CHAPTER 2

COORDINATING TAXATION ACROSS BORDERS

Introduction

International coordination on tax matters is needed now more than ever. National governments share challenges in securing revenues, addressing inequalities, and curbing greenhouse gas emissions. Succeeding in these efforts increasingly requires dealing with pressures that cannot be stopped by national borders. These cross-border spillovers—the effects of one country's actions on other countries—necessitate international coordination. The most pressing areas for coordination are the taxation of multinational enterprises (multinationals) and individuals, as well as carbon pricing.

Recent achievements toward international tax coordination include the agreement in October 2021 under the Organisation for Economic Co-operation and Development (OECD)/Group of Twenty (G20) Inclusive Framework to reform the taxation of multinationals (OECD 2021d), international agreements to exchange information led by the Global Forum, and countries' pledges under the Paris Agreement and the UN Climate Change Conference at Glasgow (COP26) to reduce emissions.[1] However, much more should be done.

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[1]The OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting (BEPS) was established in 2016 for countries to collaborate on implementing the initiative (it currently has 141 member countries and 14 observer organizations). The Global Forum refers to the Global Forum on Transparency and Exchange of Information for Tax Purposes, founded in 2000 (currently with 163 members). *COP26* is the 26th Conference of the Parties (the supreme decision-making body of the United Nations Framework Convention on Climate Change, or UNFCCC). The *Paris Agreement* is a treaty adopted by 196 parties at the COP21 in 2015.

The rising need for international coordination on taxation stems from three developments in the past few decades:

- *Globalization and digitalization* of the economy have created opportunities for development but have also intensified the mobility of the income tax base (profits and personal income) and factors of production (capital and, increasingly, people). Global firms draw on global supply chains to serve global markets, with increased possibilities for generating large profits without physical (taxable) presence. All of these developments have tax implications, which, without coordination, can adversely affect efficiency, distribution, and in some cases, international economic and trade relations.
- *Salience of aggressive tax avoidance and outright tax evasion* has raised demands for fairer and less unequal societies. This call is fueled not only by leaks of documents showing widespread egregious use of offshore opaque structures, but also by systematic evidence of weak tax compliance by rich individuals. As it becomes possible to transfer funds across borders through virtual assets with near anonymity, tax administrations—especially in developing countries—struggle to keep up, even as they upgrade their own use of technology to collect and process data to identify compliance risks.
- *Climate change*—a vital global challenge—demands urgent measures to curtail emissions. Carbon taxation (charges on the carbon content of fossil fuel supply) or other carbon-pricing or regulatory policies aimed at discouraging emissions can make a difference only if adopted by enough large emitters. If carbon pricing cannot be internationally coordinated, then other unilateral approaches would likewise entail international elements.

This chapter opens with brief general considerations for addressing cross-border tax spillovers. Next, the chapter addresses how international coordination can improve the taxation of multinationals and individuals and reduce greenhouse gas emissions. The discussion is framed around improving existing international coordination arrangements, with special attention to the standpoint of developing countries.

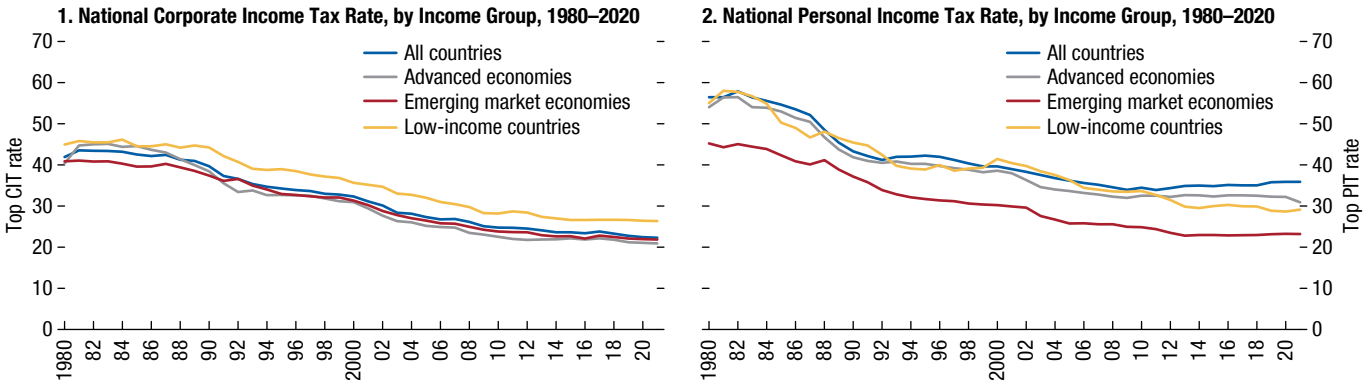
Coordinated Approach to Global Tax Challenges

From a global perspective, uncoordinated tax interactions among independent jurisdictions, with their different objectives, often lead to unsatisfactory outcomes. To illustrate, if a country lowers its tax on capital, it attracts tax bases from other countries in the form of real capital or "paper" profits, even without real capital movement (that is, profit shifting). The corresponding contraction in the other countries' tax base lowers those countries' tax revenues. Also, spillovers do not end with profit and capital movements. The other countries are under pressure to lower their capital taxes, too, with further repercussions. A similar interaction can occur in the context of taxing the rich. This "race to the bottom"—which can result in inefficiently low taxation and hence insufficient public investments and social expenditures (Keen and Konrad 2013)—has been reflected in the downward trends of corporate and top personal income tax rates (Figure 2.1).

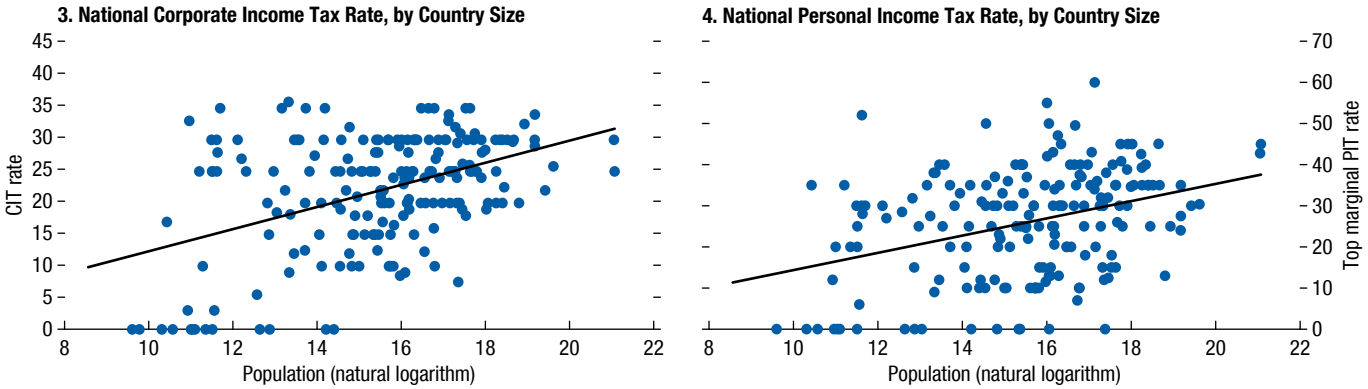
Depending on context and specifics, international coordination on the level or location of taxation can improve global outcomes with or without disadvantaging some countries. In federations, tax competition can be alleviated, and compensation can take place through fiscal transfers between subnational governments or through central policies. However, countries need to find common ground in coordination and be guided by economic assessment to understand global and country-specific effects. The ideal assessment entails comparing coordination options not only with the status quo, but also with counterfactuals of *futures*, with and without coordination. For example,

Figure 2.1. National Corporate and Personal Income Tax Rates, by Income Group and Population
(Percent)

Corporate and personal income tax rates have been declining for decades.



Large countries have higher tax rates.



Source: IMF staff calculations.
Note: CIT (PIT) denotes the statutory corporate (top marginal personal) income tax rate, obtained from the IMF Fiscal Affairs Department Tax Database. CIT = corporate income tax; PIT = personal income tax.

unchanged policies may be more beneficial now but less beneficial in the future relative to coordinated outcomes.

Coordination in tax matters is challenging because countries' interests diverge with their characteristics, including the size of their economies and populations. The cost of lowering the tax rate is generally higher for larger economies because they have a larger domestic, relatively *immobile*, tax base. For larger economies, cutting the tax rate (in response to competition pressures on the *mobile* base) means collecting less revenue from the (large) immobile base. This explains why small countries tend to have lower taxes (Figure 2.1). Small, low-tax countries have attracted high shares of international investment (they frequently reach the top of the list of investment countries worldwide), corporate profits (with an estimated 11–36 percent of multinational profits in small low-tax jurisdictions), and global wealth stock (with 8 percent of worldwide financial household wealth).[2] But even (small) low-tax countries incur costs from tax competition to attract a foreign tax base. The costs can take various forms, including unilateral countermeasures (tax and nontax) imposed by other countries and reputational risks that affect some investors' decisions.

In analogy to income tax competition, uncoordinated attempts to discourage greenhouse gas emissions face national hurdles. Higher carbon pricing in one country, for instance, increases the costs for its domestic producers, posing competitiveness concerns and potentially motivating production and emissions to move to other countries (that is, carbon leakage). Even if some countries begin implementing domestic mitigation policies, others may wait to benefit from avoiding the costs of reducing emissions. This "free-riding" issue, together with competitiveness concerns, hampers global progress on emission reduction.

In contrast with the vital role of small countries in hosting global income and wealth, a handful of large economic regions account for the majority of global emissions. International coordination could therefore generate significant progress—at least initially—in a setting with fewer participants. For example, China, the European Union, India, and the United States together are responsible for 64 percent of global emissions (Parry, Black, and Roaf 2021).

Differences among countries' incomes raise further challenges to coordination. Whereas high-tax advanced economies and developing countries face similar tax base erosion challenges, the latter countries tend to import capital, have far fewer multinational headquarters, and face harder capacity constraints in tax enforcement. An agreement must reconcile the interests of developing countries and advanced economies. Within each set, countries are different, for example, in the relative importance of specific sectors such as digital-heavy companies, natural resources, and financial firms.

The form of coordination can facilitate agreement. For example, regarding corporate income taxation, combining zero-sum reallocation of revenues with a revenue raiser facilitates agreement (as discussed in the "Corporate Income Tax Coordination" section). Coordination of mitigation policies among key large emitters could be effective in the immediate term and would constitute an important start (as discussed in the "Carbon-Pricing Coordination" section).

Countries' common interests can become more coherent in the face of a common threat. Following the global financial crisis, countries agreed on reforms to mitigate risk within the international banking sector (Basel III, in 2009). Climate change is a shared serious threat, but commonalities are masked by differences in discounting short-term versus long-term benefits.

The legal coordination modality also matters in shaping agreement. In practice, coordination can take the form of either "hard law" (with binding legal obligations for the country, for example, through a treaty) or "soft law" (based on political commitments, for example, to international standards) (Table 2.1). A soft-law approach typically offers more flexibility for domestic implementation and can be coupled with a monitoring mechanism (for instance, peer review) to ensure continued commitment to the agreement. The Paris Agreement is often described as combining both hard law (on mandatory transparency) and soft law (on enforcement).

[2]Data on international investment, corporate profits, and global wealth stock for small, low-tax countries are from the IMF Coordinated Direct Investment Survey (https://data.imf.org/?sk=40313609-F037-48C1-84B1-E1F1CE54D6D5); Beer, de Mooij, and Liu 2020, Table 3.9 in OECD 2020, and Tørsløv, Wier, and Zucman 2021; and Zucman 2013, respectively.

Table 2.1. Hard and Soft Laws Regarding International Coordination, in Practice

Method of Coordination	Hard Law	Soft Law
Modality	Creation of legally binding obligations	Entry into political commitment
Implementation	Recognition of hard-law instrument	Greater choice of instruments
Enforcement	Remedies for breach of obligations	Monitoring mechanisms (possibly with peer review)
Examples	Tax treaties, WTO rules, EU treaty	BEPS initiative, Basel III

Source: IMF staff compilation.

Notes: BEPS = base erosion and profit shifting; EU = European Union; WTO = World Trade Organization.

Corporate Income Tax Coordination

At a Glance

- The historic October 2021 Inclusive Framework agreement is a watershed moment in international corporate tax coordination, demonstrating that countries can jointly make progress in response to a global challenge.
- Allocating a portion of the tax to market countries is new and efficient, offering a preferable multilateral approach to unilateral digital-services taxes.
- Implementing a global minimum corporate income tax would reduce pressures from profit shifting and tax competition, raising global corporate income tax revenues by about 5.7 percent through the top-up tax and potentially by an additional 8.1 percent through reduced tax competition.
- Domestic tax reforms would be key to complementing the revenue gains from the agreement, including revisiting wasteful tax incentives and better taxation of monopolistic rent on efficiency, equity, and revenue grounds.
- Future coordination efforts should focus on addressing remaining needs of low-income countries.

The historic October 2021 agreement is a watershed moment in international tax coordination that could not have been politically envisaged even a few years ago. Implementation risks and potential refinements, though, continue to be at the forefront, as do broader challenges in taxing multinationals. This section reviews broad outcomes of the agreement and outlines potential further reform directions.

Two questions are at the heart of the ongoing discussion on coordinating taxation of multinationals:

- *Where to tax?* Current outdated arrangements, loosely, split the place of taxation between a headquarters (residence) country (which taxes the foreign "passive" incomes of its multinational affiliates abroad, such as interest income) and a source country where production is located (which taxes the "active" income of the multinational affiliate physically present in the country). This distinction is meant to prevent double taxation when both countries claim to tax a multinational. It is not fit, however, for a digitalized globalized economy, considering it ignores a third possible location of taxation, namely, that of consumers and users (in the destination, or market, countries). For example, under current arrangements, digital-heavy companies can generate profits without a taxable physical presence in a country. This situation has triggered controversial unilateral digital-services taxes, often in the form of a tax on turnover from specific digital activities, spreading tensions to international trade with the use of tariffs as a countermeasure.
- *How much to tax*? How much to tax multinationals has been left internationally uncoordinated since the inception of corporate taxation, resulting in the downward trend in corporate tax rates shown. The long-standing, well-known challenges here stem from (1) difficulties in enforcement (rules apply to affiliates of a multinational as if they were independent, thereby enabling profit shifting)[3] and (2) tax competition among countries through tax rates and preferential regimes.

[3]Multinationals use several techniques to shift profits. For instance, one affiliate can inflate its costs in a high-tax country by overpricing its imports from another affiliate in a low-tax country (IMF 2014). Pressures on existing corporate income tax arrangements are well known and discussed in de Mooij, Klemm, and Perry (2021).

To date, 137 jurisdictions (of 141 Inclusive Framework members) have joined the two-pillar Inclusive Framework agreement, whose first pillar addresses the "where" question and second pillar addresses the "how much" question. This agreement is the first fundamental change to international tax norms in more than a century—a major achievement on which to build as the international community shifts focus to implementation and beyond.

Major Elements of Pillars 1 and 2

Pillar 1 allocates a portion of profits to market jurisdictions, thereby giving them taxing rights even without a multinationals' physical presence. Pillar 1 applies to multinationals with global turnovers above €20 billion and allocates 25 percent of their "excess" or "residual" profit—that is, profits exceeding 10 percent of global revenue—to market jurisdictions using sales by destination. Currently, the extractives sector and regulated financial services are excluded. Implementing Pillar 1 will require countries to sign a multilateral treaty obligating them to eventually remove unilateral digital-services taxes and similar measures, with a commitment not to introduce new ones. Implementation is mandatory for all signatory jurisdictions, with planned effect in 2023. A parallel—unfinished—workstream under Pillar 1 foresees certain measures to simplify the computation of profits from specific activities of multinationals to be taxed in the source country.

Pillar 2 is an agreement on a global minimum corporate income tax if income in a given country is taxed below 15 percent. This pillar covers multinationals with global turnover exceeding €750 million. The minimum tax is a common approach, meaning that it is not mandatory for countries to implement its rules; however, by joining the agreement, countries accept its adoption by others. Pillar 2 includes three broad interrelated tax rules planned to go into effect in 2023:

- The *headquarters* country (where the parent company is located) subjects profits of affiliates abroad to an income inclusion rule (that is, a top-up tax for affiliates effectively taxed abroad below 15 percent).
- If the tax in the headquarters country is below the minimum (and it does not apply the income inclusion rule), then the *source* country (where the affiliate is located) applies the undertaxed-payments rule (that is, the top-up minimum tax).[4] Whether to give priority to tax explicitly to the headquarters country has been a contested issue, especially from a developing-country standpoint. However, in principle, the source country can choose reforms to raise its tax to the minimum to preempt the application of minimum tax in the headquarters country. The draft model rules (released in December 2021) enable the adoption of special domestic top-up taxes as opposed to general increases in tax rates to the minimum.
- Separate from the income inclusion and undertaxed-payments rule is a subject-to-tax rule, under which low-income source countries can impose withholding taxes on specific cross-border payments if a multinational is taxed on receipt of those gross payments abroad below a minimum rate. Details are yet to be finalized, including on the scope of covered payments and the minimum rate, but the tax paid under this rule would count in the calculation of the income inclusion and undertaxed-rules, thereby giving it priority and making its scope especially important for developing countries.

What are the effects of both pillars? To answer this question, the discussion starts with an analysis of profits of multinationals and next discusses revenue estimates, then broader outcomes.

Decomposition of Multinationals' Profit

A distinction between "normal" and "excess" profit has been important in the debate on taxation reform for multinationals, considering the two types of profits can be treated separately (IMF 2019). It is empirically challenging to measure excess profit with precision. Normal profit, conceptually, is broadly equivalent to normal return to capital, whereas excess profit is above the normal return to capital. Excess profit is largely associated with firm monopolistic power and firm-specific intangible assets, which are in turn difficult to value or attribute to a geographical location (de Mooij, Klemm, and Perry 2021). Taxing economic rent is efficient because it does not distort investment decisions (IMF 2016, 2019).

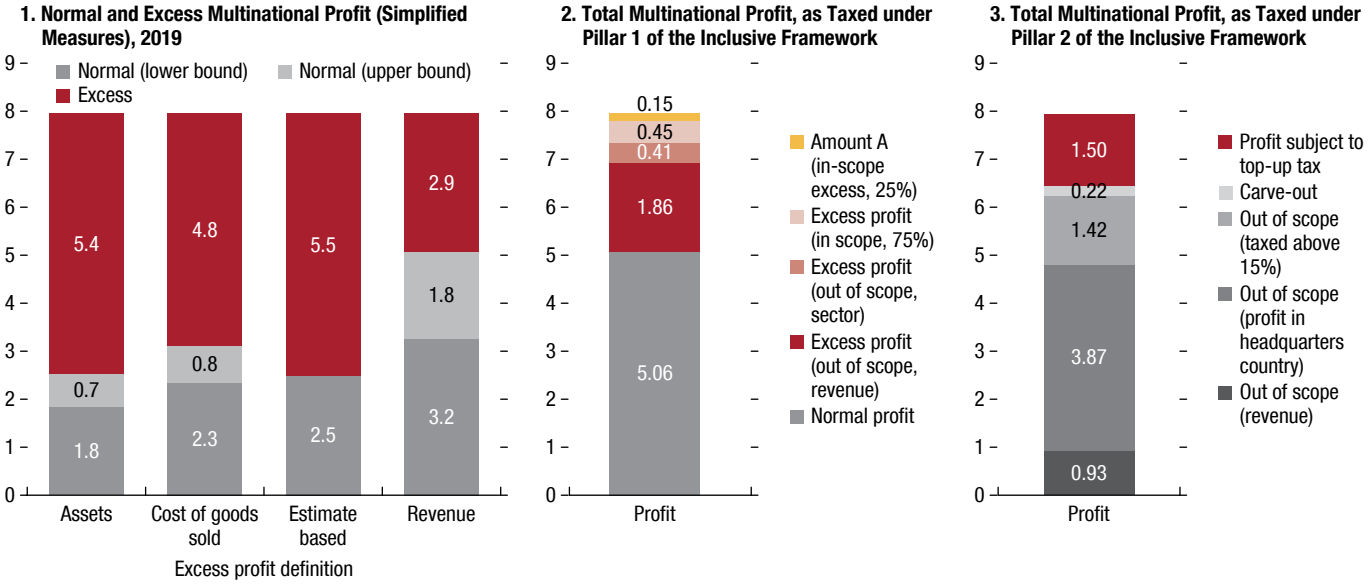
[4]The undertaxed-payments rule would be applied by denying tax deductions for payments (such as interest paid by an affiliate to a parent company) that are taxed below the minimum where they are received.

Figure 2.2. Disaggregation of Total Profit of Multinational Corporations
(Trillions of US dollars)

Rough measures of excess profit can reach 60 percent of total profit of multinationals.

Pillar 1 reallocates a small fraction of total profit of multinationals (2 percent or $150 billion).

Pillar 2 covers 18.5 percent of total profit of multinationals.



Source: IMF staff estimates, as described in Online Annex 2.1.
Note: These analyses use the Standard & Poor's Capital IQ database. Panel 1 shows empirical proxies for normal and excess profit across four simplifying measures (5.0–7.5 percent of total assets; 5.0–7.5 percent of costs of goods sold; estimate-based model using econometric specifications as specified in Online Annex 2.1; and 5.0–10 percent of revenue). *Amount A* refers to profit reallocated under Pillar 1. Panels 2 and 3 disaggregate total multinational profit into amounts included and excluded in Pillar 1 and Pillar 2, respectively. The *carve-out* is (transitionally) a deduction of 8 percent of assets and 10 percent of payroll. *Out-of-scope (revenue)* refers to companies below the revenue thresholds to be included under Pillars 1 or 2, whereas *out-of-scope (sector)* refers to excluded regulated financial and extractive sectors under Pillar 1. In panel 3, *out-of-scope (profit in headquarters country)* is the sum of profits that multinationals reported in their headquarters countries, and hence are not subject to the income inclusion rule of Pillar 2.

Multinationals generated profit of $7.9 trillion in 2019 (9.2 percent of global GDP). Estimates, based on simplifying assumptions, suggest that a sizable share of multinationals' profit (possibly reaching 60 percent) is excess profit. This illustrative estimate is based on simple ratios, for example, considering normal profits to be 5.0–7.5 percent of total assets or alternatively 5.0–7.5 percent of cost of goods sold. Similar results are obtained from a third method that estimates normal profit using firm-level data, as the counterfactual earnings firms would generate in the absence of market power and risk premia (Online Annex 2.1; Beer and Loeprick 2022). A fourth measure that uses 5–10 percent of revenue reduces excess profits to 37 percent of total profits (Figure 2.2).

Revenue Effects of Pillars 1 and 2

Pillar 1 is a relocation of revenue (creating a zero sum of losers and winners), but Pillar 2 is (mostly) a revenue raiser. Combining both in one coordination package potentially tends to make the Inclusive Framework agreement a net benefit for countries facilitating coordination.

The reallocation of a portion of excess profit to market countries under Pillar 1 is estimated to apply to only about 140 companies, capturing a small global tax base of 2 percent of global profit (Figure 2.2). Results suggest that revenues will be reallocated from low-tax investment hubs (about 2 percent of their total corporate tax) to other countries, raising revenues there by 0.7 and 0.9 percent of corporate tax revenues in low-income countries and advanced economies, respectively (Figure 2.3).[5]

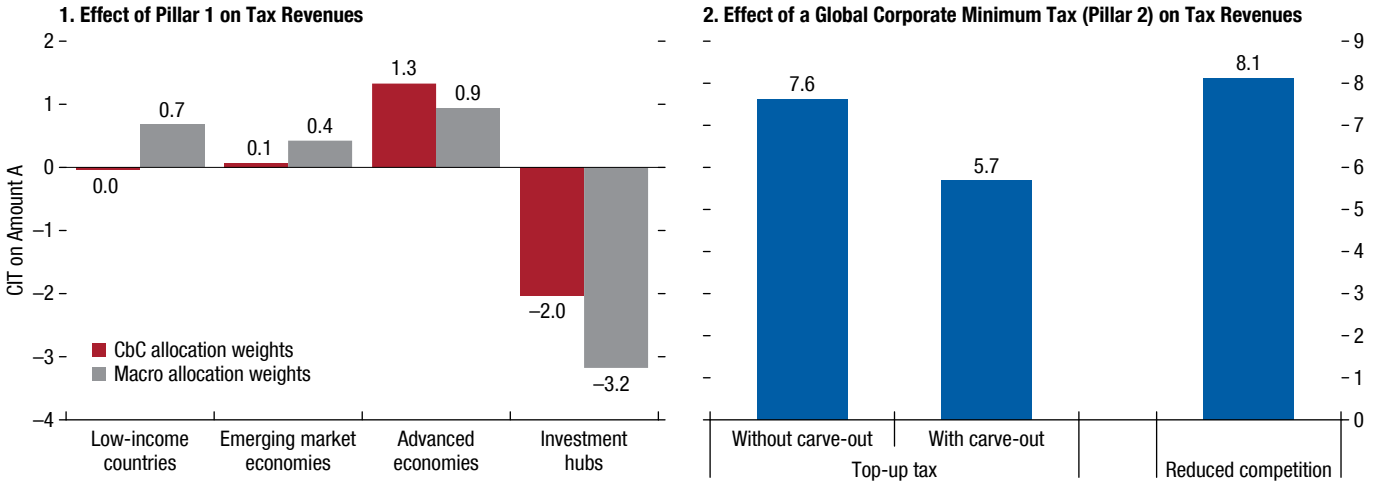
Although the global tax revenue from Pillar 1 is relatively small as a share of total taxes, it appears broadly comparable with that from existing unilateral digital-services taxes. Digital-services taxes

[5]The reallocation of the tax base depends on the sales-by-destination weights at the firm level, which are not directly observed, generating some uncertainty about the exact reallocated amount.

Figure 2.3. Revenue Effects of the OECD/G20 Inclusive Framework Agreement, Pillars 1 and 2
(Percent of current global corporate income tax)

Pillar 1 reallocates revenues from low-tax investment hubs to other countries.

Pillar 2 raises global corporate income tax revenues by 5.7 percent through the top-up tax and by an extra 8.1 percent potentially through reduced tax competition.



Source: IMF staff estimates based on the Standard & Poor's Capital IQ database, 2017 reports from the Organisation for Economic Co-operation and Development's CbC database, and statistics from the US Bureau of Economic Analysis, as described in Online Annex 2.1.
Note: *Amount A* refers to profit reallocated under Pillar 1. The calculation uses weights to proxy sales by destination for the reallocation. Macro allocation weights are taken from Beer and others (2020) and computed using national accounts, whereas CbC weights are computed using the CbC database. Under Pillar 2, the *carve-out* is (transitionally) a deduction of 8 percent of assets and 10 percent of payroll. The tax base for the minimum tax is excess profit after the carve-out is deducted (that is, the *with carve-out* bar). CbC = country-by-country; CIT = corporate income tax; OECD/G20 = Organisation of Economic Co-operation and Development/Group of Twenty.

typically raise less than 0.02 percent of a country's GDP, although the proportion varies across countries (Aslam and Shah 2020; Dabla-Norris and others 2021). Skepticism about digital-services taxes arises because the digital economy cannot be meaningfully ring-fenced and these taxes are less efficient than the alternative of destination-based taxation under Pillar 1. For example, "digital" taxes on sales would be too high for low-profit or loss-making digitalized businesses, possibly disincentivizing investment, and would imply a lower tax on high-profit businesses raising issues of fairness. Furthermore, destination-based taxation of profits is more robust to tax competition (because consumers are less mobile than capital and profits) or profit shifting (because the tax base is largely based on global consolidated profit rather than profit in each separate jurisdiction).[6]

Pillar 2 is estimated to capture a tax base of $1.47 trillion (Figure 2.2, panel 3), which increases global annual corporate income tax revenues by roughly 5.7 percent (about $150 billion) (Figure 2.3).[7] This calculation applies the minimum tax only to profits exceeding 8 percent of assets and 10 percent of payroll (called the "carve-out" in the agreement). Removing the carve-out would increase Pillar 2 revenues to an estimated 9 percent of current global corporate income tax revenues. Under the assumption that low-tax countries remain below the minimum, these "static" revenue gains are concentrated in advanced economies (Figure 2.3) because multinationals headquartered in these countries generate 20 times more profit than those located in emerging market economies. On the other end of the spectrum, if all source countries apply the minimum, then source countries will capture the revenue gains (it is the same amount of revenue gains because it is a top-up tax).

[6]Various international reform options tax excess profit largely in the destination country (de Mooij, Liu, and Prihardini 2019; IMF 2019; Hebous, Klemm, and Stausholm 2020; Devereux and others 2021). The extractive sector is one exception for taxing the (location-specific) excess profit in the source country (Albertin and others 2021).

[7]Estimated global annual corporate income tax revenues under Pillar 2 decrease to 4.8 percent if the United States is excluded, considering that it levies its own minimum tax (the global intangible low-taxed income provision). The estimates in the paragraph are smaller than those of Barake and others (2021) and larger than those of OECD (2020).

The likely outcome depends on how countries and firms react to the implementation of the Inclusive Framework agreement. To obtain a complete assessment, the discussion next considers these reactions.

The Reactions of Firms and Countries to Corporate Income Tax Coordination

The agreement affects firms by reducing incentives for profit shifting that in turn affect real investment decisions and countries by reducing incentives for tax competition. These effects could further increase global revenues and the tax base shares allocated to nonheadquarters countries. The outcome of countries' tax-setting responses, following a minimum tax, would likely be higher tax rates and revenues for most.

Firms' reactions can be summarized as follows:

- *Profit shifting by in-scope*[8] *multinationals generally decreases* to the extent that the effective minimum rate is above that firms are currently paying and the tax rate differential between countries declines. This reduction in profit shifting implies that the global profit reported in low-tax jurisdictions declines, thereby increasing tax revenues in the other countries.[9] Pillar 1 also helps reduce profit shifting, as discussed.
- *Investment becomes more costly, but the aggregate effect is modest*. The effective tax rate on investment—which considers both the statutory tax rate and the tax base, such as with depreciation allowances—increases because of the smaller scope for profit shifting and higher taxation (attributable to the minimum tax). The OECD (2020) estimates this increase to be 1.4 percentage points (expressed as a global weighted average rate), with variation across countries. However, in calculating the full effect on multinationals' investment, any analysis should also consider that a minimum tax brings a high-tax country closer to the world average (that is, it reduces the *tax rate differential*). Estimates indicate that aggregate investment in fixed assets remains roughly constant at a global minimum tax of 15 percent, but with large differences in country-specific effects, reaching a decline of 20 percent in some low-tax countries (Keen, Liu, and Pallan 2022).

Low-tax countries are likely to raise their taxes to the minimum—possibly only on in-scope companies, because incentives to compete over the out-of-scope tax base remain intact. Countries are permitted under the Inclusive Framework agreement to impose a minimum tax only on in-scope companies (OECD 2021e). This top-up tax enables low-tax countries to collect revenues from multinationals without raising their *general* corporate tax rate, thereby weakening the incentives to raise the general rate. Raising the general rate, however, can be beneficial for low-tax countries, especially if high-tax countries raise their rates as well (Hebous and Keen 2021).

High-tax countries are likely to halt their downward trend and possibly raise their corporate taxes. Empirical evidence and historical experience suggest that countries' tax rates tend to move in the same direction. If low-tax countries raise their rates to the minimum (even through a top-up tax on in-scope multinationals), then high-tax countries would likely react by raising their rates as well. New estimates are broadly in line with previous studies indicating that a 1-percentage-point change in the average foreign statutory tax rate leads the home rate to change by up to 0.6 percentage point in the same direction (Online Annex 2.2). Concurrent discussions in some countries (such as the United Kingdom and the United States) also indicate that tax rate increases are possible, or at least that future rate cuts can become less attractive (Seely 2021; US Department of the Treasury 2022).[10]

Developing countries have a strong case for revisiting, and potentially abolishing, ineffective and inefficient tax incentives, which would support both revenues and the integrity of the tax system (IMF and others 2015). Pillar 2 reduces competition pressures: multinationals would not react to a tax holiday, for example, because they would then be liable for tax in the headquarters country. Although the motivation is somewhat muted by the existence of the carve-out and out-of-scope companies, the agreement is generally an opportunity to reconsider the use of tax incentives as a tool to attract foreign investment.

Rough estimates suggest that the agreement would result in reduced tax competition, thereby increasing global corporate tax revenues by an extra 8.1 percent (Figure 2.3, panel 2). Such revenues could finance social spending, public investment, or reductions in

[8]In-scope multinationals are those that meet the criteria of Pillars 1 or 2.

[9]The OECD (2020, Table 3.10) estimates that the amount of profits in investment hubs would be reduced by 9–10 percent as a result of a minimum tax of 12.5 percent with no carve-out.

[10]As mentioned earlier, the higher tax would have a muted effect on aggregate investment of multinationals in the presence of a global minimum tax.

more distortionary taxes. Precisely quantifying this effect is challenging. The calculation here assumes that below-minimum countries raise their rates to the minimum—increasing the world average tax rate—and, in turn, other countries raise their rates by 0.6 percentage point in reaction to each 1 percentage point increase in the world average rate. As a result, the average world corporate tax rate rises from 22.2 to 24.3 percent.[11]

Opportunities to Enhance Coordination

The two-pillar solution demonstrates that coordination can succeed. The Inclusive Framework agreement is a step in the right direction, considering that Pillar 1 breaks with old norms and Pillar 2 puts a floor on tax competition. Still, both pillars are somewhat limited in scope. Hence, following their implementation more steps will be needed to address spillovers and further incorporate the interests of low-income countries. The agreement lays the foundation for the international community to expand both pillars to capture more of the tax base.

Building on the two pillars, efforts can focus more on low-income countries' circumstances by taking the following actions:

- *Agree on simplification measures* (based on those delayed under Pillar 1) that allow source (mostly low-income) countries to apply a simplified tax (for example, a fixed sales ratio) to some activities (such as buying from affiliated companies for resale, "redistribution activity"). Although such a simplified approach lowers administrative and compliance costs, it entails a margin of error in taxing actual returns, with possible adverse efficiency effects. Such costs are estimated to be the lowest for redistribution activity and a few subsectors of manufacturing—indicating that simplifications could be extended to include them (Beer, Leduc, and Loeprick 2022).
- *Maximize the benefits of a minimum tax* for low-income countries by considering withholding taxes on a wider set of cross-border payments than currently envisaged under Pillar 2's subject-to-tax rule.
- *Facilitate timely access to the country-by-country information* on multinationals on the part of low-income developing countries to support tax enforcement. Access to information is part of the broader enforcement challenges, which include capacity building to improve administration (as provided by the IMF and other international organizations) and information availability. To make taxation more transparent, the 2015 Base Erosion and Profit Shifting initiative requests multinationals (with a global turnover exceeding €750 million) to provide information about their activities on a country-by-country basis, which would be essential for enforcing current and envisaged rules. A recent analysis finds that only three low-income countries have access to these reports (OECD 2021a). Other low-income countries cannot access this information until they meet requirements concerning confidentiality, consistency, and appropriate use of information (see the "Tax Transparency and Personal Income Tax Coordination" section). Progress on this front is critical to maximizing the benefits of coordination for low-income countries and helping them strengthen corporate taxation.[12]

Existing rules to curb profit shifting remain important. Current corporate tax arrangements remain largely applicable (because of various exceptions). Hence, a multitiered framework is likely, because the agreement reduces, but does not eliminate, profit-shifting possibilities.[13]

International coordination makes domestic corporate tax reforms more feasible, particularly reforms to better tax monopolistic rent on efficiency, equity, and revenue grounds. For instance, one option to target excess profit is to offer deductions to returns to equity (like those to interest expenses) and increase the tax rate.[14] Such deductions are efficient because they

[11]Generally, it is difficult to determine who ultimately pays the corporate income tax because it may be passed on as lower wages for employees, as higher prices to consumers, or as lower prices to producers. However, a tax on economic rent does not affect the investment or price decisions of a firm that maximizes economic rent. The rent tax is thus efficient because it does not distort investment. Moreover, as the price is unaffected, its burden is not shifted to consumers or employees or producers (Devereux and others 2021). As profitable businesses tend to be owned by the better off, rent taxation supports progressivity.

[12]Other initiatives to enhance country-by-country reporting include the Extractive Industries Transparency Initiative and the European Banking Authority's Capital Requirement Directive, which requests that banks established in the European Union publish country-by-country reports.

[13]The rules of the Inclusive Framework agreement use financial accounts (ultimately prepared for shareholders), rather than the domestic tax accounts based on a country's tax system. This implies that it will also be important to prevent abuse of financial accounting to minimize taxes.

[14]On the taxation of economic rent, see de Mooij (2012), IMF (2016), Hebous and Ruf (2017), and Hebous and Klemm (2020).

resolve the chronic debt bias in corporate taxation, which encourages debt by allowing interest deductions without analogous deductions for returns to equity. This nonneutrality adversely affects investment decisions and amplifies economic-instability risks (IMF 2016). Excess-profits taxes generally can be compatible with the broad directions of international reforms (Hebous, Prihardini, and Vernon 2022). For example, Pillar 1 distinguishes between two types of profit, whereas Pillar 2 treats the carve-out differently from the rest of profit.

Tax Transparency and Personal Income Tax Coordination

At a Glance

- Curbing tax evasion requires availability, sharing, and effective use of information.
- Significant steps have been taken to exchange information among countries under the Global Forum on Transparency and Exchange of Information for Tax Purposes.
- Establishing beneficial-ownership registries would enhance tax enforcement and compliance, and further capacity building—for example, to upgrade tax administration technology—is critical for enabling low-income countries to reap the full benefits from cross-border information-sharing agreements.
- Stronger enforcement, through international information coordination, offers opportunities to revisit personal income taxation to address increasing income inequality.
- As the mobility of workers—including digital nomads—increases with the expansion of opportunities for cross-border remote work, coordination in this area will likely gain importance.

Personal taxation in a global digital economy, much like corporate taxation, requires coordination across borders to tackle tax base erosion, primarily through information sharing to enforce tax laws. Furthermore, cross-border mobility of people is increasingly relevant for taxation.

Tax Evasion and Exchange of Information

Global undisclosed offshore wealth is sizable, with macro-relevant fiscal implications.[15] Wealth generates capital income (such as rental income, dividends, interest, and capital gains). Yet, the concern about tax evasion using nontransparent offshore structures goes beyond revenue leakage; it is also a matter of tax progressivity and perception of fairness. The issue is related directly to tax compliance at the top of the income and wealth distributions, considering that capital income constitutes a significant fraction of income at the top of these distributions (Scheuer and Slemrod 2020). Available estimates suggest that the wealthiest 1 percent (who own up to 40 percent of the wealth in some countries) evade up to 25 percent of their income taxes using offshore structures (Alstadsæter, Johannesen, and Zucman 2019; Guyton and others 2021).

Moreover, governance-related concerns arise about the sources of undisclosed wealth. For example, the proportion of wealth held abroad correlates with characteristics in the wealth's countries of origin, such as political and economic instability, natural resources, and inflows of foreign aid (Alstadsæter, Johannesen, and Zucman 2018; Andersen, Johannesen, and Rijkers 2022). Thus, nontransparent offshore structures can be associated with other serious legal aspects beyond taxation (and the coverage of this chapter), including concealing the proceeds of corruption, financial crimes, and other illicit uses.[16]

Individuals are typically taxed in the country of residence. A notable exception is the United States, which taxes its citizens irrespective of residence (that is, even if they are permanently living in a foreign country) but generally credits taxes paid abroad. The United States

[15]Global undisclosed offshore wealth is estimated at $7 trillion (8 percent of global household wealth or 9.3 percent of global GDP; Zucman 2013; Alstadsæter, Johannesen, and Zucman 2018). Estimates suggest that this hidden wealth corresponds to roughly $150 billion in unpaid income tax annually. This calculation assumes that hidden wealth (1) earns a rate of return of 7 percent (the five-year average return on US federal funds and the MSCI World Index, with 75 percent of offshore funds invested in securities markets) and (2) would be taxed at 28 percent (the average capital income tax rate, weighted by GDP). This estimate reflects only income taxation, excluding inheritance, transaction, or wealth taxes.

[16]The IMF has actively contributed to policies against money laundering and the financing of terrorism. The IMF's work in these areas is fully integrated into other IMF workstreams, including capacity development and fintech. Likewise, work on transnational facilitation of corruption is part of the IMF Framework for Enhanced Engagement on Governance (see the April 2019 *Fiscal Monitor*).

typically levies the tax on individuals on labor incomes (wages) and capital income. The latter is also relevant for the self-employed. A few countries additionally tax the stock of net wealth.

Enforcing capital taxation requires reliable third-party information, including from other countries. Salaries are generally easier to monitor than capital taxation because employers usually withhold taxes on behalf of employees and remit the amounts to the tax authorities. Taxing capital requires more third-party information (to cross-validate and verify the final tax) that can be difficult to obtain, especially if the taxpayer has offshore activities.

Difficulties arise in enforcing capital taxation:

- *Information sharing*: Foreign authorities should be willing and have the legal framework to share information with other countries. For example, if a resident holds a bank account offshore, then tax authorities need to access information about this account through foreign authorities to assess self-declared information about this account.
- *Information availability*: Reliable information must be available, considering that determination of beneficial ownership is essential to ensuring the integrity of the tax system (Box 2.1). Ownership can be obscured by using an anonymous ("shell") offshore company (or a trust) that holds a bank account offshore, which is used to manage private wealth (Sharman 2010).[17] As a result, a verified identity of the beneficial owner can be lacking. For example, based on leaked data, Collin (2021) finds that 80 percent of financial assets in his sample are held by entities (such as trusts) rather than individuals and the location of the beneficial owner is generally different from that of the legal owner.

As the use of crypto assets rises, lax reporting requirements in this domain further complicate tax enforcement and increase risks of tax evasion.[18] Even as some countries strengthen their rules to combat anonymous crypto transactions and prepayments, countries still need to share information promptly. Some countries also effectively exempt crypto-asset investment gains from taxes, with potential spillovers onto other countries' tax bases.

International coordination on information sharing, such as on residents' foreign bank accounts, is necessary for enforcing capital taxation. Without information, tax authorities lack a cost-effective mechanism to protect the tax system, and tax audits generally fail to detect offshore income and assets. Ad hoc unilateral enforcement initiatives and occasional offshore voluntary disclosure programs can lead to disclosures of offshore wealth, but usually of only a small portion (for example, only 10 percent of total offshore hidden wealth was disclosed after enforcement initiatives in 2008 in the United States that included offshore voluntary disclosure; Johannesen and others 2020).[19] During the past decade, progress has been made on information sharing among countries, although much improvement is needed to maximize the benefits, as will be discussed.

International Arrangements for Exchanging Information

After the global financial crisis, in 2009, the G20 committed to ending banking secrecy and restructured the Global Forum—with its current 163 member jurisdictions, the primary multilateral body for global transparency and exchange of information standards to combat offshore tax evasion.

In 2014, the Global Forum reached an agreement on *automatic* exchange of information. To date, 120 countries are committed to implementing the standard outlined in the agreement (among large advanced economies, the United States is a notable exception). Under this standard, financial institutions (such as banks and hedge funds) report predefined financial information on nonresidents to domestic tax authorities, who in turn share it automatically and annually with tax authorities where the account holders are tax resident.[20] The Global Forum monitors

[17]There can be legitimate nontax reasons to establish trusts. There can also be tax avoidance opportunities that are not necessarily considered illegal evasion (Collins 2021). Tax evasion or avoidance structures can include taxes on income, wealth, and inheritance, as well as stamp duty.

[18]There are also other risks. For example, Alnasaa and others (2022) find that crypto asset usage is higher in countries with perceived weak governance, strengthening the case for taking appropriate policy and regulatory actions.

[19]For an overview of design of voluntary disclosure programs, see Benedek and others (2022). Tax amnesties reduce future compliance because current evaders may expect to have amnesty available in the future, reducing the cost of evading (for example, see Bayer, Oberhofer, and Winner 2015).

[20]Information on nonresidents includes bank account number, account balance, name of account holder, and address. Also, complementarily, since 2009 the standard of *exchange of information on request* allows exchanging of broader information that is foreseeably relevant for the administration of taxes.

and reviews the effectiveness of the implementation of this standard.

Additional international channels to share taxpayers' information include bilateral tax information exchange agreements and ad hoc requests. In 2010, the United States introduced the Foreign Account Tax Compliance Act, requiring financial institutions to share financial account information on US taxpayers with the US Internal Revenue Service. Further international and regional forms of cooperation on tax administration complement or use information-sharing mechanisms, including those to resolve international tax disputes, conduct joint audits and risk assessments, trace cross-border debtors and assets to collect tax arrears, and tackle cybercrimes and threats related to crypto assets.

Benefits from Exchange of Information

Automatic exchange of information has achieved notable success, globally covering nearly 75 million financial accounts in 102 jurisdictions in 2020 (OECD 2021c). Also, through the Foreign Account Tax Compliance Act, 110 countries currently provide information to the United States. Empirical studies suggest that information sharing reduced bank deposits in and portfolio investment from low-tax jurisdictions by 11–38 percent and 21–29 percent, respectively (Menkhoff and Miethe 2019; O'Reilly, Ramirez, and Stemmer 2019). Still, there is evidence of behavioral responses to information sharing that dampen its effectiveness: shifting hidden wealth to locations with less-stringent regulations or fewer information-sharing agreements, escaping reporting by using citizenship-by-investment schemes, or shifting wealth to assets not (easily) reported under the agreements (Casi, Spengel, and Stage 2020; De Simone, Lester, and Markle 2020; Langenmayr and Zyska 2021).[21]

Some (especially low-income) countries have not yet realized the full benefits from exchange of information. Not only must information be available and an exchange agreement in place, but standards of confidentiality and data safeguarding also are necessary to prevent misuse or unauthorized disclosure of received information. For several low-income countries, this is the same obstacle as in the context of sharing information on multinationals' country-by-country activities. Moreover, countries need a domestic legal framework that requires financial institutions to collect and report the information, and systems, as well as processes, for the information (including the appropriate information technology). All are nontrivial conditions for low-income developing countries to meet.

To better understand constraints on the effective use of exchanged information, IMF staff conducted a survey, for this chapter, covering tax authorities from 72 countries (of which 18 are not members of the Global Forum). Among the respondents, 9 countries did not receive information from abroad in 2019 through any channel, and another 20 countries received no more than 10 incoming exchanges. Among those that received information, almost half responded that they did not use the information in their risk and tax enforcement analyses.

Capacity constraints in data analytics and knowledge management are an additional hurdle to overcome. The use of incoming information in compliance risk analysis is strongly correlated with tax administrations' adoption of adequate information technology (Figure 2.4). Furthermore, the use of incoming information is also significantly correlated with the presence of a dedicated unit in the tax administration focusing on enhancing tax compliance among high-net-worth individuals (Figure 2.4). Audits and compliance programs focusing on high-net-worth individuals require specialized skills and training, and hence a permanent specialized group can help improve the use of available information and strengthen tax compliance (Buchanan and McLaughlin 2017).

Countries recognize the opportunities from exchange of information (along various dimensions in the survey, including reduced tax leakage and stronger enforcement capability). The Global Forum and other bodies are currently working to strengthen countries' capacity in this area.

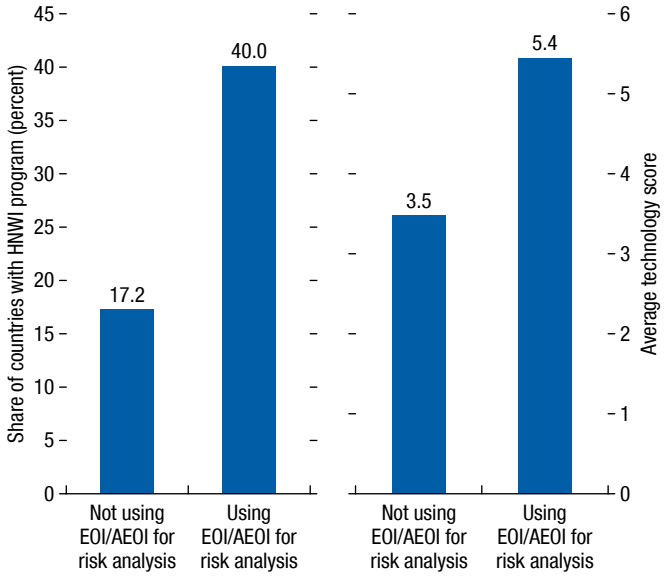
Countries are also becoming increasingly aware of, and taking actions against, professional enablers (those that engage in illegal facilitation of tax crimes). Several avenues have been pursued, for example, communication with taxpayers and intermediaries (publishing alerts about arrangements that misapply the law), mandatory-disclosure rules (requiring taxpayers and intermediaries to report to the authorities arrangements with particular hallmarks), and fines for facilitators of breaches by taxpayers (OECD 2021b).

International cooperation is also essential for success in tackling enablers of tax crimes. For instance, five

[21]Note that information sharing also entails compliance costs, especially for financial institutions (Dharmapala 2016).

Figure 2.4. Use of Internationally Shared Information in Risk Analysis by Tax Authorities

Better technology and specialized tax units are correlated with the use of incoming information in risk analysis.



Source: IMF staff analysis based on a survey of 72 countries and the International Survey on Revenue Administration database, 2017.
Note: See Online Annex 2.3 for details on the survey of countries. A tax administration's average technology score is the sum of 6 indices of technologies, scored from 0 (technology is not used) to 3 (technology is fully in place). The *p*-values of mean-differences tests are 0.03 (technology score) and 0.05 (HNWI program). (A)EOI = (automatic) exchange of information; HNWI = high-net-worth individual.

countries known as the J5 (Australia, Canada, The Netherlands, United Kingdom, and United States) formed an operational alliance in 2018 to pool resources, share intelligence, and unite investigators and data scientists. J5 investigations ultimately led to the prosecution of a fraudulent crypto-asset scheme in 2020 (OECD 2021b).

Improved Domestic Tax Policy through Transnational Enforcement

International coordination supports tax enforcement and compliance, thereby offering individual countries opportunities to strengthen personal taxation policy and thus address increasing income and wealth inequalities. There are arguments for a flat, low capital income tax rate—as is currently used in several countries—including the capital mobility and enforcement difficulties caused by offshore tax evasion and avoidance. Yet, information sharing across borders would make it more difficult to use offshore structures to minimize taxes, and that can be complementary to high taxation at the top (Keen and Slemrod 2017). In countries where implementation capacity now constrains tax policy choices, better tax enforcement could allow policy to adjust, especially at the top of the income distribution. A distinct but related issue is that effective use of information can reveal tax loopholes that may not be illegal; hence, domestic tax laws can be upgraded to capture such loopholes, if this is the policy intention.

Personal Tax Implications of Geographic Relocation

Wealth mobility across borders for tax purposes is mainly—but not only—on paper, as opposed to the actual migration of wealth holders. The foregoing discussion, therefore, has focused on tax evasion and avoidance. There are, however, known (and certainly less-known) cases of high-net-worth individuals' changing their country of residence for tax purposes (including prominent examples from the entertainment and sports professions).

Labor is generally less mobile than capital, exposing it less to tax competition. But physical mobility becomes more attractive when personal tax rates vary across countries and preferential tax regimes target specific groups from abroad, such as retirees, high-skilled workers, managers, and the super-rich (such as citizenship by investment and other similar regimes). Kleven and others (2020) find evidence that mobility decisions respond to cross-border differences in personal taxation, while acknowledging that nontax factors also matter. Tax-induced mobility varies across occupations and across countries within an occupation, although it has been concentrated at the top of the income and wealth distributions.

With expanding opportunities for cross-border remote work, a bigger segment of the labor income tax base has become more mobile. For example, since the onset of the COVID-19 pandemic, the number of countries offering digital-nomad visas, targeted at high-skilled individuals who can work remotely, has increased from 16 to 40. This development indicates that the tax elasticity of labor mobility could increase, thereby expanding international personal tax competition to more professions and income groups. Little is known thus far about the magnitude of the revenues at stake.

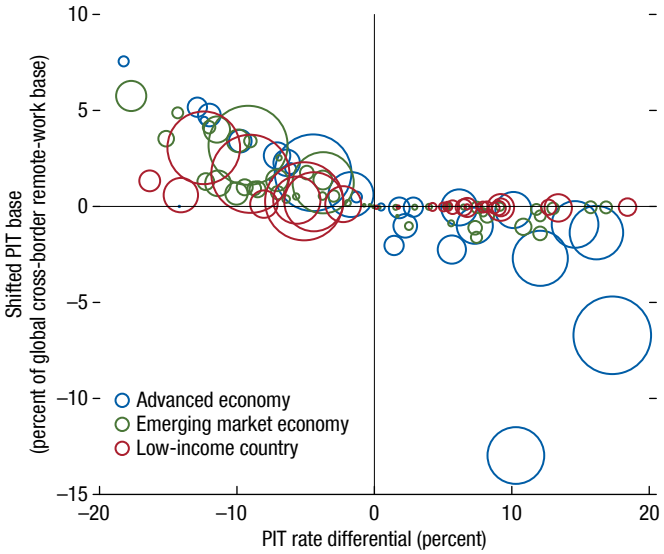
Rough estimates suggest that personal tax differentials across countries, coupled with the ease of remote work, reallocate annually about $40 billion of personal income tax base globally (1¼ percent of the

total personal income tax base in the sample; Online Annex 2.4). Country-specific estimates of the average potential revenue loss and gain are between 0.1 and 0.2 percent of GDP. Small emerging market economies with below-average tax rates and good remote work capability typically gain tax base (Figure 2.5). The estimates do not consider restrictions to international labor mobility, possible double taxation of income, and the potential for investment incomes to move with people.

The estimated tax revenue implications of cross-border remote work are small. Personal tax coordination will likely gain importance, however, raising issues not unlike those related to corporate taxation: Where is active labor income taxed? Is it the source country where the employer resides or the residence country where the employee works remotely? Does the place of remote work constitute a physical presence of the employer in the employee's residence country? Issues of consistency of legal rules across countries and the avoidance of double taxation can come to the fore.

Figure 2.5. Effect of Cross-Border Remote Work on a Country's PIT Base, by Income Group

Cross-border remote work potentially reallocates tax base to below-average tax rate countries; the aggregate effect is 1¼ percent of the global PIT base.



Source: IMF staff analysis.
Note: See Online Annex 2.4 for details on the analysis. PIT differential is a country's PIT rate minus the world average PIT rate. Shifted PIT base is the estimated country-specific loss or gain as a result of cross-border remote work, as a share of globally affected PIT base. Marker weights express the loss (or gain) in terms of GDP. PIT = personal income tax.

Carbon-Pricing Coordination

At a Glance

- Global warming is threatening our planet, and the window of opportunity for containing climate change to manageable levels is closing rapidly. International coordination is urgently needed.
- An internationally coordinated carbon price floor among key large emitters—in the form of a carbon tax designed flexibly to accommodate equity considerations and constraints on national policies—can, in conjunction with Paris mitigation pledges, reduce emissions by 32 percent by 2030, thereby keeping warming below 2°C.
- A carbon price floor can readily accommodate emissions-trading systems. The equivalent carbon price of other approaches (such as renewables policies, emission-rate standards, and feebates) can be mapped.
- In contrast with carbon pricing, other instruments do not trigger the full demand response to promote the whole range of mitigation opportunities.
- Unilateral border carbon adjustments would be far less effective at scaling up global mitigation than a more comprehensive carbon-pricing regime, as emissions in traded products are typically well below 10 percent of countries' total emissions.

Climate change is an existentially important global externality that requires carbon taxation or pricing and other tools tailored to country-specific circumstances to address it. For individual countries, scaling up their mitigation policy, including through taxation, can be difficult without international coordination, owing to concerns about competitiveness and uncertainty over trading partners' policies.

There remain critical gaps in both global mitigation *ambition* and *policy*. About 140 countries, representing more than 85 percent of greenhouse gas emissions, have now committed to net-zero emissions by around midcentury. But even if mitigation pledges were fully achieved, global carbon dioxide (CO_2)

would be cut by only one-third to two-thirds of the reductions needed by 2030 to limit global warming to 1.5°C to 2°C above preindustrial levels. Worse, there is an even larger gap in mitigation policy consistent with temperature goals. Measures equivalent to a global carbon price exceeding $75 per ton are needed by 2030, whereas the global average emission price is currently only $4 per ton (High-Level Commission on Carbon Prices 2017; Black and others 2022).

An additional international mechanism to complement the Paris Agreement, with a concrete plan to deliver the required emission reductions in 2030, is critical. Without an urgent narrowing of mitigation ambition and policy gaps, a dangerous cliff edge for emission reductions for 2030–40 will emerge, greatly increasing transition costs and potentially putting temperature goals beyond reach.

Recent proposals have focused on coordinated carbon-pricing regimes. The IMF has suggested an international carbon price floor (October 2019 *Fiscal Monitor*; Parry, Black, and Roaf 2021), and in a similar vein, in August 2021, the German government called for an international climate club (BMF 2021). The chapter next discusses design issues for a coordinated carbon-pricing regime (potentially accommodating other measures such as regulations), the effects of such a regime, and their relation to emerging instruments (border carbon adjustments).

Coordinated Carbon-Pricing Regime

The key element of an international carbon-pricing agreement is a carbon price requirement for participants, with prices set to align emissions with global temperature goals. The price of carbon emissions is an easily understood parameter. Carbon pricing would promote the full range of behavioral responses for reducing energy use and shifting to cleaner energy sources (if imposed comprehensively) and effectively address concerns about competitiveness and policy uncertainties (if internationally coordinated). A price *floor* requirement (drawing parallels with the Pillar 2 agreement on a minimum global corporate tax) is preferable, because it provides flexibility for countries to impose higher carbon prices if needed to meet their Paris mitigation pledges.

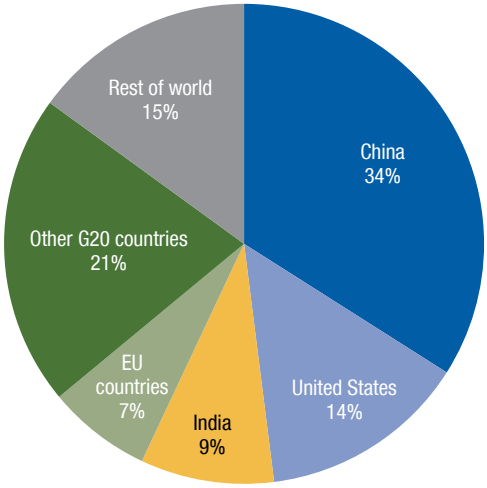
The agreement can allow countries to use carbon taxation or emissions-trading systems. The negotiating parties should also retain flexibility for those countries that prefer to use alternative or complementary policies such as partial pricing, regulations, or fiscal incentives. If emission reductions from alternative policies can convincingly be assessed—and IMF and World Bank staff have developed a method that might be used for this purpose (Online Annex 2.5)—the equivalent economywide carbon price (that would deliver the same emission reduction) can be estimated using country-specific information on various emission sources and responsiveness to price changes. In this regard, carbon prices and their equivalents facilitate negotiations by serving as a common metric.

To further facilitate negotiation, a few key emitting parties could make a crucial start (though it is difficult to predict which coalition of countries might prove most feasible). For illustration, an agreement among China, the European Union, India, and the United States would cover 64 percent of baseline global CO_2 emissions in 2030, whereas an agreement among the G20 members (encompassing all European Union countries) would cover 85 percent (Figure 2.6).

Covered emission sources would need to be specified. The agreed-upon carbon-pricing regime might initially apply to CO_2 emissions from the power and industrial sectors, because these emissions are reliably measured

Figure 2.6. Baseline CO_2 Emissions

G20 countries will account for 85 percent of global CO_2 emissions in 2030.



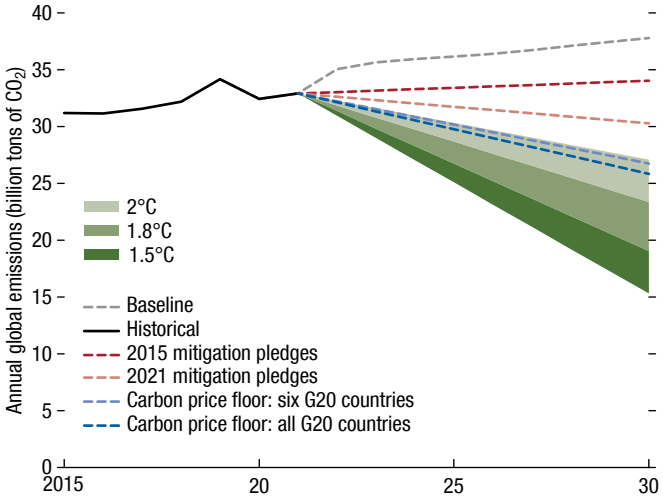
Sources: Updated from Parry and others (2021); and IMF staff analysis.
Note: Baseline refers to projected emissions with no new, or tightening of existing, mitigation policy. CO_2 = carbon dioxide; EU = European Union; G20 = Group of Twenty.

and are generally the most responsive to pricing in the near term. The regime might then be extended to all fossil fuel CO_2 emissions and, as monitoring technologies evolve, broader emission sources (for example, agriculture and methane leaks from fuel extraction and distribution). Some countries may choose to rely, at least initially, on increases in existing energy taxes or taxes on specific items (for example, coal) rather than more comprehensive carbon pricing. In such cases, the effect on emissions can also be significant (Online Annex 2.5), and an equivalent carbon price can be computed for international comparisons.

The carbon-pricing regime would need to address the differentiated responsibilities of developing countries, potentially by differentiating price floor requirements according to a country's level of economic development. Additional options include supplementary mechanisms for transferring financial and technological assistance, a priority for low-income countries and emerging market economies.

Figure 2.7. CO_2 Emission Projections

A carbon price floor can align emissions with keeping global warming below 2°C.



Source: Updated from Parry and others (2021).
Note: Fossil fuel CO_2 emissions shown exclude international aviation and maritime emissions. Six G20 countries refers to Canada, China, the European Union, India, the United Kingdom, and the United States. CO_2 = carbon dioxide; G20 = Group of Twenty.

Scenario of an International Carbon Price Floor

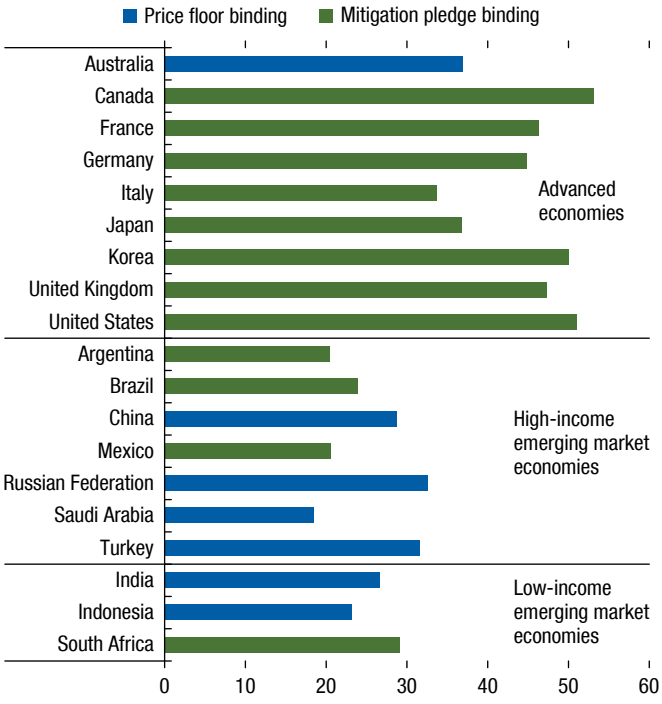
Reinforcing existing pledges with a (concrete example of a) price floor could cut global CO_2 emissions by 29 percent below baseline levels. The illustrative computation presented here is for an international carbon price floor on fossil fuel CO_2 emissions in 2030, which is aligned with keeping global warming below 2°C. It differentiates prices according to development level: $75 per ton for advanced economies, $50 per ton for high-income emerging market economies such as China, and $25 per ton for low-income emerging market economies such as India. The simulation suggests that it is sufficient for only six G20 members to participate (Canada, China, the European Union, India, the United Kingdom, and the United States). When all G20 members participate in the price floor, global emissions decrease by 32 percent. In stark contrast, existing mitigation pledges would cut global CO_2 emissions in 2030 only by 20 percent below baseline (Figure 2.7).

Under this illustrative pricing regime (Figure 2.8), emission reductions are about 35–50 percent below baseline in 2030 for advanced economies and 20–30 percent for emerging market economies. The pricing floor (rather than the mitigation pledge) is binding for 6 out of 10 emerging market economies, but for only one advanced economy. Applying a dynamic computable general equilibrium model to a cooperative international pricing scenario, Chateau, Jaumotte, and Schwerhoff (2022) find that the GDP effects are modest, at least if revenues from carbon pricing are used productively and needed energy investments materialize. Thus, cooperation in carbon pricing and equivalent measures can keep global warming within an acceptable range at relatively small macroeconomic costs and is fully compatible with continued, healthy economic development.

Implementing carbon-pricing requirements would mobilize a significant source of new revenue, ranging between 0.7 and 2.9 percent of GDP, depending on the CO_2 price and the CO_2 intensity of GDP. Abatement costs (from reducing emissions) under the illustrative regime vary from 0.2 to 1 percent of GDP for most countries. Costs on average are highest for advanced economies and lowest for low-income countries and emerging market economies, with some exceptions—for example, costs are more than 1 percent of GDP in South Africa, reflecting high emission intensity of the country's GDP. However, the domestic environmental cobenefits of carbon pricing—notably, reductions in mortality from local air pollution—can offset a large portion of these costs and substantially exceed them in several large emerging market economies.

Figure 2.8. CO_2 Reduced below Baseline in Selected Countries with a Carbon Price Floor, 2030
(Percent)

Emission reductions are 20–55 percent below baseline.



Source: IMF staff analysis.
Note: CO_2 reductions shown result from either a country's mitigation pledge or the illustrative carbon price floor, whichever is more stringent. CO_2 = carbon dioxide.

Carbon Taxes and Equivalent Measures under a Coordinated Regime

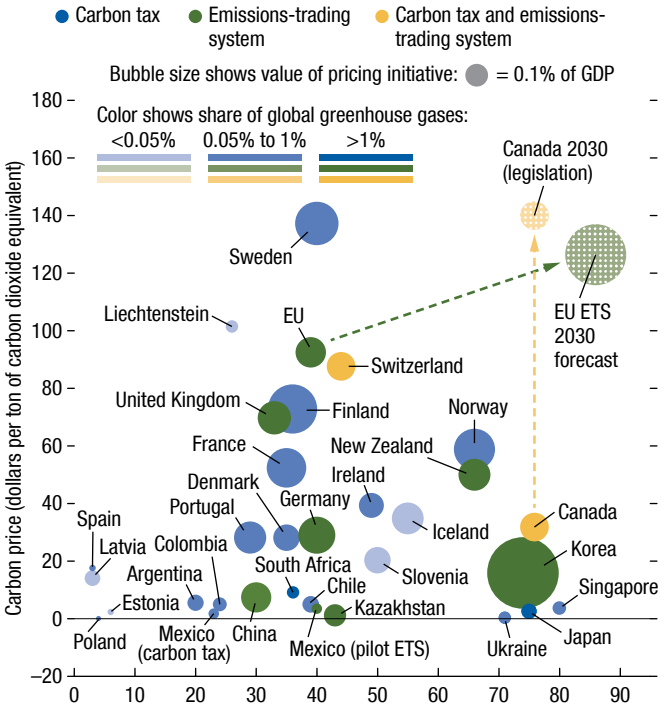
International pricing regimes can readily accommodate both carbon taxes and emissions-trading systems. In the latter, the government sets a cap on allowed emissions, firms obtain permits for their emissions (from the government or through trading with other firms), and market trading ultimately establishes the allowance or emission price. A domestic price floor mechanism or appropriate scaling of the cap can align domestic prices with international requirements.[22] About 30 pricing schemes have been implemented at the European Union and national levels, although coverage rates vary (below 30 percent of greenhouse gases in some cases and above 70 percent in others), as do prices (below $20 per ton in many cases but well above $50 per ton in others) (Figure 2.9).

Further policy approaches can be accommodated if they yield emission reductions equivalent to those from carbon pricing. Some countries may eschew carbon pricing—perhaps because of opposition to higher energy prices—in favor of other measures. These include renewables policies, emission-rate standards, feebates, clean-technology subsidies, and taxes on individual fuels.

In contrast with carbon pricing, regulatory and fiscal instruments do not trigger the full demand response to promote the full range of mitigation opportunities. For example, adopting a vehicle standard for CO_2 per

Figure 2.9. Selected Carbon-Pricing Initiatives, by Coverage of Greenhouse Gas Emissions and Carbon Price
(Percent)

Pricing schemes are proliferating, but coverage rates and prices vary considerably.



Source: IMF staff update of Parry and others (2021), Figure 1.
Note: Carbon prices are from April 1, 2021, from the World Bank. The EU ETS price is from July 19, 2021, from EMBER. Data on greenhouse gases are from 2018. Values less than 0.005 percent of GDP are of equal size for illustrative purposes. The EU ETS forecast price for 2030 is based on *BloombergNEF* (108 euros per ton CO_2 by 2030), and coverage assumes transport and buildings are covered by ETS expansion with a similar price. For EU member states, the size of the bubble reflects the value of national pricing initiatives excluding the EU ETS, which is shown only in the EU bubble. Jointly accounting for EU-wide and national schemes would substantially increase carbon pricing levels in all individual EU countries. For the purposes of this chart, EU includes Iceland, Liechtenstein, and Norway because they participate in the EU ETS scheme. EU ETS = European Union Emissions Trading System.

[22]Canada offers a prototype whereby the federal government sets the needed carbon price, while provinces and territories have the flexibility to meet the price through taxes or emissions-trading systems (ECCC 2020).

mile promotes sales of lower-emission vehicles but does not encourage people to drive less. Even so, a combination of policies could be calibrated to achieve economy-wide emission reductions equivalent to those through implementation of a carbon price.[23]

Unilateral Border Carbon Adjustment

Without an international carbon-pricing regime, unilateral border carbon adjustments seem likely to emerge, especially given the recent European Union proposal.[24] A border carbon adjustment imposes charges (or allowance purchase requirements) on imports into a jurisdiction with carbon pricing for "embodied" carbon (that is, the CO_2 emitted in the production of imports).[25] Such an adjustment is motivated by concerns about carbon leakage and competitiveness. Limiting an adjustment's scope to energy-intensive, trade-exposed industries (such as iron, steel, aluminum, petroleum products, and cement) would focus it on sectors in which these concerns are most severe and would limit administrative burdens (in part because reasonably reliable measures of embodied carbon are available for these sectors).

Border carbon adjustments are, however, subject to legal, equity, and effectiveness concerns (Parry and others 2021). Uncertainties surround the compatibility of border carbon adjustments with World Trade Organization rules. Border adjustments may disproportionately affect developing countries' competitiveness, not least because industries in large emerging market economies often have two to four times the embodied carbon of advanced economy industries—a possible response might be to base the adjustment on domestic industry emission rates for all trading partners. And border adjustments would be far less effective at scaling up global mitigation than a more comprehensive carbon-pricing regime, given they price emissions only in traded products, which are typically less than 10 percent of countries' total emissions.

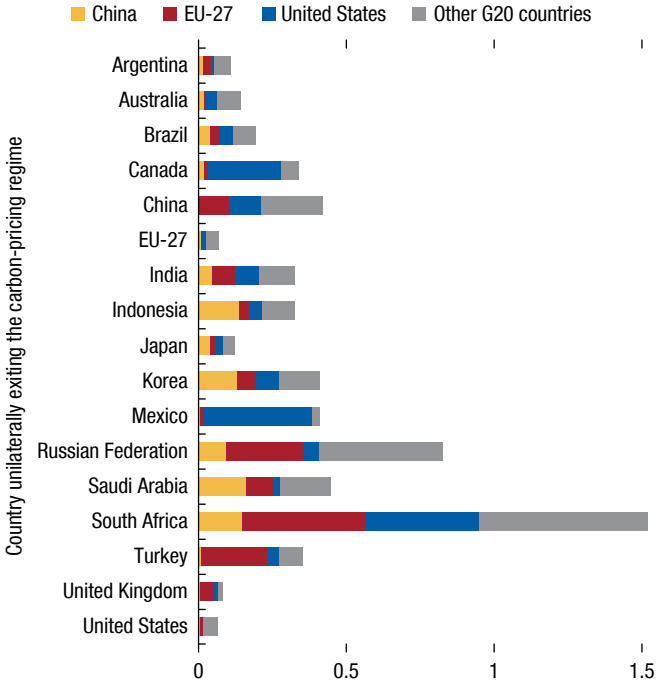
A border carbon adjustment can help create incentives for countries to remain in a pricing regime, rather than leave and subject their exports to the adjustment by those remaining in the regime. For example, if the United States unilaterally withdrew from a carbon-pricing regime in which all other G20 countries participated, then other countries would collect an estimated $13 billion (0.06 percent of GDP) a year on imports from the United States (for a border carbon adjustment based on European Union carbon intensity and a $75 per ton price). If China and India unilaterally withdrew, then revenue collections on their exports would be $62 billion (0.42 percent of GDP) and $9 billion (0.32 percent of GDP), respectively (Figure 2.10).

Aside from complicating negotiations, combining a carbon-pricing regime with a border carbon adjustment would raise two further issues:

- *All participants in the pricing regime would likely need to impose carbon pricing,* at least for domestic emissions from energy-intensive, trade-exposed industries.

Figure 2.10. Penalties from Exiting Illustrative Carbon-Pricing Regime with a Border Carbon Adjustment, 2020
(Percent of country GDP)

Border carbon adjustment penalties create incentives for countries to remain in a carbon-pricing regime.



Sources: IMF, Climate Change Indicators Dashboard, 2022; OECD, Bilateral Trade Database by Industry and End-Use, 2022; and IMF staff calculations.
Note: Embodied carbon data are for 2015, and trade flow data are for 2020 (except those for Saudi Arabia, which are for 2018). This figure assumes border carbon adjustment based on country-specific standards and a $75 CO_2 price. EU-27 = 27 countries of the European Union; G20 = Group of Twenty.

[23]Online Annex 2.5 illustrates potential CO_2 reductions under alternative mitigation policies relative to those under carbon pricing.

[24]The European Council (2022) reached an agreement in March 2022 on "carbon border adjustment mechanisms" to function in parallel with the European Union's Emissions Trading System. The European Parliament is yet to confirm its position.

[25]Rebates might be provided to domestic exporters, perhaps tied to industry-level emission-rate benchmarks to avoid undermining firm-level mitigation incentives.

A country without these emission charges may not be able, under World Trade Organization rules, to impose charges on embodied emissions for imports.

- *A common external border carbon adjustment would need to be agreed upon*, which might limit the scope for varying the pricing of industrial emissions according to development levels.

Despite the recent proliferation of carbon-pricing schemes, such pricing remains difficult domestically in many countries, not least because of opposition to higher energy prices and the contraction of fossil fuel–reliant activities. A comprehensive strategy with supporting elements can enhance prospects for reform and is especially important in light of recent surges in energy prices. Supports might include, for example, reinforcing pricing with sectoral-based regulations and feebates (which have less of an effect on energy prices), the use of carbon-pricing revenues to equitably boost the economy, robust assistance measures for vulnerable groups, and gradual phase-in of reforms in consultation with stakeholders (for case studies and an analysis of distribution and political economy issues, see IMF 2013; October 2019 *Fiscal Monitor*).

International policy coordination is, however, essential—and urgent—to overcome obstacles to unilateral action. The immediate priority is continued dialogue on, and supporting analysis of, potential coordination regimes. This dialogue could be conducted in parallel through multiple fora, such as the Group of Seven (G7) and G20 (currently under the German and Indonesian presidencies, respectively), the 27th United Nations Conference of the Parties (COP27), and the Coalition of Finance Ministers for Climate Action, as well as through bilateral discussions. Meanwhile, the type of price floor arrangement discussed here might also be implemented at the regional level (for example, several countries in the Latin American region already have carbon taxes, and several countries in the Asia and Pacific region have implemented, or are considering, carbon pricing)—regional price floor arrangements could provide valuable experience for developing a global price floor arrangement.

Box 2.1. The Need for Timely and Accurate Beneficial-Ownership Information

It is pivotal for tax authorities to effectively obtain, verify, and use beneficial-ownership information, which necessitates establishing or accessing *beneficial-ownership registries* (or alternative mechanisms that are just as effective). Owning or controlling a company or trust as a beneficial owner through complicated ownership structures, using multiple jurisdictions, as well as with no visible or direct ownership stake, allows criminals to hide their identity and the origins of their assets and to commit tax evasion and other crimes. Authorities should assess—and design measures to mitigate—risks from such activities (Table 2.1.1).

Table 2.1.1. What Is Beneficial-Ownership Information and How Can Beneficial-Ownership Measures Be Implemented?

 **Definition**	• *Beneficial owner is the natural person* who ultimately owns or controls a legal entity (such as a company) or legal arrangement (such as a trust). • *Always a person at the end of an ownership or control chain*; differs from the concept of legal ownership of an entity (which can be another company or trust that is a shareholder). • *The IMF uses the Financial Action Task Force definition of beneficial ownership*, which has also been adopted by the Global Forum.
 **Implementation**	• *Identify beneficial owners* when a company is created, and when changes to ownership and control are made, to prevent misuse and to foster transparency in business dealings. • *Centralize verified and up-to-date information into a database*: Establish a beneficial-ownership registry, for example with company registries, financial-intelligence units, and tax authorities. • *Provide access to the registry*: If the registry is not public, then at a minimum, government entities (including tax authorities), financial institutions, and gatekeepers (for example, lawyers, accountants, notaries, and trust and company service providers) should all have access. • *Use a multipronged approach*: Require companies and trusts to know their own beneficial owners, incorporate beneficial-ownership identification in customer due diligence processes, and use beneficial-ownership information for public procurement.

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