likely have no effect, since any reduced VAT paid on inputs will likely be offset by reduced VAT credits netted against VAT charged on supplies. VAT exemption of inputs for taxable supplies may even raise farm costs due to unrecovered VAT charged on input components. If, however, agricultural supplies are exempt, then reducing VAT on inputs through either lower rates or exemption should reduce production costs[11]. Although VAT food exemptions may be aimed at promoting affordability, they can cause tax "cascading" from unrecoverable VAT on agricultural inputs, which raises production costs (and likely food prices). Exemption of foodstuffs thus often leads to political pressure to exempt agricultural inputs, or to zero-rate supplies and/or inputs.

Seventeen European countries and Korea offer a simplified VAT scheme for agriculture that simulates (zero-rate) taxation without requiring farmers to register for VAT. Switzerland and the Ukraine also apply this scheme to forestry. Under these schemes, farmers charge (and retain) an additional percentage on their sales to compensate them for VAT paid on their inputs, and VAT-registered buyers deduct that additional charge as a VAT input credit. Four countries also offer simplified VAT accounting schemes for the agricultural sector.

The most common sector-specific excise provision is reduced rates or exemption from fuel and/or carbon taxes in the agriculture and forestry sectors. Some 26 countries in the AFTD alleviate charges for those products through 28 different energy tax concessions. All but three of those countries are high-income, and the remainder are middle-income, suggesting that affordability may be a significant constraint on this tax concession. Other agriculture-related products benefitting from excise relief in some countries include biofuels, explosives, fertilizer, and water effluents.

Some countries that exempt agriculture and/or forestry from standard taxation impose simplified presumptive taxes on those sectors instead. The most common tax bases for presumptive taxes, which may replace income tax, VAT, social security contributions, or a combination of taxes, are turnover (sales) and property (e.g., land, cattle). The AFTD includes 21 presumptive tax regimes for agriculture and forestry, 13 from developing countries. Most high-income country presumptive regimes are based on some measure of property values (4 out of 6 regimes), while developing-country regimes are split about evenly between property and turnover taxes.

Several developing countries try to encourage local value addition by levying export taxes on unprocessed raw materials. By reducing the return to selling unprocessed products—e.g., logs—on the international market, export taxes make it relatively attractive to process products domestically. The AFTD notes these policies for raw logs and animal hides in six countries; however, as the IBFD and PwC do not comprehensively cover tariffs, the AFTD observations for trade taxes are not comprehensive.

[11] This dynamic can also arise in the case of a reduced rate on agricultural supplies, if VAT charged on inputs exceeds VAT charged on supplies and the VAT refund mechanism does not work smoothly, as is the case in many countries.

Environmental Tax Measures

Tax measures aimed at improving agriculture and forestry's environmental impact are increasingly common, particularly in higher-income countries. The AFTD identifies 58 measures as having a clearly positive environmental impact (Table 5). About three quarters of those measures are implemented by high-income countries and the remainder mostly by emerging market countries. The measures include both tax breaks for environmentally positive activities—notably organic farming and reforestation—and surtaxes on polluting products and activities, such as pesticides and fertilizers. Environmental tax breaks, which account for about one third of environmental tax measures, are most prevalent for income taxes, while environmental surtaxes are most prevalent for excises.

Table 5. Environmentally Positive Tax Measures

Tax Head	AEs	EMEs	LIDCs	Total
Excise	20	7	1	28
CIT	11	3	0	14
PIT/Capital Income	5	0	0	5
Property Tax	3	1	1	5
Transaction tax	1	1	0	2
Trade taxes	2	0	0	2
Turnover tax	0	0	1	1
VAT/GST	1	0	0	1
Total	43	12	3	58

Source: AFTD

The most common environmentally positive tax measure, implemented by 12 mostly high-income countries, is a "stumpage fee" or tax on tree felling[12]. Four countries impose extractive taxes on other forestry-related activities, such as hunting, that should similarly deter natural resource exploitation. Burundi imposes surcharges on cattle ownership and sales. While these instruments may have positive environmental effects, the original policy intention behind them may simply be revenue raising or a substitute for standard taxation of a hard-to-tax sector (i.e., a presumptive tax).

Other common environmental taxes include excises on pollutive inputs and outputs (emissions). Six countries impose excises on pollutive agricultural inputs, notably pesticides and fertilizers, and five countries impose pollution taxes on agricultural emissions, such as manure and fertilizer runoff. These charges are mainly levied by European countries – particularly eastern Europe – though some originate in other regions.

[12] The economic literature finds that stumpage fees, which reduce the return to tree harvesting, tend to lengthen "rotation periods" and promote longer tree life See Matheson (2021) for a summary of this literature. Excessively high stumpage fees could, however, deter forestry activities, which could have negative environmental impacts if the alternative use is not wilderness. Poland varies stumpage fees by tree age at harvest, imposing higher fees on younger harvested trees.

IV. Agriculture and Forestry Tax Expenditure Estimates

This section presents preliminary estimates of forgone revenue associated with the TEs identified in the AFTD and measuring their correlation with policy outcomes of interest. International practice for the definition of TEs and quantification of associated forgone revenue varies considerably (World Bank, 2024). For purposes of this paper, we take the benchmark regime (counterfactual without TEs) to be the general statutory tax rates applicable in each country; alternative approaches could yield different estimated magnitudes.
To ensure a comparable quantification across countries and different types of TE measures, simplifying assumptions were made in the estimations that follow, which (i) rely on aggregate proxies for tax bases and rates widely available for most countries, and (ii) aim to provide an upper and lower bound range given the large variability in the applicability of TEs across countries and over time (i.e., the specificity of the deviation from a benchmark tax regime).[13] Only taxes whose bases can be readily proxied through national accounts data (i.e., PIT, CIT, and VAT) are covered. Ideally, country-specific micro-founded estimates based on actual taxpayer records or household survey data would provide a more accurate picture of the true magnitude of these measures. Notwithstanding, we see this initial attempt at building a cross-country comparable set of estimates as useful to guide policymakers and help researchers identify tax incentives most likely to merit further in-depth research.

Simplifying assumptions were made to establish the special rate applicable for preferential tax regimes, along with the relevant proxy bases. The forgone revenue was estimated for each TE to be the difference between the standard rate for the regime and the preferential rate (assumed to be zero for income tax exemptions), multiplied by the relevant tax base as a share of GDP for the latest year of data available. These were then summed at each individual country level by category of TE/tax instrument. **Table** 6 summarizes these methodological simplifying choices for ease of comparability.

For CIT, the proxy tax base is net operating surplus of the agricultural and forestry sector, estimated as the product of agriculture and forestry value-added share of GDP and net operating surplus in the whole economy.[14] For PIT, if the TE applies to farm worker wages, the proxy tax base is taken to be the estimated share of agricultural sector in national compensation of employees, and the standard rate to equal that of the lowest non-zero PIT bracket. On the other hand, if the TE applies to overall farm income or turnover,[15] the proxy tax base is taken to be the agricultural share of net mixed income, and the standard tax rate equal to the statutory CIT rate.

[13] These are also intended to be more comparable than forgone revenue estimates available on a provision by provision basis from GTED, which is based on often very different country-specific methodologies and data availability. We do not attempt to match these to GTED's given the degree of country-specific methodological noise.

[14] Ideally, one would further refine this proxy base and bring it closer to the actual corporate income tax base (which allows for deductions of (at least some) debt financing costs, loss carryforwards and other differences described in Ueda (2018)). Ueda (2018) includes illustrative statistics for the United States of the adjusted proxy taxable base being around ¾ of net operating surplus. While we could adjust our estimates of forgone revenue below downward by that factor, to the best of our knowledge there is no credible cross-country comparison of these base adjustments across countries that we would find adequate for application for LIDCs, for example, which show the largest magnitude of estimated forgone CIT revenue here, so we do not incorporate that adjustment.

[15] We did not quantify forgone revenue attributable to the existence of a presumptive tax regime for agriculture per se, given the complexity in defining the comparable benchmark regime.

The methodological approach to estimating VAT TE forgone revenue is similar to that applied to income TEs. Value-added from the agricultural and forestry sectors in national accounts was the proxy for the VAT base. This base does not allow us to differentiate between VAT TEs on food, agricultural supplies or inputs, and therefore our estimates are based on an unweighted average of the preferential rates applicable across all such TEs in a given country. The relationship between production and consumption of agricultural products in a given country and associated tax expenditures may bias our estimates upwards in cases where preferential rates are granted primarily on agricultural inputs only, but outputs taxed fully. Bias correction would require some measure of the input and import shares of agricultural output for all countries in the sample, which were not readily available at the time of writing this paper, but could be considered for further research. Exemptions are treated as zero-rated for estimation purposes.

Table 6. Summary of Proxy Bases and Key Parameters for TE quantification

Tax	Proxy Base in National Accounts	Benchmark Rate	Preferential Rate
CIT	Net operating surplus of the sector	Statutory CIT rate	Rate set by the regime, or zero if exemption
PIT – farm worker wages	Sectoral share of national compensation of employees	Lowest non-zero PIT bracket	Zero if exemption
PIT – farm income	Sectoral share of net mixed income	Statutory CIT rate	Rate set by the regime, or zero if exemption
VAT	Value-added from the sector	Standard VAT rate	Rate set by the regime, or zero if exemption

Overall forgone revenue from agricultural TEs has a wide range across regions and income groups. We calculate a range of likely forgone revenue estimates by country and tax head. Given the uncertainty in the aggregate estimation just described, we first produce a “lower bound” estimate for each tax head-country pair, which includes only TEs whose base closely approximates a particular national accounts’ measure of income/expenditure (e.g., an income tax exemption for all agricultural income, or VAT zero-rating for all agricultural output). We then calculate an “upper bound” estimate which uses national accounts proxies for the tax base that are broader than the TEs identified in the AFTD (e.g., income tax exemption for agricultural cooperatives, VAT zero-rating for specific agricultural outputs or VAT exemption for all agricultural output). The “upper bound” is by construction likely to be an overestimate of the true fiscal cost of these measures but can still have illustrative value regarding their magnitude.

In addition to the simplifying assumptions over proxy base choice just described, these estimates importantly do not account for the magnitude of the informal sector, which could reduce the potential tax base substantially. IMF (2021) estimates the general informality rate at 35 percent of GDP in EMEs and LIDCs and 15 percent in AEs, and agricultural informality rates are likely even higher. Similarly, a large number of even formal farmers falling below high VAT registration thresholds or PIT allowances could bias our estimates upwards, since the true potential tax base is overstated by relying simply on national accounts variables as proxies. Our estimates

of forgone revenue could therefore reasonably be adjusted downwards by 35 percent or more for low and middle-income economies.

On average, we find that agricultural TEs are approximately 0.7 percent of GDP (lower bound) or 1.6 percent of GDP (upper bound), which suggests that the value of agricultural tax expenditures exceeds that of subsidies.[16] However, the global average belies a sharp difference between LIDCs and higher-income groups. Figures 6-11show the distribution of the total estimated fiscal costs associated with agricultural and forestry TEs in the cross-section of countries in our sample, as a share of GDP. Estimated forgone revenue is highest for AFR and low-income countries at 2-5 percent of GDP (or 1.3-3.5 percent of GDP adjusted for informality), and it is lowest for EUR, APD and AEs at 0.2-1.2 percent of GDP. As a reference point, overall average reported forgone revenue from tax expenditures worldwide is in the order of 4.9 percent of GDP in 2024.[17] In the lower-bound estimates (Figure 11), CIT has the largest source of revenue loss in the agricultural sector, followed by the VAT; but in the upper-bound estimates (Figure 10) that order is reversed.

Figure 6. Average Tax Expenditure (Forgone Revenue in % of GDP) by Region (Upper bound)

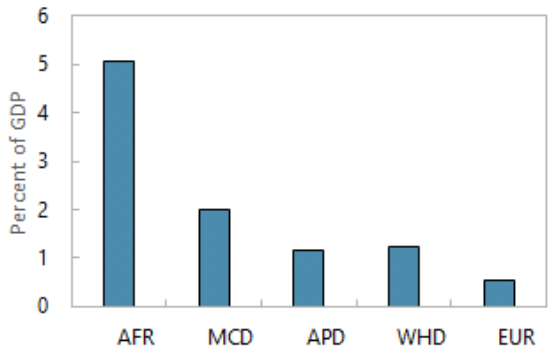


Figure 7. Average Tax Expenditure (Forgone Revenue in % of GDP) by Region (Lower bound)

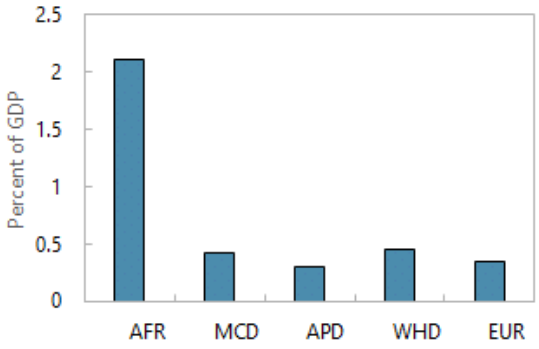


Figure 8. Average Tax Expenditure (Forgone Revenue in % of GDP) by Income Group (Upper bound)

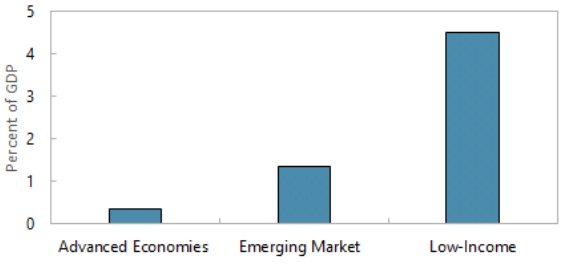
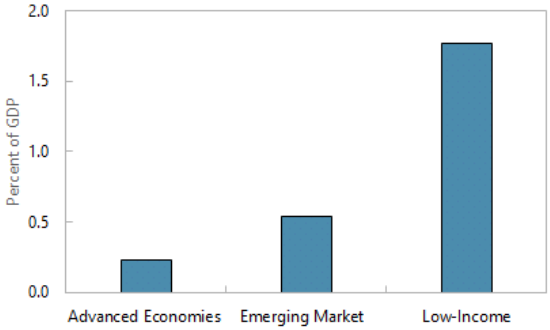


Figure 9. Average Tax Expenditure (Forgone Revenue in % of GDP) by Income Group (Lower bound)



[16] FAO (2023) finds average subsidy values of 0.4-0.7 percent of GDP.

[17] See https://gted.taxexpenditures.org/. Note those reported estimates are not strictly comparable across countries since different countries use different methodologies to classify measures as tax expenditures and calculate the respective forgone revenue.

Figure 10. Tax Expenditure (Forgone Revenue in % of GDP) by Category and Income Group (upper bound)

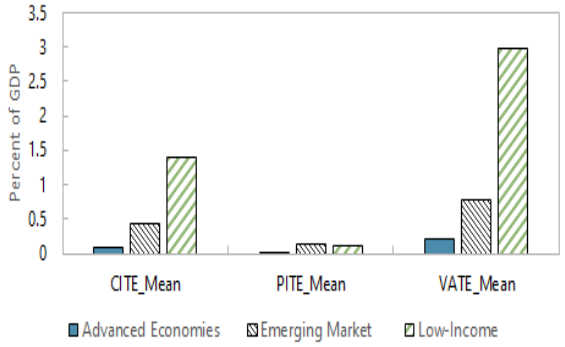
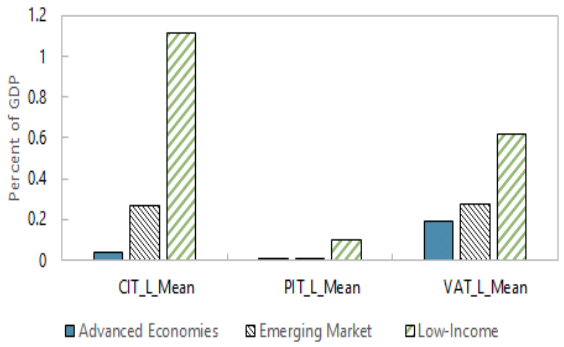


Figure 11. Tax Expenditure (Forgone Revenue in % of GDP) by Category and Income Group (lower bound)



Source: Authors calculations.

Import Tariffs

This section assesses the extent to which tariff policy favors or penalizes agricultural trade, with a focus on revenue and policy implications. Many countries adjust tariffs on food or agricultural inputs to promote food security (affordability and/or domestic production). To quantify the implied fiscal cost or gain from such adjustments, this analysis examines average applied tariff rates across different agricultural product categories, compared against each country's average tariff across all goods. Note this comparison (and estimated relative fiscal impact) does not constitute an estimation of forgone revenue associated with tax expenditures, since we do not measure a deviation from a clear benchmark system. In contrast, tax expenditures in the context of customs tariffs would typically entail an exception to the standard customs schedule (e.g., in the context of an exemption for imports by agricultural companies, or special customs treatment of certain products outside of the customs schedule itself).[18]

Tariff data are sourced from the WTO WITS database most favored nation (MFN) applied rates. Four broad agricultural categories are considered: (i) agricultural inputs (e.g., fertilizer, seeds); (ii) food products; (iii) non-edible agricultural outputs (e.g., lumber, tobacco, cut flowers); and (iv) products subject to special treatment (e.g., tobacco). For each country, the average tariff in each category is compared to the national average across all imports. The resulting tariff differential reflects the degree of preferential (tariff differential < 0) or protective (tariff differential > 0) treatment. To ensure comparability among AEs, the European Union was treated as 27 individual countries when calculating group averages, given the bloc's common external tariff and sizable influence on global trade patterns.

To summarize results at the country level, category-level tariff differentials are weighted by the import share of each sub-product within the relevant category, per the formula below, where: D represents the applied MFN tariff differential between HS code *i* and the average MFN across all products for country *j*; M_{ij} represents the

[18] Less commonly, a benchmark system for customs tariffs could be defined as the conceptual ideal of domestic and imported goods being subject to the same taxes (i.e., free trade/zero tariff), which would imply negative tax expenditures whenever tariff rates are positive.

import value of product *i* into country *j,* and M_{cj} represents the total value of imports within that product's broader subcategory (e.g., food products, agricultural inputs, etc), with the weights applied at a country/product category level for all N subproducts in *c*. This yields a weighted average tariff differential for each agricultural category per country. A notional relative fiscal contribution is then calculated by multiplying the differential by the corresponding import value, summed across sub-products and expressed as a share of GDP.

$$\sum_{i=1}^{N} \frac{D_{ij} \cdot M_{ij}}{M_{cj}}$$

Tariff policy on food products tends to be protective in both developing and AEs. Figure 12 shows that the weighted-average MFN tariff on food products exceeds the average for all products by approximately 3⅓ percentage points in both low-income and emerging market economies, and just over 2 percentage points in AEs in our sample.[19] This suggests a policy tendency for all economies to shield domestic food production and/or raise revenue from food imports, although in LIDCs certain agricultural products are actually subject to below-average tariffs.[20]

Figure 12. Weighted Average MFN Tariffs: Food vs All Products (ad-valorem percentage points)

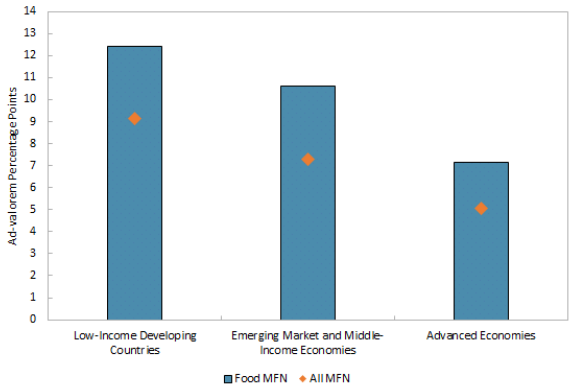
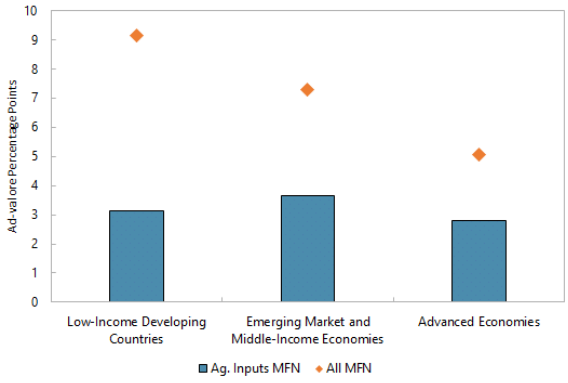


Figure 13. Weighted Average MFN Tariff Difference: Agricultural Inputs vs All Products (ad-valorem percentage points)



Sources: WTO, WEO, and IMF staff calculations.

By contrast, tariff policy toward agricultural inputs is preferential in nearly all country groups. Figure 13 shows that agricultural input tariffs fall significantly below the national average tariff level. The average MFN tariff differential for inputs is approximately -6 percentage points in low-income developing countries, -3⅔ percentage points in AEs, and -2¼ percentage points in AEs. This pattern likely reflects policy efforts to reduce input costs for farmers, thereby supporting domestic production. The deepest discounts are observed in low-income developing countries, consistent with their greater emphasis on food security and higher average tariff rate.

[19] Note that the general weighted-average tariff declines with income level, rising from 5.1 percent for AEs to 7.3 percent for EMEs and 9.1 percent for LIDCs.

[20] Examples include cereals in Zimbabwe, Madagascar, or Lesotho (with a 10, 8 and 6.5 percent lower tariff than the average across all products in those countries, respectively). This policy appears likely to reflect insufficient domestic production of certain foods, but given the relatively high tariff rates in low-income economies, it is unclear whether it improves food access.

The tariff structure on agricultural goods is associated with different customs revenue contributions, depending on the direction of tariff differentials and magnitude of imports. To understand the relative magnitude of these contributions, we applied each country's average tariff differential to import values by product category, expressed as a share of GDP.

Food imports are associated with positive relative revenue contributions across all country groups, indicating that food tariffs tend to exceed the national average and thus generate more revenue than average imported goods. Revenue corresponding to food tariff differentials are largest in low-income developing countries, where food imports represent a larger share of GDP (around 4 percent compared to 1 percent in higher income groups), averaging 0.12 percent of GDP. In emerging and AEs, the average revenue gain is close to negligible, at less than 0.05 percent of GDP, consistent with their lower food import dependence and import tariff differentials.

Conversely, agricultural inputs are associated with slightly lower customs revenues than average, reflecting below-average tariff rates. All country groups provide implicit support to farmers by reducing tariffs on inputs. However, the revenue differential associated with this implicit support is estimated to be close to negligible and varies by income level: only 0.05 percent of GDP in low-income developing countries, and less than 0.01 percent of GDP in emerging and AEs. Since relative revenue yields from tariff differentials on food imports are generally greater than lower relative revenue yields from negative differentials on agricultural inputs, tariff policy for agriculture as a whole raises net revenues that partially offset domestic TEs for the sector.

V. Conclusions and Areas for Further Research

Summary of findings

This paper seeks to supplement the existing literature on agricultural fiscal treatment, which focuses largely on tariff and expenditure policies, with improved information on domestic agricultural tax policy. To that end, we construct a global cross-sectional database of sector-specific agricultural tax measures, which provides a detailed inventory of almost 950 tax measures currently applied in agriculture and forestry by countries across all regions and income levels. The paper also offers preliminary estimates of the revenue impact of VAT and income tax expenditures, as well as import tariff differentials for the agricultural and forestry sectors, which can be integrated with existing measures of trade taxes and subsidies to obtain a more complete understanding of agriculture and forestry's fiscal profile.

We find that agricultural TEs are both common and costly: Close to 90 percent of sectoral measures reduced taxes on agricultural producers and/or products. Tax concession patterns reflect the general composition of country revenues: CIT and VAT account for the largest number of TEs across all country groups, while PIT and excise concessions are most prevalent among AEs. Property tax concessions are more common among AEs and EMEs than among LIDCs. The authors estimate the fiscal cost of selected income and indirect TEs for the agricultural sector at 0.7-1.6 percent of GDP globally. This compares with agriculture's direct expenditure costs of 0.3-0.7 percent of GDP estimated by FAO (2022), suggesting that agricultural TEs likely exceed agricultural subsidies. The global average of agricultural TEs conceals a large disparity among income groups: Agricultural TE estimates range from 1.8-4.5 percent of GDP for LIDCs (most of which are in the AFR region), 0.5-1.35 percent of GDP for EMEs, and 0.2-0.4 percent of GDP for AEs.

Trade policies respecting agricultural goods and inputs are similar across income groups and regions: all countries tax food imports more heavily than average while relieving import duty on agricultural inputs.[21] Since the former effect is larger, most countries have positive net agricultural trade revenue contributions that partly offset their agricultural domestic TEs. The size of the rate reduction on agricultural inputs is inversely related to country income: low-income countries, which have higher average tariff levels, reduce agricultural input tariffs about twice as much (six percentage points) as emerging and AEs.[22] Net trade tax revenue associated with these tariff differentials, which is negative for agricultural inputs but overall positive due to protection of domestic agricultural products, claw back almost 0.1 percent of GDP among low-income countries but only about 0.025 percent of GDP in higher-income countries.

By showing the most common tax policies applied to the agricultural sector, the AFTD suggests certain "stylized facts" of agricultural tax policy that should facilitate policy modeling and analysis. A common feature of most countries' fiscal system is the combination of elevated customs duties and VAT/GST concessions for foodstuffs. This combination suggests that food security is a primary motivation driving agricultural taxation. Reduced VAT/GST rates on foods make them more affordable, while elevated customs duties—though raising the domestic price of food—favor domestic production over imports. While affordability of basic necessities to the poor is usually of greatest policy concern, households at all income levels benefit from reduced food prices.[23]

The plethora of tax breaks for agriculture and forestry operators suggest that stimulating domestic agricultural activity (both investment and employment) is another important policy motivation. Unlike elevated food tariffs, these concessions complement reduced VAT/GST rates to promote food security. As with most investment tax incentives, there are two basic approaches: Profit-based incentives, such as income tax reduced rates and exemptions, and cost-based incentives, such as reduced indirect taxes on inputs or accelerated capital cost recovery allowances. Cost-based incentives comprise a wide range of tax instruments including income, indirect and property taxes. IMF (2015) discusses the relative efficacy of profit-based and cost-based incentives, finding that the latter are generally more efficient. Lowering taxes on production generally improves efficiency[24] provided that the taxes are not externality-correcting, such as fossil fuel excises, and that the tax is not a "benefit tax" that compensates for government services. Nonetheless, although input tax breaks may improve allocative efficiency within the agriculture and/or forestry sectors, different treatment from other economic activities may detract from broader allocative efficiency.

Another common motive for many agricultural tax provisions is administrative simplification. Compliance with VAT and especially income tax could be burdensome for smaller farmers and foresters, particularly in developing countries. Most countries' income tax and VAT legislation includes thresholds that reduce or eliminate compliance obligations for small businesses and/or low-income taxpayers that should alleviate compliance for small farmers. However, agricultural concessions often extend to large agricultural operators for whom compliance should not be excessively burdensome. Exemption of agricultural activities from standard

[21] See Figures 12 and 13 in previous section.

[22] The WATR for advanced economies is 7.1 percent; for emerging market economies 9.2 percent, and for low-income countries 11.3 percent.

[23] In practice, the literature suggests these types of tax expenditures are often poorly targeted, particularly in low-income and emerging market countries, where consumption taxes are made progressive by the de facto exemption of the informal sector (unregistered, small-scale sellers). See Bachas et al (2024).

[24] See Diamond and Mirrlees.(1971).

income and consumption taxes is sometimes accompanied by presumptive taxes on simplified proxies for agricultural income, such as turnover, land or cattle.

Agriculture and forestry have numerous environmental impacts, due to pollutive inputs (e.g., pesticides and fertilizers), agricultural emissions (e.g., manure and methane from cattle and rice cultivation), and deforestation (e.g., land clearing for agriculture, fuel and other types of development). Nonetheless, dedication of land to agriculture and especially forestry may also have positive environmental impacts, if the alternative land use (e.g., suburban development or industrial use) is more pollutive than agriculture or forestry[25]. Conversely, if the alternative land use is wilderness (e.g., national parks), then agriculture or forestry may be more pollutive. General stimulus measures for agriculture or forestry therefore have an ambiguous environmental effect.

Box 1 presents a preliminary analysis of some potential policy motivations for agricultural TEs – food insecurity, fuel and fertilizer dependency, and GHG emissions.

Areas for Further Research

As a first step, the AFTD could benefit from expansion and methodological refinement. Although every effort was made to ensure the AFTD's completeness, there will inevitably be gaps to fill, and existing entries will require updating in response to repeals or reforms. Establishing the AFTD as an open-source database could assist with this process, so that both authors and users can contribute. More comprehensive coverage of export taxes on agriculture and forestry could potentially be sourced from WTO WITS data.

The forgone revenue estimation methodology could also be further developed. For example, applying progressive PIT marginal schedules to distributional estimates of individual agricultural income across countries could provide more precise estimates of the magnitude of these incentives. Likewise, country-specific estimates of narrower sets of TEs of interest (based on administrative taxpayer data), such as VAT TE forgone revenue associated with basic food items only, could be compiled to provide more informative guidance on key policy areas of focus. In addition, the TE forgone revenue estimation could be expanded to include TEs associated with excise taxes and relatively understudied export taxes (many of which may have negative forgone revenue), whose rates are not readily available through standard cross-country databases, unlike for import tariffs or more standardized tax instruments (e.g., VAT, CIT).

The AFTD shows that agriculture and forestry are subject to a variety of special tax provisions—as well as subsidies and regulations—that likely interact with each other. Formal modeling of the sectors, particularly a general equilibrium model incorporating tax treatment of inputs, outputs, trade and consumption, would be useful to determine the most effective policies for stimulating (agricultural) economic activity and promoting food security. Similarly, the interaction of various fiscal instruments aimed at promoting socio-economic objectives with environmental sustainability policy objectives for the sector merit further modeling and quantitative research into their interactions.

[25] Poland, the Czech Republic and China use innovative surtaxes on agricultural and/or forestry land converted to other uses.

Box 1. Policy Motivation Analysis

Forgone revenue from agricultural TEs is positively correlated with key policy outcomes of interest, such as food insecurity, fertilizer dependency, but negatively so with carbon emissions intensity in the sector. By construction, countries with larger shares of agricultural value added and/or employment are likely to have larger estimated fiscal costs associated with tax expenditures granted to the sector. More interestingly, the magnitude of the fiscal cost of these TEs is positively correlated with moderate or severe food insecurity, suggesting a poverty reduction motive for the existence of the incentives, particularly for overall agricultural supplies (and not restricted to the consumption of basic food products, as could be expected). On the production side, TEs for countries with preferential VAT rates for agricultural inputs are also positively correlated with fertilizer import dependency ratio. Figures 14 and 15 illustrate these relationships based on data from the IMF's Food Insecurity Assessment Tool, which assesses countries' vulnerability to food insecurity

Figure 14. Correlation between Agriculture and Forestry TEs and Prevalence of Food Insecurity

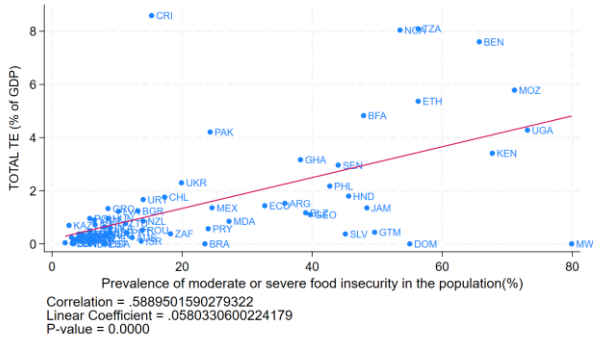


Figure 15. Correlation between TEs on Agricultural Inputs and Fertilizer Import Dependency

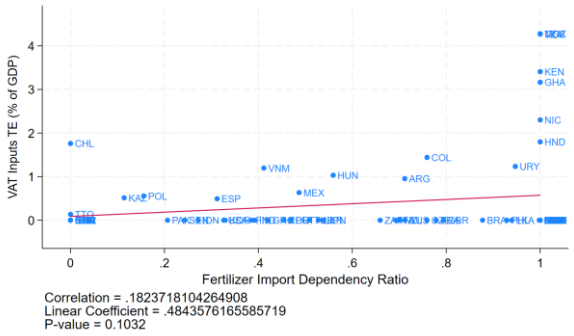
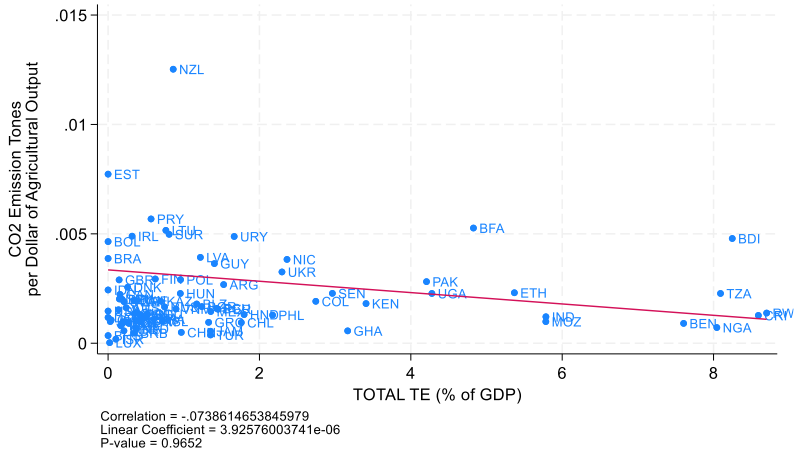


Figure 2. Correlation between CO2 emissions and Agriculture and Forestry TEs



Sources: AFTD, IMF Food Insecurity Assessment Tool, and Climate Trace.

By contrast, agricultural TEs seem to be negatively correlated with the carbon emissions intensity of agricultural output value, based on data from Climate Trace for the sector (Figure 16). Although these correlations cannot be used to infer causality between policy intentions and outcomes, they suggest most of the fiscal cost associated with agricultural sector TEs is currently benefiting relatively low greenhouse gas emitting production, mostly in developing countries.

Annex A – Database construction

To build the database, text data related to agriculture and forestry taxation was extracted mainly from IBFD reports, supplemented by PWC reports. The latest available country reports on corporate and personal income tax, and the reports on value added tax if available, are the primary text data source of the AFTD database. A comprehensive methodology combining natural language processing (NLP) techniques and human expertise inputs was then conducted in several key steps.

First, an initial set of keywords that were representative of the agricultural and forestry sector was developed by the authors, such as "farm", "agriculture", "food", "pesticide", and "forest". With the text data source mentioned above, a word embeddings model was trained using the initial set of keywords to identify additional terms that were closely related to the agricultural and forestry sector. This helped to expand the list of keywords to include relevant variations and synonyms, ensuring a comprehensive extraction process. The machine-learning model generated a list of the most similar words to the initial keywords. The authors then reviewed and finalized this list to ensure all relevant terms were included for effective text extraction. This refined list of keywords included terms such as "farm(s)", "agriculture", "pesticide(s)", "forest(s)", and many others[26]. Using the finalized list of keywords, relevant sections of text were extracted from the IBFD and PWC reports. This included extracting both the text blocks and the titles of the sections in the reports where the keywords were located.

In addition to the machine-enabled text block extraction, we took several steps to manually clean the data. We eliminated the mis-extracted or duplicated excerpts by reading through the text blocks and added short description to each of the excerpts. The extracted text blocks were categorized by country, data source, tax category (e.g., CIT, PIT, VAT), and specific tax measures (e.g., exemptions, reduced rates, deductions). The different tax measures were further classified as tax increasing measures or tax decreasing measures. For the exemption and rate reduction tax measures where a specific reduced rate (or zero-rated) could be mentioned, the special rates and the standard rates were extracted and labeled respectively for quantitative estimation of TE. The classification and cleaning process allowed for a structured organization of the data.

[26] The full key words list: "farm(s)", "agriculture", "food", "pesticide(s)", "fertilizer(s)", "forest(s)", "crop(s)", "grain(s)", "animal(s)", "pasture(s)", "farmland(s)", "insecticide", "farmer(s)", "seed(s)", "horticulture", "wood(s)", "staples", "cultivate", "cultivation", "cultivating", "farming", "breeding", "breed", "cattle", "livestock", "agribusiness", "farmhouse", "agritourism", "agrochemicals", "agroindustrial".

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